

**Fishery Management Report No. 07-05**

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**Fishery Management Report for Sport Fisheries in the  
Upper Tanana River Drainage in 2003**

by  
**James F. Parker**

February 2007

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Alaska Department of Fish and Game

Divisions of Sport Fish and Commercial Fisheries





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by

James F. Parker

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Division of Sport Fish, Research and Technical Services  
333 Raspberry Road, Anchorage, Alaska, 99518-1599

February 2007

The Division of Sport Fish Fishery Management Reports series was established in 1989 for the publication of an overview of Division of Sport Fish management activities and goals in a specific geographic area. Since 2004, the Division of Commercial Fisheries has also used the Fishery Management Report series. Fishery Management Reports are intended for fishery and other technical professionals, as well as lay persons. Fishery Management Reports are available through the Alaska State Library and on the Internet: <http://www.sf.adfg.state.ak.us/statewide/divreports/html/intersearch.cfm>. This publication has undergone regional peer review.

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## **ABSTRACT**

This document provides a wide array of information regarding the recreational angling opportunities that exist within Region III, specifically those within the Upper Tanana Management Area (UTMA). Summaries of major fisheries within the area are detailed, including descriptions of recent performances, Alaska Board of Fisheries regulatory actions, social and biological issues, and descriptions of ongoing research and management activities, and fish stocking information within the upper Tanana River Management Area.

Key Words: Tanana River, Upper Tanana River Management Area, Delta River, Delta Clearwater River, Goodpaster River, Chisana River, sport fisheries, commercial, subsistence, coho salmon, king salmon, burbot, lake trout, Arctic grayling, northern pike, stocking waters.

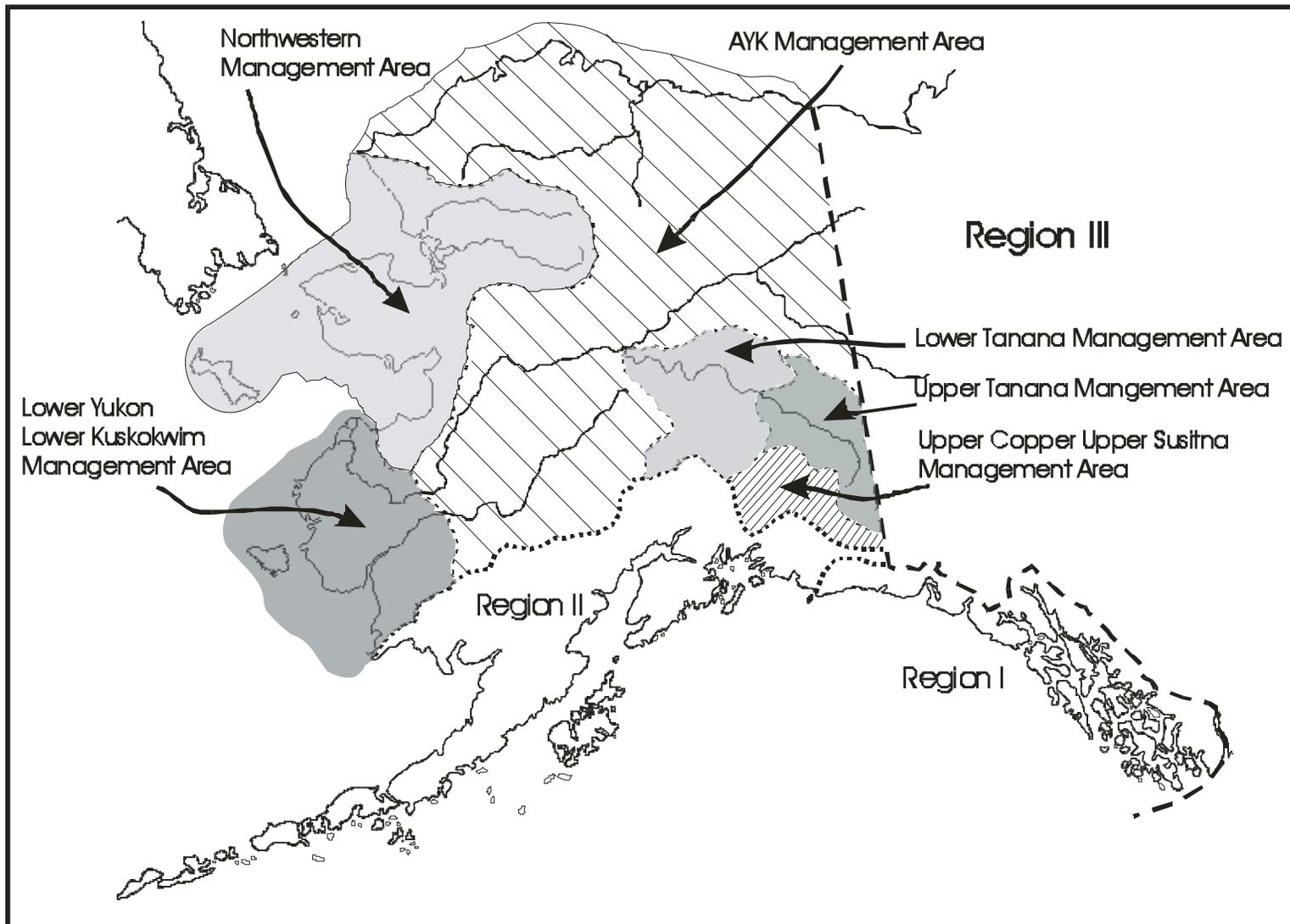
## **PREFACE**

This report is written to make fisheries management information available to the State Board of Fisheries, Fish and Game Advisory Committees, and the public. Management strategies developed in this report are a result of biological assessment (current and prior research projects), and input from user groups. Reviews of these strategies are done on an annual basis and research is prioritized during the area review process prior to each field season. Other information in this report includes a description of the fisheries regulatory process, the geographic boundary of the area, angler access information, and fish stocking information within the upper Tanana River Management Area. Division of Sport Fish operations are fully funded by sport anglers and recreational boaters through contributions to the Federal Aid in Sport Fish Restoration and the Fish and Game general fund. A minimum of 15% of the state's Federal Aid appropriation must be used to improve recreational boating access and facilities.

## **INTRODUCTION**

The Alaska Board of Fisheries (BOF) divides the state into regulatory areas for the purpose of organizing the sport fishing regulatory regime by drainages and fisheries. These areas (not to be confused with Regional management areas) are described in Title 5 of the Alaska Administrative Code (5 AAC). Sport Fish Division of the ADF&G divides the state into three administrative regions with boundaries roughly corresponding to groups of the BOF regulatory areas (Figure 1). Region I is Southeast Alaska. Region II covers portions of South-central Alaska, Kodiak, Southwestern Alaska, and the Aleutian Islands. Region III includes two of the BOF fishery regulatory areas. They are the Upper Copper and Upper Susitna regulatory area and the Arctic-Yukon-Kuskokwim regulatory area.

Region III is the largest geographic region, encompassing the majority of the landmass of the state of Alaska (Figure 1). The region contains over 1,251,300 km<sup>2</sup> (485,000 mi<sup>2</sup>) of land, some of the state's largest river systems (the Yukon, the Kuskokwim, the Colville, the Noatak, and upper Copper River and upper Susitna River drainages), thousands of lakes, and thousands of miles of coastline and streams. Regional coastline boundaries extend from Sheldon Point in the southwest, around all of western, northwestern and northern Alaska to the Canadian border on the Arctic Ocean. Region III as a whole is very sparsely populated, with the most densely populated center located in the Tanana River valley. Fairbanks (population about 31,000) is the largest community.



**Figure 1.**-Map of the sport fish regions in Alaska and the six Region III management areas.

For administrative purposes Sport Fish Division has divided Region III into six management areas. They are: Northwestern Management Area (Norton Sound, Seward Peninsula and Kotzebue Sound drainages); AYK Management Area (the North Slope drainages, the Upper Yukon River except the Tanana River drainage, and the Upper Kuskokwim River drainage upstream from the Aniak River); Lower Yukon /Lower Kuskokwim Management Area, Upper Copper/Upper Susitna Management Area (UC/US, the Copper River drainage and the Susitna River drainage above the Oshetna River); Upper Tanana Management Area (UTMA, The Tanana River drainage upstream from Banner Creek and the Little Delta River); and, Lower Tanana Management Area (LTMA, The Tanana River drainage downstream from Banner Creek and the Little Delta River; Figure 1). Area offices for the six areas are located in Nome, Fairbanks, Bethel, Glennallen, Delta Junction, and Fairbanks, respectively.

The Tanana River drainage is divided into two separate management areas because it contains population centers that result in a large amount of angling effort on local fishery resources. Intensive, stock-specific studies are required in the Tanana drainage to provide biological and fishery management information because of higher fishery exploitation rates. This report details the management activities in the Upper Tanana Management Area.

The BOF is the seven-member board that sets fishery regulations, allocates fishery resources, and approves or mandates fishery conservation plans for the State of Alaska. Board members are appointed by the Governor and must be confirmed by the legislature. Board members are appointed for a term of 3 years. Under the current operating schedule, the BOF considers fishery issues for regulatory areas or groups of regulatory areas on a 3-year cycle. The BOF meetings are usually in the winter, between early October and late March. Statewide fisheries issues are considered at statewide BOF meetings. The BOF receives regulation proposals and management plans from ADF&G, local advisory committees, and the public (any Alaskan can submit a proposal to the BOF). The last BOF meeting for the AYK regulatory area was in January 2003. During its deliberations the BOF receives input and testimony through oral and written reports from staff of the ADF&G, members of the general public, representatives of local fish and game Advisory Committees, and special interest groups such as fishermen's associations and clubs.

Under the Alaska National Interest Lands Conservation Act (ANILCA) the federal government requires that subsistence use of fish and game by rural residents have priority over other uses. This is unconstitutional under Alaskan state law, which requires equal access to resources for all residents. Because the state is not in compliance with the federal law, managers of federal lands in Alaska are obligated by ANILCA to implement subsistence priority on federal lands and waters.

The Federal subsistence management includes a system of 10 federally-funded Regional Advisory Councils (RAC's) that provide recommendations to the Federal Subsistence Board (FSB) to ensure rural priority for fish and game use on federal lands statewide. The RAC's make recommendations to the FSB, which upon approval, codifies them into federal law. The federal government implemented their subsistence fisheries management program and started accepting proposals in October 1999.

The ADF&G has emergency order (EO) authority (5 AAC 75.003) to modify time, area, and bag/possession limit regulations. Area managers implement EOs to deal with conservation issues that are not controlled by existing regulations. In this way, managers deal with conservation issues until resolved or until the BOF can take up the issue. EOs is also the

mechanism by which "in-season" management of fisheries is accomplished. In-season management is usually in accordance with a fisheries management plan approved by the BOF.

The Region III Sport Fish Division staff biologists are organized into a research group and a management group. The management group consists of a management supervisor, a regional management biologist, an area management biologist for each of the six management areas, one or more assistant area management biologists, and two stocked waters biologists. The area managers evaluate fisheries, propose and implement management strategies through plans and regulations to meet Divisional goals. These area managers interact with the BOF, Advisory Committees, and the general public. The stocked waters biologists plan and implement the Regional stocking program for recreational fisheries.

The research group consists of a research supervisor, six research biologists, and various field assistants. The research biologists plan and implement fisheries research projects in order to provide information needed by the management group to meet Divisional goals. The duties of the management and research biologists overlap somewhat.

This report summarizes fisheries information for 2003 and preliminary information from 2004. This report is organized into two major sections. Section I provides an overview of the Upper Tanana Management Area. Included, is an area description, BOF activities, and information pertaining to management, stocking, research, and access program activities conducted. Section II provides a more detailed summary of important fisheries and has special management concerns identified during the reporting period. Included in these summaries are: a fishery description, fishery management objective, a description of recent performance of the fishery; a description of recent BOF actions related to the fishery, a discussion of social or biological issues that may be associated with each fishery, a summary of current research and management activities related to each fishery, and a outlook for the 2005 fishing season.

## **SECTION I: MANAGEMENT AREA OVERVIEW**

### **TANANA RIVER MANAGEMENT**

The Tanana River is the second largest tributary of the Yukon River. The Tanana River basin (Figure 2) drains an area of approximately 116,500 km<sup>2</sup> (11.7 million ha). The main river is a large glacial stream formed at the confluence of the Chisana and Nebesna rivers near Tok. The Tanana River flows in a generally northwest direction for some 917 km. The Tanana drainage is split into the Upper Tanana and Lower Tanana management areas because of the intensive effort and high sport fishery exploitation levels in this region of Alaska. In 2003, sport-fishing effort in the Tanana River drainage was 99,934 angler-days being 48% of the total effort in Region III and 5% of the State of Alaska total (Jennings 2006a). During this reporting period Mike Doxey was the Area Management Biologist for the Lower Tanana Management Area and Fronty Parker was the Area Management Biologist for the Upper Tanana Management Area.

### **UPPER TANANA RIVER MANAGEMENT AREA DESCRIPTION**

The boundary between the Lower Tanana Area and the Upper Tanana Area is at Milepost 295 Richardson Highway (Figure 3). On the South side of the Tanana River the Western-most part of the Upper Tanana Area is confined by the Matanuska-Susitna, Denali, and Fairbanks North Star boroughs. The Eastern-most extent of the Tanana River drainage includes the Alaska portion of the White River. The Southern-most extent of the drainage is the Tangle Lakes

System (Delta River) along the Denali Highway and the headwaters of the Nabesna River at the end of the Nabesna Road. Communities located within the Upper Tanana drainage are Big Delta, Delta Junction, Fort Greely, Dot Lake, Tanacross, Mansfield, Tok, Tetlin, Northway, and Nabesna. The Upper Tanana Area affords unique fishing opportunities such as the high elevation waters found along the Denali Highway that support lake trout populations. Along the Tok Cutoff Road flowing waters support the only known Dolly Varden populations in the Tanana River drainage. In addition, numerous spring-fed waters near Delta Junction provide critical habitat for the largest coho salmon spawning concentrations in the Yukon River drainage. Because spring-fed systems do not freeze up, spawning coho provide the latest-season open water fishing opportunity in the region. In addition, adult Arctic grayling migrate in June after spawning to feed in these spring-fed waters because of abundant aquatic invertebrate resources found there. These Arctic grayling are larger than in other systems and provide desirable sized fish in the Delta Clearwater and Richardson Clearwater rivers.

### **ALASKA BOARD OF FISHERIES AND ADVISORY COMMITTEES**

Sport fishing regulations are established by the BOF. Public input concerning regulation changes is provided for in this process through direct testimony to the BOF and through participation in local fish and game advisory committees. Advisory committee meetings allow opportunity for direct public interaction with department staff. In this way, the public can ask questions and staff can provide clarification to proposed regulatory changes. During the January, 2004, BOF meeting in Fairbanks, 37 proposals were considered that would change sport fishing regulations in the Arctic-Yukon-Kuskokwim Region. The Board adopted 11 of these proposals, resulting in changes to some sport fishing regulations in the Region. A complete summary of how the proposals were voted upon is found in Appendix C3. The Boards Support Section within the Division of Administration provides administrative and logistical support for the BOF and Fish and Game advisory committees. There are two advisory committees in the Upper Tanana Area that represent resource users: Delta and Upper Tanana/Forty Mile. These two committees meet on a monthly or bi-monthly schedule throughout the fall and winter months. There is a third Advisory Committee in Paxson that addresses fishery issues both in the Tanana and Upper Copper rivers. To address conservation emergencies between BOF meetings, the Upper Tanana Area manager has EO authority (5 AAC 75.003) to modify time, area, and bag/possession limit regulations. No EOs were issued during 2004 in the Upper Tanana Area. Regulations for Tanana drainage sport fisheries are found in Chapter 70 of Title 5 of the Alaska Administrative Code. Regulations for specific waters in the Upper Tanana Area are found under the Tanana River portion (5 AAC 70.022 d) of the Arctic-Yukon-Kuskokwim Area.

### **FEDERAL SUBSISTENCE REGIONAL ADVISORY COUNCIL**

The Upper Tanana Area is within the Eastern Interior Regional Advisory Council region (includes Game Management Units 12, 20 and 25). The Eastern Interior RAC (region 9) met in Eagle on March 27-29, 2004, and in Beaver Alaska on October 5-6, 2004. The most recent rulings by the FSB for seasons, harvest limits, methods, and means of taking fish for subsistence uses includes allowing the take of salmon for religious ceremonies and allowing hook & line for subsistence fishing year round. The community of Delta Junction's bid to be included in the Upper Copper River C & T Use (salmon) was rejected by the FSB.

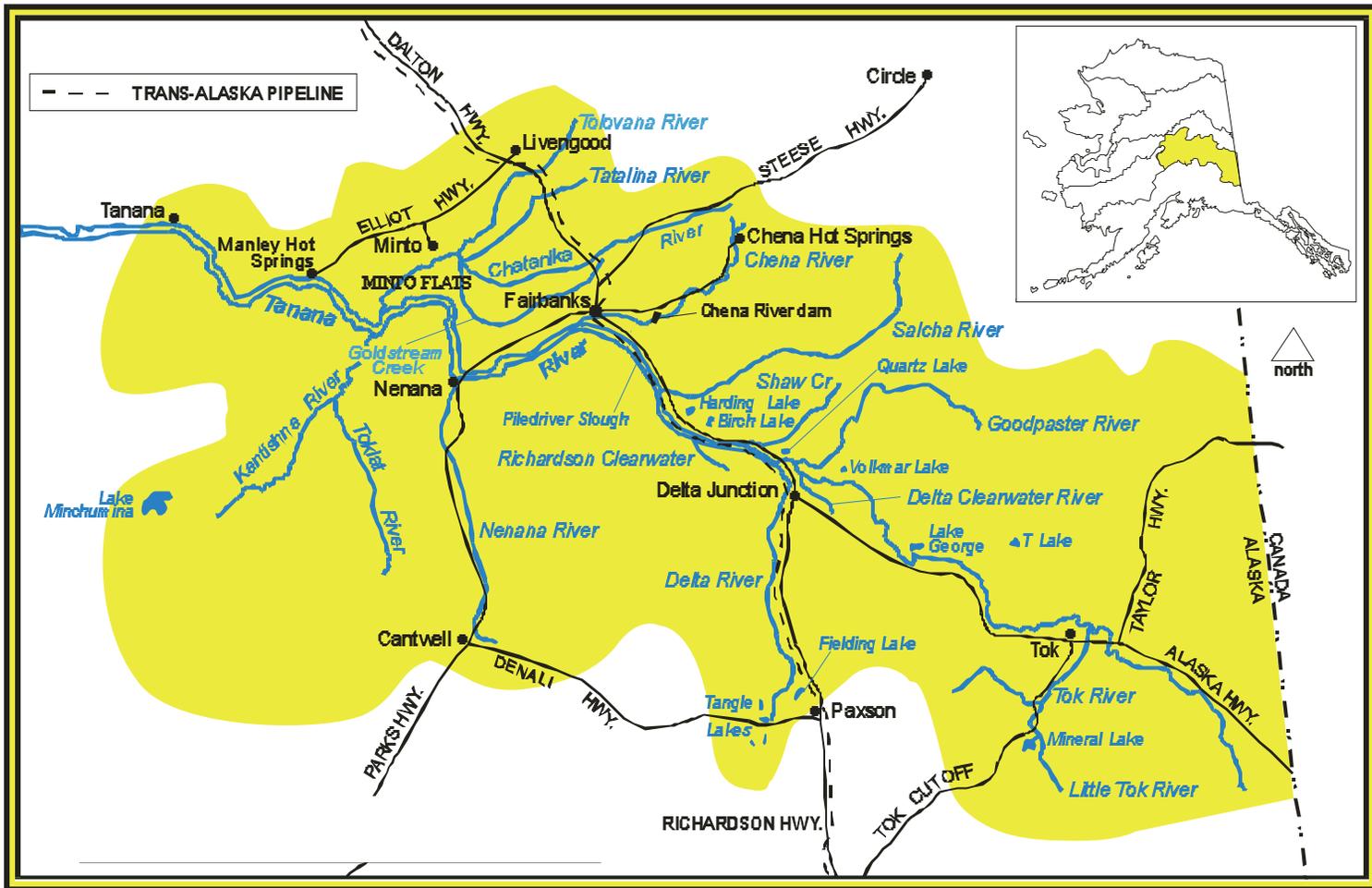


Figure 2.-Map of the Tanana River drainage.

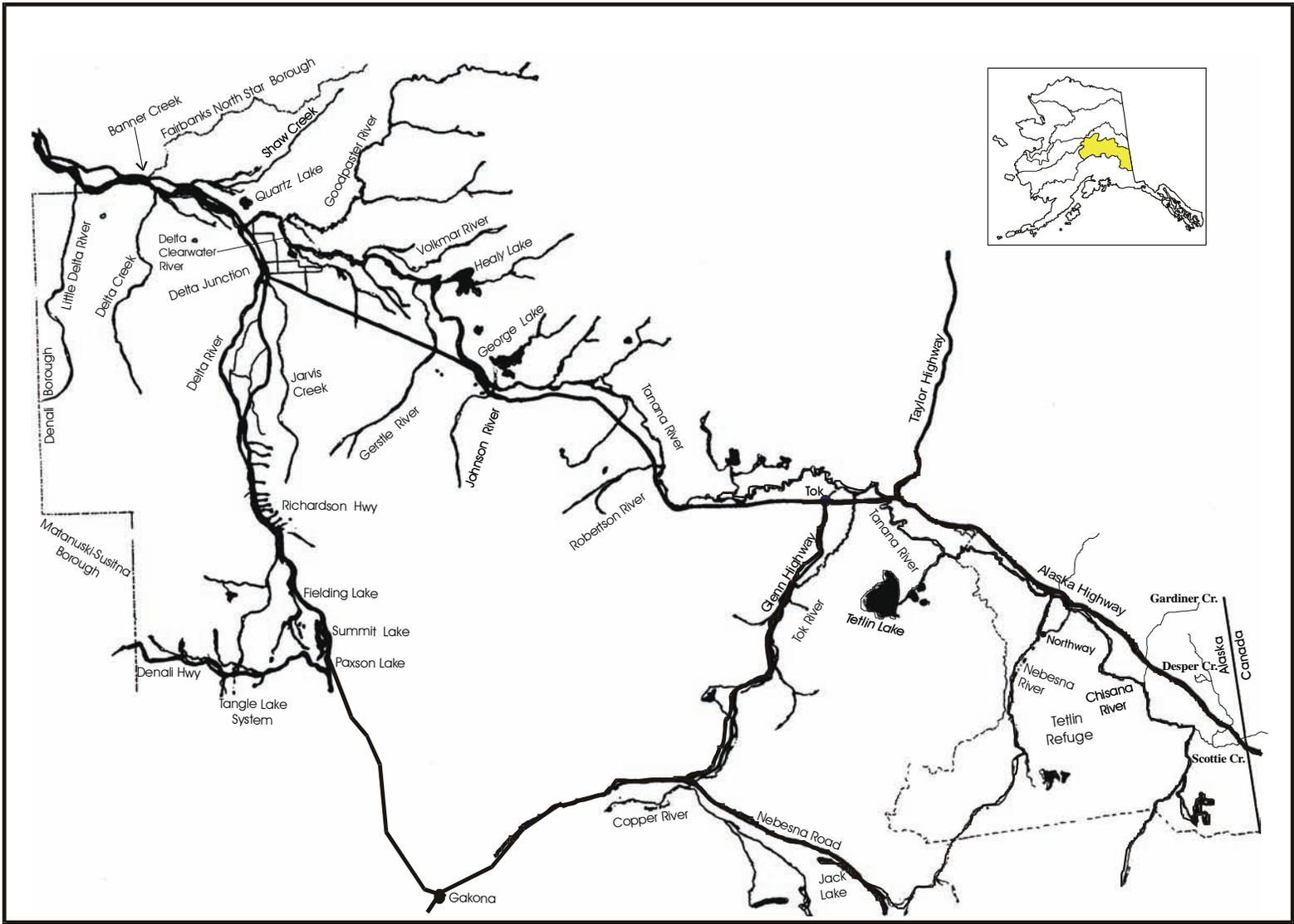


Figure 3.-Map of the Upper Tanana Management Area within the Tanana River drainage.

Federal lands within the Upper Tanana Area are: 1) Tetlin Refuge (730,000 acres; Figure 3) which includes much of the Nebesna and Chisana rivers; 2) Delta River Wild and Scenic River Corridor (37,000 acres, 62 river miles); 3) the Tangle Lakes Archaeological District (460,000 acres); and, 4) the headwaters of the Chisana and Nabesna rivers are with the Wrangle-St. Elias National Preserve adjacent to the Tetlin National Refuge.

## **FISHERY RESOURCES**

There are 17 fish species known in the Upper Tanana Area, of which 10 are species commonly targeted by sport anglers. They include: king salmon *Oncorhynchus tshawytscha*, coho salmon *Oncorhynchus kisutch*, chum salmon *Oncorhynchus keta*, Arctic grayling *Thymallus arcticus*, burbot *Lota lota*, lake trout *Salvelinus namaycush*, Dolly Varden *Salvelinus malma*, round whitefish *Coregonus cylindraceum*, least cisco *Coregonus sardinella*, humpback whitefish *Coregonus pidschian*, and northern pike *Esox lucius*. Rainbow trout *Oncorhynchus mykiss* are not native to the drainage, but have been stocked in several locations. Arctic char *Salvelinus alpinus*, coho salmon, Arctic grayling and lake trout have also been stocked in selected waters of the Upper Tanana area.

## **STATEWIDE HARVEST SURVEY DESCRIPTION**

Recreational angling effort in the Tanana drainage has been estimated since 1977 using a statewide mail-out survey (Mills 1979-1994; Howe et al. 1995; 1996, 2001a-d; Walker et al. 2003; Jennings et al. 2004, 2006a-b) administered by Regional Technical Services (RTS) of the Sport Fish Division. This cost effective alternative to creel census information is important to fishery managers to maintain, protect or improve important fisheries. These estimates from the SWHS report the number of angler-days of sport fishing effort expended by recreational anglers fishing Alaskan waters as well as the catch and harvest of important sport species. The survey is designed to provide estimates of effort and harvest on a site-by-site basis. The standard questionnaire used annually since 1977 was mailed to 22,500 households containing at least one individual who purchased a 2003 sport fishing license or a valid permanent identification card for sport fishing. Approximately 12,100 surveys were sent to non-resident license purchasers and the remainder to Alaskan residents. Each household was asked for information in 2003 on number of licensee's, on participation (number of anglers, trips, and days fished), and number of fish caught and number of fish kept (harvested) by species and site. An estimate was generated for catch and harvest for each species and participation by site. Confidence intervals for estimates were calculated using the percentile method of bootstrap resampling with 1,000 replications. Guidelines (Mills and Howe 1992) for evaluating the utility of the estimates are: 1) other than to document that sport fishing occurred, estimates based on fewer than 12 responses should not be used; 2) estimates based on 12-29 responses can be useful in indicating relative order of magnitude and for assessing long-term trends; and; 3) estimates based on 30 or more responses are generally usable. For larger fisheries SWHS harvest estimates have been consistent with onsite creel surveys (Mills and Howe 1992). For the most part, use of SWHS data has replaced onsite creel surveys. Because of the time delay to obtain results, estimates cannot be used for in-season management and are not recommended for compliance with regulatory and management policies, quotas, and guidelines (Walker and Bingham 2002). The

estimates for 1996-1999 (Howe et al. 2001a-d) have been revised and republished in 2001. The revised estimates are updated in all tables presented in this report.

## RECREATIONAL ANGLER EFFORT, HARVEST AND CATCH

From 1977-2003, the majority (average 66.9%; Table 1) of sport effort in Region III (or AYK) occurs in the Tanana River drainage. From 1977-2003, anglers in the Tanana drainage expended an average of 138,356 angler-days (Table 1; Figure 4). The fraction of statewide effort expended in the Tanana drainage in 2003 was 4.5%, somewhat lower than the 24-year average of 6.7% (Table 1). From 1999 to 2003, sport fishing effort in Tanana drainage portion of the AYK Region ranged from 46.9% to 52.7% (Table 1). The Upper Copper and Upper Susitna River Management Area was included into the AYK Region in 1997 and the Lower Yukon/Lower Kuskokwim Management Area included in 2000. Prior to incorporation of additional management areas, the average sport fishing effort in the Tanana River drainage portion of the total AYK region was 71% of the total effort (Parker 2000).

Numbers of anglers for the Upper Tanana Management Area (UTMA) are derived as a proportion of the total number of Tanana drainage anglers. The ratio is determined from the sum of anglers partitioned from each management area (Lower and Upper Tanana River drainage) and multiplied to the number of anglers from the Tanana drainage. This is required because numbers of anglers do not equal sum of sites, due to some anglers fishing at more than one site (Walker and Bingham 2002). From the most recent 5-year average (1999-2003), the number of anglers in the UTMA averaged 34% of the entire Tanana drainage while the number of trips averaged 26%, and the average number of angler-days averaged 34,019 or 29% of the Tanana drainage (Table 2). The number of angler-days in 2003 was 29,036, down 15% from the 5-year average of 34,019 (Table 2). From 1999-2003, the average harvest of 30,948 fish in the UTMA was 42% (Table 2) of the Tanana drainage total. In 2003, the harvest in UTMA (22,267) was significantly lower than the 5-year average (30,948). In the entire Tanana River drainage harvest was down 31% from the 5-year average (Table 2), this is probably largely due to decreased availability of stocked species, in particular rainbow trout.

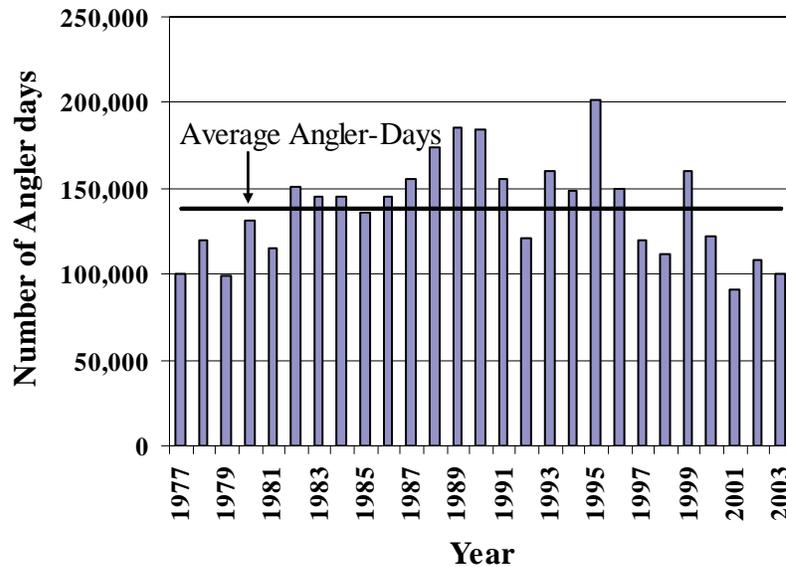
**Table 1.**-Number of angler-days of sport fishing effort expended by recreational anglers fishing the Tanana River drainage, Statewide, and Region III waters, 1977-2003<sup>a</sup>.

Year	Tanana Drainage Effort	Statewide Effort	Tanana Percent of Statewide	Region III Effort	Tanana Drainage Percent of Region III
Average 1977-1981	112,878	1,351,484	8.4	140,780	80.2
1982-1986	144,242	1,847,387	7.8	195,711	73.7
1987-1991	171,063	2,327,570	7.3	231,169	74.0
1992-1996	156,243	2,522,778	6.2	222,751	70.1
1997-2001	121,014	2,242,240	5.4	241,386	50.1
2002	108,462	2,259,091	4.8	220,276	49.2
2003	99,934	2,219,398	4.5	206,705	48.3
Average 1977-2003	138,356	2,071,696	6.7	206,888	66.9

<sup>a</sup> (Mills 1979-1994; Howe et al. 1995; 1996, 2001a-d; Walker et al. 2003; Jennings et al. 2004, 2006a-b)

From 1999 to 2003, recreational anglers in the Tanana River drainage harvested an average of 73,179 fish, accounting for an average of 2.3% of the annual estimated statewide recreational fish harvest and 48.3% of the total estimated AYK harvest for the same period (Table 3). Sport harvest of all species since 1977 in the Tanana drainage reached a peak in 1988 when over 198,000 fish were harvested (Mills 1989). Total harvest experienced a low of 49,197 fish in 2001 (Table 4) in the Tanana drainage compared to the 1999-2003 average of 73,179 (Tables 3 and 4).

From 1977-1986, Arctic grayling alone accounted for 47.6% of the total Tanana drainage harvest, whereas rainbow trout and stocked coho salmon together accounted for 34.3% (Table 4). Arctic grayling have been the most harvested species in the Tanana drainage until 1988 (Parker and Viavant 2000; Table 4). Since then rainbow trout have dominated harvests. Rainbow trout accounted for an average of 49.9% of the total Tanana drainage harvest over the past 5 years (Table 4) and 45.3% of the total Tanana drainage harvest in 2003 (Table 4). A total of 9,731, or 37.0% of the total Tanana drainage rainbow trout harvest were harvested in the UTMA in 2003 (Table 5). From 1999-2003 the combined average harvest of rainbow trout and landlocked coho salmon stocked in area lakes accounted for 66.3% of total harvest in the Tanana drainage (Table 4). This indicates a significant reversal in the role of the stocking program in the interior. In 2003, combined, Chinook salmon, chum salmon, whitefish, sheefish, and other fish species accounted for less than 1% of the total Upper Tanana area harvest in 2003 (Table 5).



**Figure 4.-**Angler effort in the Tanana River drainage from 1977 – 2003 (Mills 1979-1994; Howe et al. 1995; 1996, 2001a-d; Walker et al. 2003; Jennings et al. 2004, 2006a-b).

**Table 2.-**Effort and harvest in the Tanana River drainage and Upper Tanana area, 1997 – 2003 <sup>a</sup>.

Year	Number of Anglers in Upper Tanana area	Percent of Tanana Drainage	Number of Trips in Upper Tanana area	Percent of Tanana Drainage	Number of days (effort) in Upper Tanana area	Percent of Tanana Drainage	Total Harvest in Upper Tanana area	Percent of Tanana Drainage
1997	7,075	22%	20,393	23%	30,536	26%	30,009	40%
1998	9,664	31%	20,054	25%	31,412	28%	37,561	47%
1999	9,637	31%	22,839	24%	46,809	29%	38,103	46%
2000	8,306	33%	19,693	26%	34,956	29%	39,316	44%
2001	7,775	36%	17,696	31%	28,150	31%	23,112	47%
2002	7,763	36%	16,145	26%	31,145	29%	31,941	37%
2003	8,540	36%	16,211	25%	29,036	29%	22,267	37%
Average								
1998-2003	8,404	34%	18,517	26%	34,019	29%	30,948	42%

<sup>a</sup> (Mills 1979-1994; Howe et al. 1995; 1996, 2001a-d; Walker et al. 2003; Jennings et al. 2004, 2006a-b).

**Table 3.-**Five-year averages and remaining latest years of fish harvested by recreational anglers fishing Tanana River drainage, statewide, and Region III waters, 1977-2003<sup>a</sup>.

Year	Tanana Drainage Harvest	Alaska Harvest	Percent by Tanana Drainage Harvest	Region III Harvest	Percent by Tanana Drainage Harvest
1977-1981	134,947	2,459,475	5.5%	178,809	75.5%
1982-1986	173,185	3,058,086	5.7%	250,262	69.2%
1987-1991	161,588	3,249,825	5.0%	222,965	72.5%
1992-1996	94,898	3,164,254	3.0%	138,333	68.6%
1997-2001	74,106	3,258,252	2.5%	157,033	51.2%
2002	86,796	3,216,432	2.7%	164,463	52.8%
2003	58,055	3,052,136	1.9%	129,029	45.0%
Average					
1999-2003	73,179	3,220,472	2.3%	151,422	48.3%

<sup>a</sup> (Mills 1979-1994; Howe et al. 1995; 1996, 2001a-d; Walker et al. 2003; Jennings et al. 2004, 2006a-b).

**Table 4.-**Number of fish by species harvested by recreational anglers fishing Tanana River drainage waters, 1977-2003<sup>a</sup>.

Year	Salmon				Non-Salmon								Other Fish	Total
	Chinook	Coho <sup>b</sup>	Coho <sup>c</sup>	Chum	Rainbow Trout	Lake Trout	Char <sup>c</sup>	Arctic Grayling	Northern Pike	Whitefish	Burbot	Sheefish		
<b>Harvests</b>														
1977	100	94	7,151	300	5,992	1,471	877	57,793	9,345	3,378	1,547	158	732	88,938
1978	163	139	22,412	158	6,406	603	524	83,275	7,838	6,573	1,383	234	81	129,789
1979	515	25	36,073	219	5,186	946	364	70,243	7,975	5,159	1,979	279	79	129,042
1980	941	67	25,733	483	19,584	1,264	524	80,150	9,452	5,987	2,700	96	0	146,981
1981	763	45	57,294	595	24,571	1,721	572	75,288	9,941	4,873	4,122	93	108	179,986
1982	984	52	43,374	698	26,186	3,104	482	81,753	9,822	8,643	3,887	127	10	179,122
1983	1,048	147	34,255	649	20,664	2,937	293	92,363	10,225	8,311	5,040	157	21	176,110
1984	338	831	29,245	585	34,022	2,104	350	83,626	9,607	11,658	5,556	338	39	178,299
1985	1,356	796	41,042	1,255	33,432	2,984	1,230	63,560	12,090	20,230	4,795	420	0	183,190
1986	781	1,374	24,061	693	31,270	713	200	45,981	11,934	26,810	5,142	72	171	149,202
1987	502	1,231	26,566	620	31,824	652	36	38,480	9,471	26,435	3,855	235	0	139,907
1988	853	2,237	32,342	491	78,345	2,221	909	52,569	11,986	11,775	3,733	982	0	198,443
1989	963	1,596	18,614	1,134	74,675	1,932	913	54,823	11,330	16,935	4,357	643	130	188,045
1990	439	1,719	13,943	55	64,143	896	830	28,414	7,348	6,891	3,799	169	34	128,680
1991	630	2,345	22,125	588	72,024	1,978	2,891	33,778	12,476	739	2,739	158	303	152,774
1992	118	1,115	14,019	690	37,547	993	2,088	14,983	6,184	3,246	3,620	184	0	84,787
1993	1,573	278	15,734	371	49,693	1,939	3,873	17,658	7,712	984	5,717	100	79	105,711
1994	1,871	1,165	10,350	260	33,400	1,582	1,799	24,741	16,299	940	5,165	166	175	97,913
1995	2,488	1,116	8,198	985	35,625	887	2,736	16,089	10,620	493	4,934	310	367	84,848
1996	3,745	1,354	13,640	1,880	48,975	877	3,261	15,198	8,327	412	3,203	231	126	101,229
1997	1,953	1,229	6,824	456	33,833	832	2,530	16,570	3,328	1,062	6,348	35	108	75,108
1998	447	604	11,614	70	38,292	524	3,996	11,687	2,870	853	3,291	24	104	74,376
1999	1,001	451	8,637	474	48,226	1,145	4,851	11,523	2,925	235	3,148	114	0	82,730
2000	178	310	16,945	97	49,690	1,133	4,009	8,560	3,467	385	3,740	220	385	89,119
2001	667	1,122	10,197	29	19,919	445	3,368	7,074	4,207	785	1,297	9	78	49,197
2002	478	541	17,693	307	38,562	709	6,645	12,987	3,436	1,086	4,009	92	251	86,796
2003	2,153	1,317	6,680	63	26,292	862	4,854	10,084	2,947	167	2,561	59	18	58,057
1999-2003	895	748	12,030	194	36,538	859	4,745	10,046	3,396	532	2,951	99	146	73,180
% of Total	1.2%	1.0%	16.4%	0.3%	49.9%	1.2%	6.5%	13.7%	4.6%	0.7%	4.0%	0.1%	0.2%	
1977-1986	699	357	32,064	564	20,731	1,785	542	73,403	9,823	10,162	3,615	197	124	154,066
% of Total	0.5%	0.2%	20.8%	0.4%	13.5%	1.2%	0.4%	47.6%	6.4%	6.6%	2.3%	0.1%	0.1%	

<sup>a</sup> (Mills 1979-1994; Howe et al. 1995; 1996, 2001a-d; Walker et al. 2003; Jennings et al. 2004, 2006a-b).

<sup>b</sup> Harvests occurring on naturally occurring coho salmon stocks.

<sup>c</sup> Stocked landlocked coho salmon.

**Table 5.-**Number of fish by species harvested and caught by recreational anglers fishing Tanana River drainage waters, including the proportion within the Upper Tanana area in 2003<sup>a</sup>.

Species	Tanana River Harvest	Upper Tanana area Harvest	% Delta Harvest	Tanana River Catch	Upper Tanana area Catch	% Delta Catch
<b>Salmon:</b>						
Chinook	2,153	17	0.8%	7,000	157	2.2%
Coho <sup>b</sup>	1,317	1,306	99.2%	15,377	14,744	95.9%
Coho <sup>c</sup>	6,680	2,017	30.2%	19,880	7,059	35.5%
Chum	63	17	26.7%	1,791	278	15.5%
<b>Non-Salmon:</b>						
Rainbow Trout	26,292	9,731	37.0%	80,447	26,341	32.7%
Lake Trout	862	793	92.0%	3,595	2,946	81.9%
Char <sup>d</sup>	4,854	1,732	35.7%	13,224	5,126	38.8%
Arctic Grayling	10,084	4,532	44.9%	144,505	56,064	38.8%
Northern Pike	2,947	924	31.4%	26,591	6,611	24.9%
Whitefish	167	0	0.0%	1,018	283	27.8%
Burbot	2,561	1,189	46.4%	3,332	1,475	44.3%
Sheefish	59	0	0.0%	415	0	0.0%
Other Fish	18	9	50.0%	994	501	50.4%
Total	58,057	22,267	38.4%	318,169	121,585	38.2%

<sup>a</sup> Jennings et al. 2006a.

<sup>b</sup> Anadromous salmon.

<sup>c</sup> Landlocked coho and Chinook salmon

<sup>d</sup> Includes Arctic char and Dolly Varden.

Estimates of the number of fish caught and released by recreational anglers fishing Tanana drainage waters became available for the first time during 1990. In 2003, a total of 318,169 fish were caught in the Tanana drainage (Table 6) of which 121,585 (38.2%; Table 7) were caught in the UTMA. The proportion of fish caught in the UTMA in 2003 (38.2%) is consistent with catches in years previous. Anglers are keeping less of their catches, retention of catches declined by four percentage points from 2002 (22.5%; Parker *In prep c*). Recreational anglers in the UTMA kept 18.3% of their catch in 2003, similar to 18.2% of the catch harvested in the Tanana River drainage (Tables 6 and 7).

In 2003, Arctic grayling were caught in the greatest numbers in the Upper Tanana River drainage while rainbow trout were harvested more in numbers than any other species (Table 7). In 2003, the catch of Arctic grayling was 56,064 and 26,341 rainbow trout were caught. The harvest rate is much greater for rainbow trout in the UTMA (36.9%) compared to 8.1% for Arctic grayling (Table 7). UTMA burbot, which are typically harvested, rather than released, were harvested at a rate of 80.6% (Table 7) nearly the same as in the entire Tanana River drainage 76.9% (Table 6).

## MANAGEMENT AND RESEARCH ACTIVITIES

The management staff in Region III began drafting Fishery Management Plans in 1992 for each significant fishery. Each of the plans, including those listed below for the Upper Tanana area, was finalized in 1993. Managers use the plans as annual planning and evaluation tools. Each January the management staff discusses the trends and objectives of each fishery and any management actions or research needs based upon these plans. To date two of these plans have been officially updated. Final plans were completed in November, 2002 for the Delta Clearwater River Arctic grayling and Goodpaster River fishery. A draft plan for Quartz Lake was submitted for review in July 2002 however, staff review of the plan has been delayed. The Upper Tanana area Plans and the date finalized are as follows:

1. Quartz Lake Stocked Lake sport fishery, June 1992, *draft update July 2002*;
2. Small Stocked Lakes sport fishery, June 1992;
3. Delta Clearwater River coho salmon fishery, April 1993;
4. George Lake sport fishery, April 1993;
5. Volkmar Lake, April 1993;
6. Tangle Lake System sport fishery, May 1993;
7. Delta Clearwater River Arctic grayling sport fishery, June 1993, *final update November 2002*;
8. Fielding Lake sport fishery, June 1993;
9. Goodpaster River sport fishery, June 1993, draft update October 2001. *Final update, November 2002*;
10. Richardson Clearwater River sport fishery, June 1993;
11. Shaw Creek sport fishery, June 1993; and,
12. Tanana River burbot sport fishery, June 1993.

**Table 6.**-Number of each game species caught and harvested (kept), and percent harvested by recreational anglers fishing Tanana River drainage waters during 2003<sup>a</sup>.

Species	Catch	Harvest	Percent Harvested
<i>Salmon:</i>			
Chinook	7,000	2,153	30.8%
Coho <sup>b</sup>	15,377	1,317	8.6%
Coho <sup>c</sup>	19,880	6,680	33.6%
Chum	1,791	63	3.5%
<i>Non-Salmon:</i>			
Rainbow trout	80,447	26,292	32.7%
Lake Trout	3,595	862	24.0%
Char <sup>d</sup>	13,224	4,854	36.7%
Arctic grayling	144,505	10,084	7.0%
Northern pike	26,591	2,947	11.1%
Whitefish	1,018	167	16.4%
Burbot	3,332	2,561	76.9%
Sheefish	415	59	14.2%
Other fish	994	18	1.8%
Total	318,169	58,057	18.20%

<sup>a</sup> Jennings et al. 2006a.

<sup>b</sup> Anadromous salmon.

<sup>c</sup> Landlocked coho and Chinook salmon

<sup>d</sup> Includes Arctic char and Dolly Varden.

**Table 7.-**Number of each game species caught, harvested (kept), and percent harvested by recreational anglers fishing the Upper Tanana area portion of the Tanana River drainage in 2003<sup>a</sup>.

Species	Catch	Harvest	Percent Harvested
<i>Salmon:</i>			
Chinook	157	17	11.0%
Coho <sup>b</sup>	14,744	1,306	8.9%
Coho <sup>c</sup>	7,059	2,017	28.6%
Chum	278	17	6.0%
<i>Non-Salmon:</i>			
Rainbow trout	26,341	9,731	36.9%
Lake Trout	2,946	793	26.9%
Char <sup>d</sup>	5,126	1,732	33.8%
Arctic grayling	56,064	4,532	8.1%
Northern pike	6,611	924	14.0%
Whitefish	283	0	0.0%
Burbot	1,475	1,189	80.6%
Sheefish	0	0	0.0%
Other fish	501	9	1.8%
Total	121,585	22,267	18.3%

<sup>a</sup> Jennings et al. 2006a.

<sup>b</sup> Anadromous salmon.

<sup>c</sup> Landlocked coho and Chinook salmon

<sup>d</sup> Includes Arctic char and Dolly Varden.

## COMMERCIAL SALMON HARVESTS

Tanana River stocks of chum, Chinook, and coho salmon provide commercial fisheries in the Tanana River district. In 2003, 87,423 salmon were caught commercially in the entire Yukon River drainage (Table 8). The last time commercial harvests of fall chums occurred was in 1997. It is during commercial openings for fall chum salmon that coho salmon are caught. 2003 was a particularly high run of coho salmon, and they were caught in higher numbers than fall chum salmon. In 2004, starting September 24<sup>th</sup>, three 48-hour commercial openings in District 5A and 6 occurred because the biological escapement goal of 136,000 fall chums was met. Strong numbers of coho salmon were also reported and were the target of ensuing commercial and subsistence fisheries.

**Table 8.-**Commercial salmon harvest (preliminary) in the Tanana River drainage and percent of Yukon River drainage harvest in 2003 (F. Bue, Commercial Fisheries Biologist, ADF&G, Fairbanks; personal communication).

Species	2003		
	Tanana Total	Yukon Total	% Tanana
Chinook	1,813	40,437	4.5
Summer chum	4,461	10,685	41.8
Fall chum	4,095	10,998	37.2
Coho	15,119	25,243	59.9
Total	25,488	87,423	29.2

Commercial fishing in the Tanana River is managed by EO in three statistical areas (6a, b, c), from the mouth of the Tanana River to the mouth of the Chena River. Commercial fishing above the mouth of the Chena River is prohibited, precluding any commercial activity in the Upper Tanana area portion of the Tanana River drainage. Commercial harvests in the Fairbanks area are primarily for summer chum and Chinook salmon, coho salmon arrive later and are caught incidentally the larger fall chum salmon fishery. In the event of a poor run of fall chum salmon, Commercial Fisheries Division may direct the fishery (later openings) to harvest coho salmon. This occurred in 2004, when commercial fishing was allowed in Subdistrict 5-A and 6, during this opening 4,100 chum and about 20,000 coho were caught (B. Busher, Commercial Fisheries Biologist, ADF&G, Fairbanks; personal communication).

The Tanana River from its confluence of the Gerstle River to the Little Delta River is critical habitat for returning fall chum salmon. Alluvial aquifers associated with porous floodplain gravels store water and stabilize winter flows in this area near Delta Junction. All the large aquifers are located on the south side of the Tanana River. Groundwater upwells into the Tanana River, providing spawning habitat for fall chum and coho salmon, which are the last salmon species to spawn during the year. In 2004, nearly 19,000 spawning fall chums were counted near the mouth of the Delta River (B. Busher, Commercial Fisheries Biologist, ADF&G, Fairbanks; personal communication).

The furthest major upriver Chinook spawning system is the Goodpaster River with fish entering the river in July. A Chinook salmon aerial survey and a tower count were conducted in 2004. The aerial escapement count was performed by a consulting firm hired by the Pogo mine, using a helicopter. Survey conditions were fair to good with varying cloud cover and clear water. A total of 340 live and 140 dead Chinook salmon and 158 spawning redds were observed (Morsell 2004). The number of Chinook salmon carcasses observed indicates that the survey which took place July 31 was well past its peak. Many of the spawning redds observed did not have salmon on them. The total peak run estimate may have been under estimated (Morsell 2004).

Teck-Pogo contracted a salmon enumeration project to monitor spawning escapement of Goodpaster River Chinook salmon. Tanana Chiefs Conference (TCC) operated the counting tower that counted Chinook salmon on the North Fork Goodpaster River from July 1 to July 31, 2004. A total of 3,777 Chinook salmon were counted from July 1<sup>st</sup> - July 31<sup>st</sup>. Chinook Salmon were first observed July 7<sup>th</sup> and numbers dwindled after the 25<sup>th</sup> of July (C. Stark, Fisheries Biologist, Bering Sea Fishermen’s Association, Fairbanks; personal communication). The low aerial count demonstrates that an aerial survey must take place at peak of run. The aerial survey conducted this year should have occurred two week earlier. In addition, the river was very low this year making carcass removal much easier by animals. Arctic grayling research conducted during July 2004 by Sport Fish Division personnel also confirms large numbers of Chinook salmon in the river as early as the first week in July.

**SUBSISTENCE AND PERSONAL USE SALMON HARVESTS**

In 2003, the estimated subsistence and personal use harvest of salmon in the Tanana River was 29,703 fish or 13.4% of the Yukon River total (Table 9). Better than expected returns of Chinook and chum salmon to the Yukon River drainage met escapement goals for the first time since 1997. As a result, commercial fishing and subsistence and personal use fishing occurred on the Yukon River in 2003 and 2004. Subsistence and personal use fisheries were also opened in the Tanana River districts. Subsistence fishing is closed in the Tanana River within the Fairbanks Non-subsistence use area (5 AAC 99.015). In the closed area, however, whitefish and suckers can be taken under the authority of a whitefish and sucker personal-use permit.

**Table 9.-**Subsistence and personal use salmon harvest (preliminary) in the Tanana River drainage and percent of Yukon River drainage harvest in 2003 (B. Busher, Commercial Fish Biologist, ADF&G, Fairbanks; personal communication).

Species	2003		
	Tanana Total	Yukon Total	% Tanana
Chinook	2,349	57,140	4.1%
Summer chum	3,062	82,420	3.7%
Fall chum	13,380	57,306	23.3%
Coho	10,912	24,420	44.7%
Total	29,703	221,286	13.4%

Deadman, Jan, and Fielding lakes within the Upper Tanana area of the Tanana drainage are also closed to subsistence fishing. The BOF in 1994 closed the Delta River to all forms of fishing including subsistence spearing for chum carcasses, citing that the spawning area should be left undisturbed.

In 2001, the BOF passed proposal 165 that removed the reporting requirement for a non-salmon species subsistence permit in the Upper Tanana River. Even though compliance with the reporting requirement was poor, ADF&G no longer has the ability to determine the extent or numbers of harvest in the drainage. The previous regulation provided the only potential data for harvest of species such as pike, inconnu (sheefish), burbot, and whitefish caught in the subsistence fishery. The portion of the Upper Tanana River management area affected by the change includes waters upstream of the mouth of the Volkmar River on the north bank of the Tanana River, and upstream of the mouth of the Johnson River on the south bank of the Tanana River.

Prior to 2001, personal use fish could only be harvested using gillnets or fish wheels within a portion of the Tanana River near Fairbanks. The BOF in 2001 allowed the use of dip-nets and hoop-nets as legal gear in the personal use fishery. The justification for use of such gear was to allow the release of non-targeted species unharmed.

The Yukon River fall chum and coho salmon runs for 2004 were exceptionally strong. The Fall chum run was expected to reach its biological escapement goal of 136,000 fish and the coho salmon run size was projected to be 50% above average to the Tanana River. In 2004, about 20,000 commercially caught coho salmon were taken in Sub-district 5A and 6, most of these were stripped of roe and carcasses dispensed for non-human consumption (B. Busher, Commercial Fish Biologist, ADF&G, Fairbanks; personal communication).

The 2004 escapement index of 37,550 coho salmon is a large run for the Delta Clearwater River. After several years of high escapements the average escapement from 1999-2003 is over 47,000 fish, with the largest escapement being 102,800 in 2003 (Parker *In prep b-c*). It appears that if coho runs remain high they will support an equal share of the commercial and subsistence fisheries in the future.

## **ECONOMIC VALUE OF SPORT FISHERIES**

Parker (2001a) reported an average expenditure of \$75 per day for anglers fishing Arctic grayling and coho salmon on the Delta Clearwater River based upon an economic study (Howe 1987) in 1985. Current findings put that expenditure value much higher. Duffield et al. (2001a) partitioned the angling public into different populations showing that non-resident anglers to Region III pay an average of \$2,152 per angling trip, residents from Region I and II pay \$192 and residents of Region III pay \$122 per trip. The expansion of knowledge of economic values was a large project for the region and took several years to produce the data.

Four reports were published by John Duffield for Arctic grayling fisheries in 1996 (Duffield et al. 2001a), salmon fisheries in 1997 (Duffield et al. 2001b), burbot, pike, and lake trout in 1998 (Duffield et al. 2001c), and major stocked waters in the Tanana Valley during 1995 (Duffield et al. 2001d). The purpose of these studies was to estimate net economic values for sport fishing in Region III but also to estimate value by different areas within the region. Also specific questions were asked of anglers, such as how regulation changes would change number of angler trips. The net economic value per fishing trip (NEV) is the amount of money a person would be willing to pay to take the trip in addition to what they actually did pay. Once value has been placed on fisheries we can discern if the public benefit outweighs our management and research cost. In 1996, the net economic value of fishing *all* species was \$28,809,984 with cost of management and research at \$1,371,904 for a cost-benefit ratio of 21 (Table 10), indicating the benefit far outweighs the program cost.

The Tanana portion of Region III had 117,011 angler trips in 1996 for an estimated total NEV of \$15,718,895 or nearly 55% of the region total (Duffield et al. 2001a). The Arctic grayling portion of the NEV for the Tanana River drainage in 1996 was \$3,529,662 or 22.5% of the total value of the Tanana River (Duffield et al. 2001a).

Non-resident anglers are an important element of the fishing population in interior waters. In 1996, non-residents provided 34% of the total NEV while residents of Region III excluding the Seward Peninsula and Northwest Alaska, comprised nearly 54%, and the remaining value (22%) came from residents of Region I and II (Table 10). Broken down by species, salmon has the highest NEV for the region, followed by Arctic grayling (Table 10).

## **STOCKING PROGRAM INVENTORY**

Stocking serves to divert angling pressure away from wild stocks and maintains or creates new angling opportunities. Rainbow trout are the dominant game fish stocked in the Tanana drainage, and are also the most harvested species (26,292) in the Tanana drainage during 2003 (Table 6). Other species stocked are Arctic char, Arctic grayling, Chinook and coho salmon. In the UTMA, there are 53 lakes in the stocking inventory for 2003 and 2004.

A regional stocked waters management plan was developed and passed by the BOF in 2003. The plan provides the department and BOF the tools to manage stocked waters based on opportunity asked for by the public. Stocked waters are divided into three management categories; high yield, conservative yield, and special management. In addition, water bodies are further stratified into sub categories based on size of drainage, ease of access, and proximity to human populations (large, urban, rural, and remote).

Quartz Lake is the only high yield lake in the UTMA; it is the largest lake both in size (600 acres) and recreational opportunity. There were 254,220 rainbow trout, 9,504 Arctic char, 5,000 Chinook salmon, and 33,189 coho salmon stocked in Quartz Lake in 2004. The remaining 52 lakes are considered “urban high yield”, “rural high yield”, and “remote high yield” lakes, they average 34 acres in size. These lakes are stocked either annually, or, in the case of the more remote lakes, every other year.

## **ACCESS PROGRAM**

The Wallop-Breaux amendment to the Federal Aid in Sport Fish Restoration Act mandates that at least 15% of the federal funds collected from taxes on sport fishing equipment be used by the states for the development and maintenance of boating access facilities. This mandate is fulfilled by the ADF&G Sport Fish Access Program, which consists of two parts. The first part, the boating access coordination program, involves large capital improvement projects, such as boat ramps, parking areas, fishing docks, and land acquisition, which are subject to public review under the National Environmental Policy Act.

The second portion of the program is called the small access site maintenance program. The small access program is an ongoing, annually funded program. Activities include placing and maintaining signs at lake and river angling-access sites, constructing and maintaining pedestrian and off-road vehicle (ORV) trails to fishing sites and providing portable toilets, picnic tables, and trash removal at heavily used roadside sites. The program also secures permanent right-of-ways on public and private land to ensure continued public access to fishing sites, maintains access roads to boating or angling sites that might not otherwise be maintained, constructs and maintains outhouses and tent platforms at remote angling sites, provides public-use ice-fishing houses for rental at several large stocked lakes, and produces and prints publications informing anglers about fishing and boat launching opportunities. In 2004, small access monies funded trail restoration into Lisa Lake and a small cabin was built for public use. The history of major and small access projects completed in the Tanana drainage from 1988 to 1994 can be found in Burr et al. (1998).

## **BIOLOGICAL AND SOCIAL ISSUES IN THE UPPER TANANA AREA**

### **Ground-Based Midcourse Missile Defense**

The Ground-Based Midcourse Missile Defense (GMD) Test and Evaluation (T&E) program began construction in August of 2001. The test-bed was operational in December 2004. Further construction including additional missile silos will be phased in over the next few years as the program is expanded. Construction of the project will employ several hundred personnel at the high point of construction activity. This will lead to an expansion of recreational use, especially fishing on stocked lakes in the Upper Tanana area. Currently the Sport Fish Division is stocking additional catchable size fish into the Fort Greely lakes along Meadows Road. This strategy appears to be working as fishing pressure is contained closer to the work project. Heavy use of the lakes have occurred both in 2003 and 2004 (J. Mason, LCTA Coordinator, Donnelly Training Area, US ARMY, Delta Junction; personal communication).

**Table 10.**—Average expenditures, estimates of adjusted mean net economic value for a fishing trip, estimated angler trips, net economic value, cost for management and research, and cost benefit ratio by species and population, 1995-1998<sup>a</sup>.

Population	Expenditures Per Trip	Adjusted Mean		Net Economic Value	Cost for Management and Research	Cost Benefit Ratio
		Net Economic Value Per Trip	Estimated Angler-Trips			
<b><i>Fisheries for all species in 1996 or FY97 budget cycle <sup>a</sup></i></b>						
Seward Peninsula	\$167.00	\$149.69	8,618	\$1,290,028		
Copper River	--	--	--	--		
Northwest	\$268.99	\$274.78	841	\$231,090		
Non-residents	\$2,151.96	\$590.84	16,531	\$9,767,176		
Remainder of Region III	\$182.43	\$121.86	126,310	\$15,392,137		
Regions I & II	\$429.38	\$192.25	11,077	\$2,129,553		
Total				\$28,809,984	\$1,371,904	21
<b><i>Arctic grayling fisheries for 1996 or FY97 budget cycle <sup>a</sup></i></b>						
Seward Peninsula	\$167.00	\$149.69	483	--		
Copper River	--	--	--	--		
Northwest	\$268.99	--	49	--		
Non-residents	\$2,151.96	\$559.08	3,951	\$2,208,925		
Remainder of Region III	\$182.43	\$123.24	47,240	\$5,821,858		
Regions I & II	\$429.38	--	3,692	--		
Total				\$8,030,783	\$366,200	22
<b><i>Burbot, Northern pike, and Lake trout fisheries for 1998 or FY99 budget cycle <sup>a</sup></i></b>						
Seward Peninsula	--	--	--	--		
Copper River	\$84.47	\$158.80	--	\$254,715		
Northwest	--	--	--	--		
Non-residents	\$1,198.09	\$371.16	2,099	\$779,065		
Remainder of Region III	\$151.15	\$161.24	16,559	\$2,669,973		
Regions I & II	\$263.36	\$238.22	2,469	\$588,165		
Total				\$4,291,918	\$313,300	14
<b><i>Salmon fisheries for 1997 or FY98 budget cycle <sup>a</sup></i></b>						
Seward Peninsula	\$93.30	\$136.56	4,423	\$604,000		
Copper River	\$164.07	\$121.70	2,871	\$349,400		
Northwest	--	--	--	--		
Non-residents	\$1,892.90	\$816.50	20,790	\$2,825,350		
Remainder of Region III	\$162.70	\$135.90	11,311	\$9,235,420		
Regions I & II	\$199.38	\$191.57	3,569	\$683,330		
Total				\$13,697,500	\$410,100	33
<b><i>Five largest Stocked lakes in Tanana River drainage 1995 or FY96 budget cycle <sup>a</sup></i></b>						
All five stocked lakes	\$54.54	--	75,689	\$3,998,458		
Total				\$3,998,458	\$475,008	8

<sup>a</sup> John W. Duffield et al. 2001 a-d.

## **Environmental Assessment “Range Expansion Projects Donnelly Training Area, Alaska”**

U.S. Army Alaska (USARAK) is proposing to construct a combined arms collective training facility (CACTF), a battle area complex (BAX), and a collective training range (CTR) at Donnelly training area. These projects would support proposed implementation of a “Stryker Brigade Combat Team”. The environmental assessment suggests the proposed CACTF and BAX be located within Donnelly East Training Area (93,000 acres). The proposed CTR would be located within Donnelly West Training Area (531,000 acres). The proposed action includes possible changes in range orientation and/or location within the general Eddy Drop zone study area (CACTF and BAX) and the general North Texas Study Area (CTR). Another alternate site could accommodate a combination of facilities is the Donnelly Drop Zone Study Area, near Donnelly Dome.

There is considerable opposition by the community for a facility at the Eddy Drop Zone location because of close proximity to Delta Junction. The City of Delta has sued the Army to include the concerns the city has that were not included in the EIS. The Army indicates this is their preferred option, however if they choose another option it would likely be development of North Texas Study Area. This proposal in the EIS would close Meadows Road and therefore exclude public access to 14 lakes stocked by ADF&G. These lakes are important recreational opportunities to the public and especially to the army, missile defense, and construction workers. These lakes are absorbing increasing demands for recreational fishing, close to the base, without expanding into other already heavily used fisheries in the area. USARAK should consider expanding these proposed facilities west the Delta River, within the larger Donnelly West Training Area. Railroad expansion to Fort Greely would give military access west of the Delta River. There are no significant foreseeable impacts generated by the use of this area, already used as an impact area and for similar purposes by the Army. The department has formally filed comments to the Army through the DNR.

### **State Land Selection-Denali Block/Tangle Lakes Area**

The Denali Block is the unofficial name given to about five million acres of largely federal land along the Denali Highway between Paxson and Cantwell. There has been a great deal of exploration in this area in the past several years. These explorations have shown the potential for a significant deposit of rare minerals of the platinum group. The eastern end of the Denali Block includes the Tangle Lakes archaeological district. Specifically, the district includes 226,000 acres between mileposts 17 and 37 along the Denali Highway which is also within the Upper Tanana Management Area. In 2001, DNR asked BLM to transfer approximately 235,000 acres including much of the archaeological district. This would mean that many of the mineral rents would come to the State of Alaska, but also the state will now have the responsibility to manage recreational use. This area includes the Tangle Lake System which is rich in sport fishing opportunity and has an annual average of 5,000 angler-days of use. The National Wild Scenic River Corridor is excluded from the state’s conveyance and will continue to be managed by BLM. DNR will establish a special-use area over the portions of the Archaeological District to protect the historical and recreational value. DNR also will eliminate conflict with property rights to the minerals and surface disturbance. Also DNR will afford the same protections that BLM provided for the use of off-road vehicles in the area.

## Shallow Natural Gas Lease Applications

The Division of Oil and Gas (DO&G) received 100 applications for Shallow Natural Gas Leases in June 2000. These leases were located near Nenana, Fairbanks, and Delta Junction. In Delta Junction a large section of land (452,000 acres) was available for leasing. Waters affected by the leases include those in Table 11. Conditions for exploration of gas reserves were outlined by ADF&G Habitat Division. Most of the exploratory work is expected to be done during the winter, wells will be drilled to 3,000 feet, detonation of charges, and ice road construction is involved.

**Table 11.**-Location of gas lease sale area, waters affected, species of fish affected, and fisheries information.

Sale Area	Water Body	Species	Activity
East of Little Delta	Little Delta River	AG	Fish distribute seasonally throughout the drainage, summer residence in clear spring tributaries.
	Delta Creek	AG, WF, SS	Fish distribute seasonally throughout the drainage, summer residence in clear spring tributaries.
	Kiana Creek (between Little Delta River and Delta Creek)	AG, WF	Important AG spawning stream
	100 mile Creek (tributary to Delta Creek, 15.5 miles above mouth )	AG	AG migrate to 100-Mile Creek for summer feeding and migrate out to Tanana for the winter
	Koole Lake	RT	Stocked every other year
	Richardson Clearwater River	AG, SS, WF	Important AG fishery, coho - chum spawning stream.
	Rainbow Lake	RT	Stocked every other year.
	Clear Creek	AG, WF, SS, CS	AG summer residence, silver salmon spawning.
	Delta River	AG, CS, SS	Important chum salmon spawning stream first two miles of river. Silver salmon. AG on Clear spring seeps.
East of Delta River	Delta Clearwater River	AG, BB, WF, CS, SS	Important AG fishery, silver and chum salmon spawning stream, high resident population of round whitefish.

## **Pogo Mine**

Gold exploration has led to the development of large-scale mining operations in the Tanana River drainage. The Pogo mine site on the Goodpaster River includes nearly 200 square miles of claims. The areas surrounding these claims are watersheds that influence important fish streams, and there are concerns about water quality and access issues to this large mine. After investigations in the summer of 2000, the mine operator has narrowed down an access route, from the Richardson Highway to Rosa Creek, following the Shaw Creek hillsides, and then crossing Shaw Creek. In 2001, a trail was surveyed to the mine site. In the fall of 2002 the EIS progressed with public comments taken through the summer of 2003. The EIS was stalled with a water quality issue about disposal of water into the Goodpaster River from within the mine. Those concerns have been addressed and full development of the facilities occurred in the summer of 2004. In addition, a permanent road from the Richardson Highway from the mouth of Shaw Creek to the mine was completed by June 2004. The Camp Creek Fire in the summer of 2004 burned nearly 200,000 acres in Shaw Creek and Upper Goodpaster River. The Pogo facility was evacuated for two weeks while the fire burned across the river from the site.

Starting in 1998, Teck-Cominco Inc., developers of the mine site, have annually funded (\$11,500) a long-term population study on spawning Arctic grayling in the lower Goodpaster River. In 2003 and 2004, these monies were directed towards a study of the summer resident Arctic grayling population in 27 miles of the North Fork Goodpaster River (between Barbara Creek to Indian Creek Goodpaster River).

## **Federal Subsistence**

There are a number of management concerns regarding the federal takeover of subsistence management of fisheries in the state. These include enforceability of dual sets of regulations, public confusion over jurisdiction, potential increases in subsistence harvests related to customary trade, loss of sport fishing opportunity, and the lack of mechanisms for cooperative management of stocks supporting both subsistence and sport harvests.

## **INFORMATION AND EDUCATION PROGRAM**

Sport Fish Division has provided information and education services to anglers, educators, interest groups, and the general public since statehood (Greiner 2001). In the Upper Tanana area, a technician in Delta Junction is available to give the public information on sport fisheries. Information provided includes a large wall map of the area with lakes and access areas marked, pamphlets, brochures, and maps. The program also provides aquatic education at the local elementary school. In addition, another informational brochure was started in 2002 to include stocked lakes on the "Coal Mine Road" and the Delta Clearwater River Arctic grayling/coho salmon sport fisheries. The Area Management Biologist (AMB) assists to provide coho salmon eggs from the Delta Clearwater River to several school districts. Schools from Fairbanks to Tok participate in this aquatic educational program which has grown so large that it is largely handled out of the Fairbanks office. The coho eggs are raised and hatched in classroom incubators. A fish transport permit (FTP) is required for collection and return of these fish to the Delta Clearwater River. In 2004, live coho salmon were taken from the Delta Clearwater River to Fairbanks to expose more schools to the program.

## **SECTION II: UPPER TANANA AREA RECREATIONAL EFFORT**

The SWHS estimates the number of angler-days of sport fishing effort expended by recreational anglers fishing Alaskan waters as well as the catch and harvest of important sport species. The survey is designed to provide estimates of effort and harvest on a site-by-site basis; however, it does not provide estimates of effort directed towards a particular species. In 2003, a total of 24,999 anglers took 64,418 trips for a total of 99,934 angler-days reported for the Tanana drainage statistical area "U". Of the Tanana drainage total in 2003, 29,036 angler-days of effort were reported in the Upper Tanana area or 29% of the total (Table 2). This estimate was obtained by sorting all waters reported in the Tanana drainage by Lower Tanana and Upper Tanana management areas. It is estimated that 24,999 anglers fished the Tanana drainage in 2003 and 34% (8,540) of them fished the Upper Tanana area (Table 2). In 2003, anglers took a total of 64,418 trips in the Tanana drainage and 25% (16,211) of those trips were in the Upper Tanana area (Table 2). Anglers in the Upper Tanana area harvested 38% (22,267) of the total Tanana drainage harvest of 58,055 (Table 4). Effort data between the two management areas has only been extracted since 1996 and is consistent, averaging 29% from 1998 to 2003 (Table 2).

## **SECTION III: COHO SALMON-DELTA CLEARWATER**

### **BACKGROUND AND HISTORICAL PERSPECTIVE**

The Delta Clearwater River (DCR) is one of several spring-fed tributaries to the Tanana River and supports the largest documented spawning run of coho salmon in the Yukon River (Parker 1991). The DCR is about 20 miles in length, is road assessable (Figure 5), and has the largest recreational fishery for coho salmon in the Tanana River drainage (ADF&G 1993). Effort estimates for just coho salmon are not available from the SWHS, however data from mail-out surveys conducted in 1994 and 1995 indicate that 82% and 79% respectively, of the effort for the Delta Clearwater is directed at the Arctic grayling (Parker 2001a). Starting in 1999, a factor of 0.80 was applied to the total angler-days to derive the number of Arctic grayling angler-days. In 2003, an estimated 4,805 angler-days were directed on Arctic grayling and 1,201 angler-days are directed on DCR coho salmon (Table 12). Because of the extraordinary run of coho salmon in 2003, it is likely that angler-days of effort using this proportion will under estimate coho salmon effort. From 1999 to 2003, 80% of the coho salmon sport harvest in the Tanana drainage came from the DCR. A summary of annual DCR coho salmon harvests are found in Appendix C2.

Annual escapement index counts of coho salmon are accomplished by a boat survey. An additional 21.3% is added to the boat count for coho in non-navigatable portions of the river (Table 13). Escapement counts are completed on 17.5 miles of navigable water from an elevated platform on a riverboat. Aerial helicopter surveys have been done to estimate escapement into non-navigable portions of the river from 1995 to 1998 (Stuby 1999; Table 13).

Yukon River drainage commercial and subsistence harvests over the past 5 years are half of what they were over the 26-year average (1977-2003) and in the past 5 years there has been double the coho salmon escapement in the DCR (Table 14). One can surmise from the data that the declining fisheries have allowed the building of coho salmon stock. Before reaching the DCR, coho salmon travel about 1,700 km from the ocean and pass through six different commercial fishing districts in the Yukon and Tanana rivers (Parker 1991). Subsistence and personal use fishing also occurs in each district.

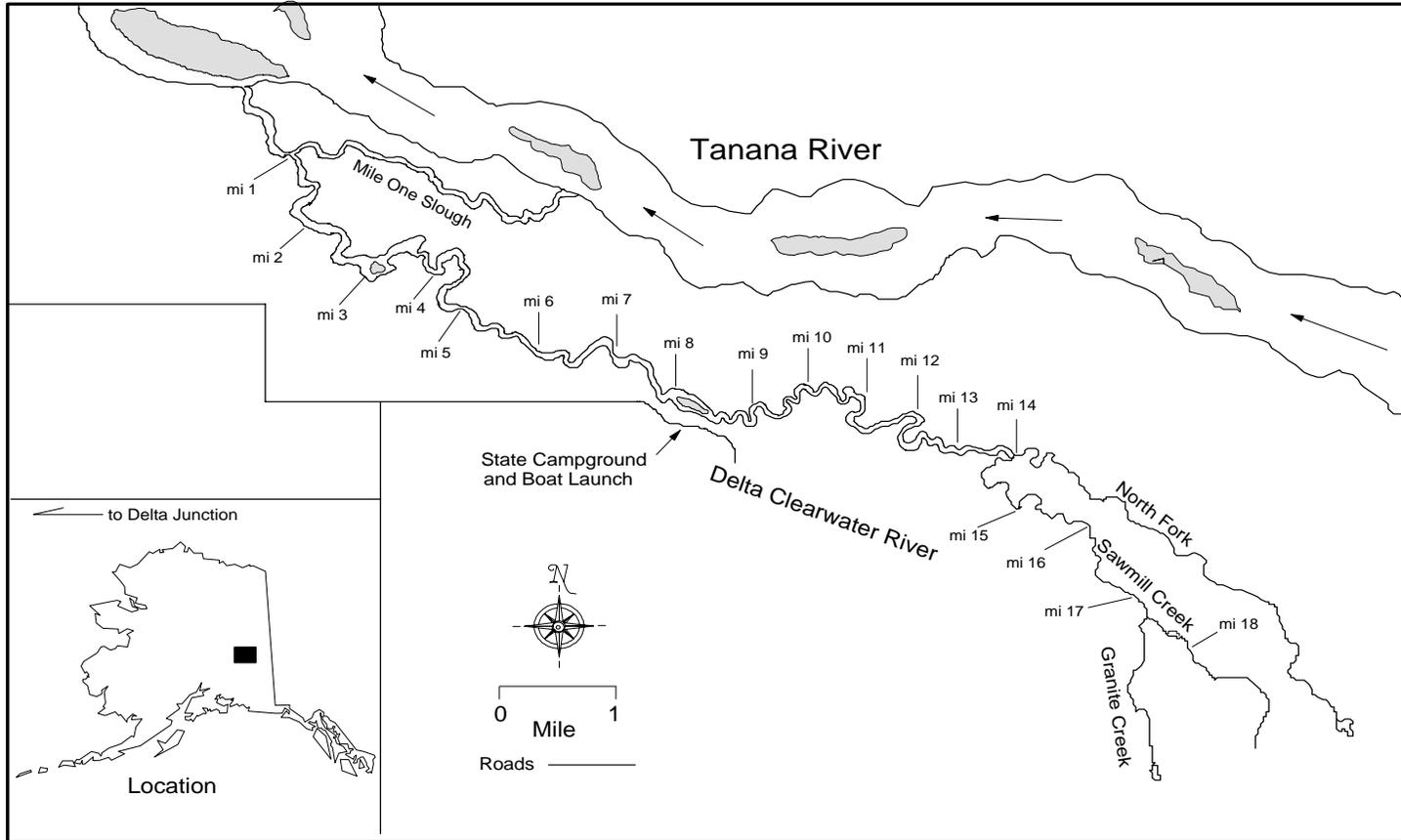


Figure 5.-Map of the Delta Clearwater River.

**Table 12.-**Delta Clearwater River, coho salmon escapement effort, harvest, and catches from the Statewide Harvest Survey, 1977-2004<sup>a</sup>.

Year	Escapement <sup>b</sup>	Angler Days	Harvest and Exploitation	Catch
1977-1981	6,214	6,280	45 (0.7%)	N/A
1982-1986	8,732	6,819	476 (5.5%)	N/A
1987-1991	17,745	5,279	1,301 (7.3%)	3,827
1992-1996	22,337	4,467	514 (2.3%)	2,888
1997-2001	11,525	2,931	794 (6.9%)	4,174
2002	38,625	4,580	517 (1.4%)	5,311
2003	102,800	6,006	1,272 (1.2%)	14,665
2004	37,550			
Average 1999-2003	47,015 <sup>c</sup>	4,722	587 (1.25%)	5,783

<sup>a</sup> (Mills 1979-1994; Howe et al. 1995; 1996, 2001a-d; Walker et al. 2003; Jennings et al. 2004, 2006a-b)

<sup>b</sup> Estimates of escapement from river boat surveys only.

<sup>c</sup> Escapement average 1999-2004 only.

**Table 13.-**Boat count surveys and aerial surveys of the non-navigatable portion of the Delta Clearwater River for 1994-1998 and expanded counts including 1999-2004.

Year	Boat Count Escapement	Aerial Count Tributaries	Total Count	Percent in Tributaries
1994	62,675	17,565	80,240	21.9%
1995	20,100	6,283	26,383	23.8%
1996	14,070	3,300	17,370	19.0%
1997	11,525	2,375	13,900	17.1%
1998	11,100	2,775	13,875	20.0%
1999	10,925	2,967 <sup>a</sup>	13,942 <sup>b</sup>	21.3% <sup>c</sup>
2000	9,225	2,494 <sup>a</sup>	11,719 <sup>b</sup>	21.3% <sup>c</sup>
2001	46,875	12,013 <sup>a</sup>	58,888 <sup>b</sup>	21.3% <sup>c</sup>
2002	38,625	10,441 <sup>a</sup>	49,066 <sup>b</sup>	21.3% <sup>c</sup>
2003	102,800	27,791 <sup>a</sup>	130,591 <sup>b</sup>	21.3% <sup>c</sup>
2004	37,550	10,551 <sup>a</sup>	48,101 <sup>b</sup>	21.3% <sup>c</sup>
Average 1994-2004	33,229	8,983	42,212	21.3%

<sup>a</sup> Total Delta Clearwater River escapement total using a expansion factor of 21.3%.

<sup>b</sup> Expansion factor (21.3%) to applied to average boat survey counts.

<sup>c</sup> 1994-1998 average.

**Table 14.-**Commercial, subsistence, personal use, and sport fish coho salmon harvests for the Tanana and Yukon rivers for 2003.

Year	Commercial Fish		Subsistence/ Personal Use		Tanana Sport Harvests	Tanana Total Harvests	Yukon Total Harvests	DCR Coho Escapement
	Yukon	Tanana	Yukon	Tanana				
2003	25,243	15,119	24,128	11,461	1,314	27,894	50,685	130,591 <sup>a</sup>
Average 1999-2003	5,369	3,024	19,554	8,941	738	12,703	25,661	59,673 <sup>a</sup>
Average 1977-2003	31,264	4,712	30,265	13,663	867	18,663	62,396	25,351 <sup>a</sup>

<sup>a</sup> Total Delta Clearwater River escapement total using a expansion factor of 21.3%.

Coho salmon are the last of the salmon species to enter the Yukon River and begin to enter the DCR in mid-September. The peak of the run is by mid-October. Property owners living near the spring have reported coho salmon spawning as late as January. The springs provide favorable over-wintering habitat for coho salmon that rear in the river for 1-3 years. Carcass sampling over several years showed that an average of 79% of the returning coho salmon was 4-years of age, 14% were 3 years and the remaining 7% were 5-years of age (Parker 1991). The majority of the coho fingerlings rear in the DCR for 3-years before smolting, and spend 1-year in the ocean before returning.

Preliminary boat counts are made in September, and if it appears that the escapement goal may not be met, the sport fish bag limit is reduced or the fishery is closed by EO. The present bag limit is three coho salmon per day and three in possession. This is the last open-water fishery of the year attracting both local and non-local anglers who are new to the area and want the opportunity to catch a salmon (ADF&G 1993). Anglers fish from shore or by boat near the State Park campground and boat launch at river mile 8.5. Coho salmon are caught from mid-September through October with rod and reel using various spoons or large spinners. Only 1.2% of the total escapement was harvested in 2003 (Table 12).

## **RECENT FISHERY PERFORMANCE**

The coho salmon fishery on the DCR is relatively new, growing in popularity since 1984. Angler effort has been relatively consistent over the years largely due to high coho salmon runs. In the mid-eighties the Arctic grayling fishery began to decline and about the same time coho escapements increased. For a number of years angler effort remained consistent however, more effort appeared to be directed on coho salmon when the grayling fishery was at its lowest point. As the Arctic grayling fishery rebounded, the angler effort, as surveys suggests, is mostly on grayling and is growing towards historical levels (Table 12).

Initially coho harvest rates were high, with exploitation up to 16% in 1990. Starting in 1992, harvests were below 1,000 however, catch rates did not decline; in fact, the catch of 14,665 in 2003 is the largest ever recorded (Table 12). This demonstrates that anglers remain interested in participation but less in keeping their catch. The quality of the salmon flesh is not as desirable as fish caught at the mouth of the Tanana River. Many anglers taking advantage of this fishery are new to the state and have not had the opportunity to catch salmon. News articles in the Fairbanks Daily News-Miner have helped educate new anglers, particularly military personnel, about the fishery. The prospect for angler opportunity on the DCR is enormous.

The biological escapement goal (BEG) for the DCR is 9,000 coho salmon (ADF&G 1993). The boat-count escapement index in 2004 was 37,550 with an expanded count of 48,101 (includes tributaries not counted by boat; Table 13). Chum salmon escapements in lower Yukon/Tanana River fisheries were better than in previous years and commercial and subsistence fisheries were allowed. After salmon fishing activity was curtailed for several years, commercial buyers were not ready to buy fish when fishing improved in 2003. Given low numbers of harvested fish the coho salmon escapement to the spawning grounds was high. In 2004, commercial fisheries in sub-districts 5a-6 were opened and coho salmon were harvested four times as much as chum salmon taking advantage of the strong run of coho. The roe was taken from these commercially caught fish and carcasses used for dog food (B. Busher, Commercial Fish Biologist, ADF&G, Fairbanks; personal communication).

Arctic grayling apparently change their migratory behavior to respond to large runs of coho salmon. In 2004, about 10,000 Arctic grayling were estimated from mile 15 down to the mouth of the DCR. In 2000, only 1,000 grayling were estimated visually, the numbers have increased each year since 2002 (Parker *In prep a-c*).

Aerial counts for coho salmon in the non-navigable portions of the DCR were conducted from 1994 to 1998. These counts comprised 21.9%, 23.8%, 19%, 17.1%, and 20.0% (averaging 21.3%) of the expanded escapement respectively (Evenson 1995-1997a; Stuby and Evenson 1998; and Stuby 1999). Expanded coho salmon escapement (including aerial survey of spring areas) for the DCR in 2003 was 130,591 and 48,101 in 2004 (Table 13). The average expansion proportion of 21.3% (Table 13) is applied to future boat counts for an expanded total escapement count.

Average total escapement (expanded count) over the past 5 years has been 59,673 (Table 14) far above the average total escapement since 1977, which is 25,351 (Table 14). Large escapements of coho salmon to the DCR may be attributed to above average run strength or below average harvests in the commercial, subsistence, and personal-use fisheries during recent years and large parent-year escapements (Table 13). For example in the Yukon River drainage, no commercial catch occurred during 2002, whereas average commercial catch was 31,264 from 1977-2003 (Table 14).

## **MANAGEMENT OBJECTIVES**

Escapement estimates of coho salmon in the DCR have steadily increased since 1972. In 1993, ADF&G set an escapement goal of 9,000 for the DCR based on the average historical boat survey escapements from 1972 to 1992 (ADF&G 1993). At that time the estimates of escapement were based upon boat counts on the navigable portion of the river (17.5 miles). More recently, the average expanded count from 1977 to 2004 in the DCR is 25,351 fish (Table 14).

The department plans to monitor the escapement between mid-September and early October to make an in-season projection. The projection is based upon 1/3 (3,000) of the escapement goal being in the lower eight miles of river (Figure 5). In 2004, fish wheel catches on the lower Tanana River indicated an above average run, which developed into a large run. Preliminary coho escapement data for the DCR can be based upon Yukon River sonar counts and Nenana test wheels catches, alerting the manager that a problem exists or not. With these data and a preliminary river count, the department has reasonable tools to predict if the fishery needs to be closed to the retention of coho salmon.

## **FISHERY MANAGEMENT**

Unless there are targeted lower-river fisheries on coho salmon in the future, there is room for expansion in the DCR coho fishery. Harvest rates are low and more anglers are starting to practice catch-and-release. It is possible to allow an increase in the bag limit but few anglers are likely to take advantage of it. In 2003 and 2004, record numbers of anglers were on the river in late September and October, many using boats to fish the river. The apparent increase was likely due to the unseasonable warm weather. Some local residents are concerned that increasing bag limits would put additional stress upon the rivers riparian area. Large amounts of boat traffic on this small river is likely causing riparian damage and disturbing spawning fish. The fishery is building by word and mouth and no additional incentive is necessary.

## **FISHERY OUTLOOK**

In 2003 and 2004, a record number of coho salmon returned to the DCR. In 2005, and the next several years escapement runs will be based upon high parent escapement runs. These large anticipated runs should allow special targeted commercial and subsistence fishing, as occurred in 2004, to harvest the coho surplus.

## **BOARD OF FISHERY ACTIONS**

Until recently, there was no management plan allowing directed coho salmon commercial fishing in the Yukon-Northern Area. The fall season is managed based on the timing and stock status of fall chum salmon. The BOF recently (December 1997) had three proposals to establish a coho salmon management plan for the Yukon River. In 2000, the BOF authorized the Yukon River Coho Salmon Plan. In that plan the department can allow a directed coho fishery when the coho run is above average, when the fall chum salmon return is more than 625,000 fish, and when no directed fall chum salmon commercial fishing has occurred or is expected to occur.

## **CURRENT ISSUES**

The management of directed coho salmon fishing during the fall season is complicated by an overlapping run of fall chum salmon stocks. When fall chum salmon stocks are below the escapement goal of 625,000, then downriver fisheries are closed and regardless of coho salmon run strength, no fisheries are normally directed on coho salmon largely due to coho salmon being the last species to enter the Yukon system. Indications from the Yukon River sonar passage estimator, test fishing indices, and subsistence reports are that there is un-utilized coho salmon fishing opportunity in the Tanana River.

## **ONGOING AND RECOMMENDED RESEARCH AND MANAGEMENT ACTIVITIES**

A preliminary lower DCR survey (mid September) and a peak DCR coho salmon survey should be done on an annual basis to manage for the established 9,000 fish escapement goal.

Stock composition of coho salmon harvested in down-river fisheries is unknown. Historical harvests of coho salmon in the Yukon and Tanana rivers are fairly large in comparison to the documented escapement levels in the DCR and other coho salmon streams. It is possible that exploitation levels on the DCR stock were substantial. The Tanana River harvests in all fisheries (sport, commercial, subsistence, and personal use) from 1977-2003 averaged 93% of the DCR escapement (Table 15). More recently, as harvests have fallen and escapement index counts have increased, exploitation levels have been much lower. In 2003, the entire Yukon River coho salmon fishery harvest of 50,685 was 49% of the DCR coho escapement (Table 15).

If Tanana Drainage harvests should significantly increase, and DCR escapement indices fall, aerial surveys of other important coho salmon producing streams in the area should be conducted. For example, baseline information should be gathered on the Richardson Clearwater River. An estimated 2,175 coho salmon were counted on the Richardson Clearwater River by aerial survey on October 24, 2000. No other surveys have been done since.

## SECTION IV: ARCTIC GRAYLING – DELTA CLEARWATER

### BACKGROUND AND HISTORICAL PERSPECTIVE

The Delta Clearwater River (DCR) is the largest of several spring-fed streams near Delta Junction (Figure 5). These clearwater streams are cool in the summer and provide ideal habitat for adult Arctic grayling. In rapid-runoff Rivers such as the Goodpaster River, grayling spawn during the early spring. When spawning is complete, some adults leave for summer feeding waters such as the DCR. Grayling, however, are not known to spawn in the DCR. It is unclear how grayling recruit to spring-fed systems; however fidelity to the DCR and other spring systems is strong. The abundance of grayling populations within donor streams will determine how many fish migrate to spring-fed systems. The majority of the DCR Arctic grayling population is fish age-5 and older. Based upon catch-at-age estimates of abundance, the DCR grayling population declined for nearly 12 years from 1984 to 1996 (Figure 6). Numbers of grayling (age-5 and greater) averaged 8,600 from 1977-1989. Abundance continued to decrease (Figure 6) to 2,750 fish in 1996 (Ridder 1998a). The population increased since 1996 to 6,891 fish in 2000, the last estimate completed (Gryska 2001). This increase may be a result of more restrictive regulations, or could be related to increased population levels in donor streams.

Despite the decline in population numbers, DCR arctic grayling appeared healthy to anglers. This was largely due to decreasing numbers of small fish, leaving a population of older, larger-sized fish, albeit fewer of them. The recent increase in the population and increasing average size have helped to create a trophy fishery. Catch rates have been as high as 17,576 in 2003 (Table 16).

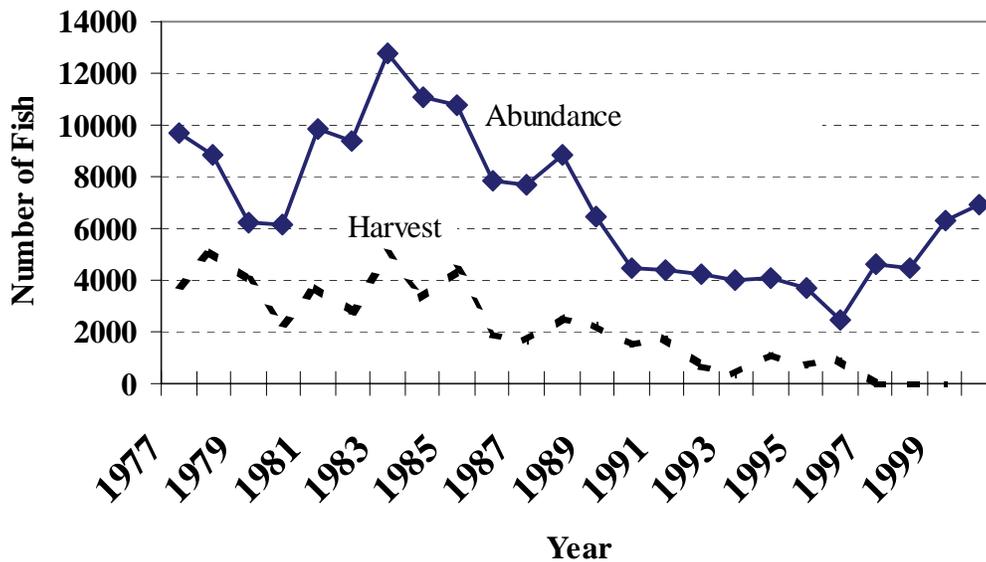
The DCR has been transformed into a trophy catch-and-release Arctic grayling fishery however; there are anglers who still desire to harvest grayling. For the time being the BOF allowed a small level of harvest in 2000 with a regulation to allow a daily bag limit of one fish, less than 12 inches, from June 9 to July 10. Models estimated that a harvest of 1,000 small fish would be sustainable but these harvests have not occurred.

**Table 15.-**Tanana and Yukon rivers coho salmon fishery averages as percent of DCR coho salmon escapement, 1977-2004.

Years	DCR Coho Escapement <sup>a</sup>	Tanana River		Yukon River	
		All Harvests <sup>b</sup>	% of DCR Escapement	All Harvests	% of DCR Escapement
1977-1981	7,894	6,953	93%	38,055	509%
1982-1986	11,093	18,196	173%	83,165	791%
1987-1991	22,543	34,387	161%	114,802	538%
1992-1996	28,569	20,782	73%	57,867	204%
1997-2001	17,940	10,782	60%	28,430	158%
2002	38,625	10,060	26%	15,802	41%
2003	102,800	27,894	27%	50,685	49%
2004	37,550	..	..	..	..
1977-2003	19,964	18,663	93%	62,396	313%

<sup>a</sup> Total Delta Clearwater River boat escapements only.

<sup>b</sup> Includes commercial, subsistence, personal use and sport caught fish.



**Figure 6.**-Abundance of age-5 Arctic grayling in the Delta Clearwater River from 1977-2000. Estimates for 1977 - 1990 are from CAGEAN modeling (Clark and Ridder 1994) and reflect population at start of fishing season. Estimates for 1996 - 1999 are from mark-recapture experiments and reflect the population in July (Ridder 1998b; 1999; Ridder and Gryska 2000; and Gryska 2001). Harvest data from Mills (1979-1994), Howe et al. (1995, 1996, 2001a-d), and Walker et al. (2003).

**Table 16.**-Number of Arctic grayling harvested and caught by recreational anglers fishing the Delta Clearwater River from 1977-2003<sup>a</sup>

Years	Average DCR effort	Average grayling harvest	Average grayling catches
1977-1981	6,280	6,662	..
1982-1986	6,819	4,734	..
1987-1991	5,279	2,374	10,211
1992-1996	4,467	958	7,211
1997-2001	3,720	29	10,767
2002	4,580	51	12,913
2003	6,006	0	17,576
1999-2003	4,722	28	12,705
1977-2003	5,312	2,735	10,057

<sup>a</sup> (Mills 1979-1994; Howe et al. 1995; 1996, 2000a-d; Walker et al. 2003; Jennings et al. 2004, 2006a-b)

Average exploitation on the DCR grayling population from 1977 through 1990 was 37.6%, which appeared to be sustainable from 1977-1989. This high exploitation level probably exceeded sustainability due to fluctuations in abundance of grayling from up to eight nearby rivers, leading to a decline in the DCR summer population. An exploitation rate above 20% for Arctic grayling in the DCR is probably not sustainable, assuming that a 20% harvest rate occurs on each of the eight contributing populations. If this assumption is not true then higher levels of harvest can detrimentally affect some contributing populations, especially the smaller ones.

In 1995 and 1996, the bag and possession limit was reduced to two fish by EO, resulting in an exploitation rate of 25%. However, the population continued to decline. In 1997, an EO was issued for catch-and-release angling only. The BOF implemented a catch-and-release only regulation in 1997. Starting in 2001, a restrictive bag limit of one grayling (for one month) with a maximum length of 12 inches allowed some opportunity to harvest on a growing Arctic grayling population.

## **RECENT FISHERY PERFORMANCE**

Angler effort declined in the DCR as the grayling population declined. Angler effort from 1977-1986, averaged 6,500 angler days, the majority probably targeting Arctic grayling (Ridder 1999). From 1992-1996 angler effort declined to an average of 4,467 days (Table 16). In 2003, angler effort on the DCR (6,006 angler days) was above the 5 year average (1999-2003) of 4,722 angler days (Table 16). This significant change is likely due to an abnormally high escapement (102,800) of coho salmon and higher proportion of effort toward that fishery in 2003.

The proportion of angling effort directed toward Arctic grayling has also changed in recent years. Data collected from mail-out surveys indicates that 76% of the annual reported effort is attributed to angling for Arctic grayling (Howe and Fleischman 2001).

No harvest (<12 inches) was reported in 2003 (Table 16) under the bag and possession limit of one fish (<12 inches) and open season from July 10- Aug 9 for the DCR. Grayling catch rates averaged 10,057 grayling from 1990-2003 and 12,705 from 1999-2003, a significant increase (Table 16). In 2003, 17,576 grayling were caught (Table 16) and of those 3,700 were less than 12 inches (Jennings et al. 2006b). Small fish are caught in this fishery, but there is apparently no desire to harvest them. A summary of DCR Arctic grayling annual harvests are found in Appendix C2.

## **MANAGEMENT OBJECTIVES**

Objectives have been updated from those made in 1993 (Parker 2003a) and will be used by ADF&G to direct the recreational fishery in the foreseeable future. The management objectives for the Delta Clearwater River Arctic grayling recreational fishery are:

1. To maintain a fishery in which at least 40% of the measurable population of Arctic grayling exceeds 14 inches in length.

In 1999, 48% of the sampled population was 14 inches (total length, or TL) or greater. In 2000, 54% of the measured population was 14 inches or greater. Arctic grayling were also sampled throughout the DCR from 2001 to 2004 using hook-and-line. In 2001, 83 fish were caught averaging 382 mm FL or slightly over 15 in length, 77% of the fish caught were greater than 14 inches. In 2002, 203 samples were caught averaging 365 mm FL or 14.4 inches and 67% caught were greater than 14 inches. In 2003, 236 samples were caught averaging 358 mm FL or 14.1

inches and 78% fish caught were greater than 14 inches. In 2004, 201 samples were caught averaging 375 mm FL or 14.8 inches and 89.1% fish caught were greater than 14 inches. Based upon these size compositions in the DCR and the public desire to maintain the presence of large fish, it is reasonable to manage this fishery in such a way which ensures that over 40% of the measurable population will be of fish greater than 14 inches. Current regulations passed by the BOF in 2000 are based on maintaining or increasing the current numbers of large fish.

2. To allow a harvest not to exceed 900 fish less than 12 inches in length.

In addition to maintaining large fish in the DCR the new regulations were designed to allow a small harvest of fish less than 12 inches. Simulations show that a harvest of 900 fish or fewer is sustainable in the DCR (Roach *Unpublished*). Simulations also indicated that the current length structure would only be affected minimally by a harvest of fewer than 900 fish that are less than 12 inches (Roach *Unpublished*). The number of fish harvested can be estimated from the SWHS. In 2001, new regulations allowed for a harvest of one fish per day, less than 12 inches TL in size, from July 10 to August 9th. The timing of the open season was intended to avoid potentially high harvests during the 4th of July weekend. In 2001, 91 Arctic grayling were harvested (Jennings et al. 2004) and of these 44 were greater than 12 inches. In 2002, 51 Arctic grayling were caught less than 12 inches (Table 16). In 2003, no Arctic grayling were reported harvested (Table 16). The low harvest of small fish can be explained by the evident preference to release fish. In 2003, anglers caught over 3,700 small fish and there was no reported harvest.

3. To prosecute the fishery in such a way to allow at least 1,500 angler-days of annual fishing effort and allow a catch rate of at least one Arctic grayling per angler day.

Data to determine angler days of effort, and catches come from the SWHS. About 75% of the DCR angler-days are directed toward Arctic grayling. Angler-days averaged 3,720 between 1997 and 2001, but increased to 6,006 in 2003 (Table 16). With current management objectives, angler-days will likely continue to increase. The average number of angler-days from 1999 to 2003 was 4,722 (Table 16) with an average catch rate of 2.7 Arctic grayling per angler-day. This is one of the highest estimated catch rates anywhere in the Interior. If the number of angler days were to fall below 1,500 or if catch rates fall below a threshold level of one fish per day, then the department would determine cause and seek a remedy if possible.

## **FISHERY MANAGEMENT**

Without the opportunity to harvest Arctic grayling, recreational fishing opportunity in the DCR initially experienced a decline (Parker and Viavant 2000; Clark and Ridder 1994). In 2003, the number of angler-days was above the 25 year average (Table 16) which may be attributed to a large run of coho salmon or allowing some harvest of grayling in the previous 2 years. Since harvest is very small it is likely that anglers are attracted to the catch-and-release quality of the fishery. The catches in 2003 (17,576) are considerably higher than the last 5-year average (12,705; Table 16). One can conclude the experience of fishing large DCR grayling is catching on. More visitors from across Alaska have participated here knowing large grayling exist, and enjoying catch-and-release only opportunities. These anglers have been enthusiastic about the quality of the fishery. Many anglers comment that the regulations should remain the same.

The Arctic grayling population in the DCR will be deemed healthy if all three objectives mentioned above are being met. To ensure objectives are met and that regulations don't need to

be changed, length and age composition of the measurable population will be estimated every 3 years using established sampling methods. The number of fish harvested and catch rate will be estimated every year (1-year lag). When any one of the objectives are not met, the department will determine a course of action to evaluate the true health of the stock and to determine if there is a need to propose a change in regulation based on the regulatory cycle framework.

## **FISHERY OUTLOOK**

Healthy numbers of recruits to the DCR were observed for the first time in 4 years in 1997 and 1998 (Parker and Viavant 2000). A mark-recapture experiment was completed in 1999 and 2000. In 1999, the Arctic grayling population was estimated at 6,684 fish (SE=408; Ridder and Gryska 2000) over 269 mm in fork length, which was an increase of 1,941 fish over the 1998 estimate of 4,743 fish (SE=479; Ridder 1999). During 2000, the population again increased by 907 fish to 7,591 fish over 269 mm (SE=895; Gryska 2001). The length of 270 mm fork length is equivalent to a 12-inch total length fish, commonly used in Arctic grayling regulations. In 2004, a sample of 201 fish was collected along the length of the DCR in July and average size of these fish was 375 mm fork length or a 14.8 inch equivalent. The proportion of the sample collected in 2004 was 89% over 14 inches in length. Only two Arctic grayling in 2004 were caught less than 12 inches in length. A summary of estimated abundance of DCR Arctic grayling are found in Appendix C1.

Uncharacteristic of how biologists view recruitment, in the DCR large fish across several older age classes migrate into the population and inhabit choice habitat areas. If large sized fish continue to occupy the DCR, and continue to grow in numbers, it is theorized that the capacity of the system will soon be reached, and smaller fish will be excluded. Based on per recruit analysis, sustainable harvest from the DCR can range from 11 to 22% depending on the desired population structure. If the mortality rate for small fish is greater than replacement, abundance will drop but the large-fish component could be maintained with only a few fish growing across the large-size categories.

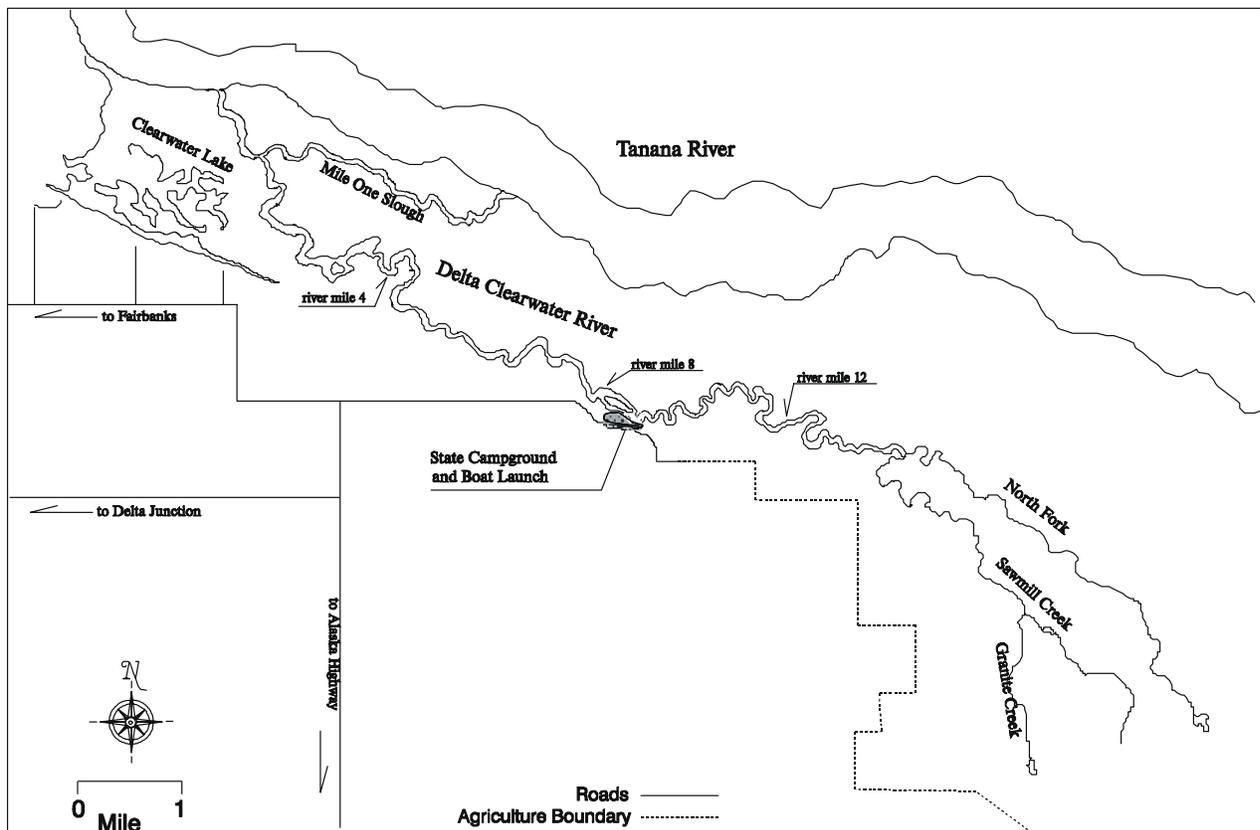
## **BOARD OF FISHERY ACTIONS**

The BOF took action regarding this fishery at its December 1997 meeting, changing the Arctic grayling regulations in the DCR to catch-and-release only. The proposal was amended to add single-hook to the unbaited, artificial lure restrictions from January 1 to September 1. The non-single hook applies to the remainder of the year when the fishery targets coho salmon. Additional substitute language included the Clearwater Lake drainage with the same regulation to avoid enforcement issues (Figure 7).

The BOF once again took action during 2001 on 17 proposals that requested some level of harvest. The department was neutral on these proposals based upon competing consumptive and non-consumptive uses of Arctic grayling on the DCR. The BOF amended proposal submitted by the Delta Fish and Game Advisory Committee to include a one fish daily bag and possession limit from July 10-August 9, catch-and-release only from August 10-July 9. The maximum size limit of Arctic grayling is 12 inches (total length) or less. The hook restriction remains the same (un-baited, single hook, artificial lures from January 1-August 31; and, un-baited, artificial lures from September 1-December 31). A complete chronological review of regulation changes on the DCR can be found in Appendix B1.

In 2003, the Delta Fish and Game Advisory committee submitted a proposal to allow only barbless hooks. Because of high catchability (i.e., 3.8 fish per angler-day in 2003; Table 16), the Delta Fish and Game Advisory Committee proposed a regulation of barbless hooks only. The intent of the proposal was to lessen the physical damage caused by barbed hooks. Personal testimony indicated a greater ease of removing a barbless hook and therefore less stress on the fish. The department was opposed to the proposal because scientific data indicates that this would not change the status of the population. Schill and Scarpella (1997) synthesized numerous studies, and found no significant differences in mortality of fish caught with barbed and barbless hooks. Both gear types incur visible damage and ultimately produce the same result depending on the intensity of the fishery. The issue with the advisory committee is likely less to do with mortality rate, rather the condition the fish is in. The proposal did not pass. Additional information compiled for the BOF concerning hook-and-release is found in Appendix B2.

In 2004 the BOF adopted a management plan for Arctic grayling fisheries within the Arctic-Yukon-Kuskokwim Region (Swanton and Wuttig *In prep*). The plan outlines the distribution, biological attributes and populations of Arctic grayling throughout the region. In addition, the plan divides Arctic grayling fisheries in the region into four categories: high exploitation fisheries, large-fish fisheries, low exploitation fisheries, and, restoration fisheries.



**Figure 7.**-Map of Delta Clearwater River and Clearwater Lake, all included in special catch-and-release waters regulations made by BOF in 1997.

These stocks of fish are managed for long-term sustained yield through the application of simple regulatory and monitoring policies of which three policies are suggested (Swanton and Wuttig *In prep*). The DCR fall under Policy II of the Arctic grayling plan whereas, the fishery is managed to provide high catch levels and a desired size composition (Swanton and Wuttig *In prep*).

## **CURRENT ISSUES**

Questions about enforcement have been raised from the public who feel that violations will increase when harvest is allowed with restrictive bag, size, and season limits. Catch rates are very high in the DCR averaging nearly 13,000 over the past 5 years (Table 16). The catch rate is nearly double the population size indicating many fish are being caught multiple times. The high catch is probably responsible for some level of mortality, although probably low (McKinley 1993), but even a low hooking mortality rate could be significant with such high catch rates.

## **ONGOING AND RECOMMENDED RESEARCH AND MANAGEMENT ACTIVITIES**

Management activities will continue to ensure protection of aquatic habitat for healthy fish production. Starting in 1999, the National Resource Conservation Service (NRCS) will begin implementing a watershed project that will prevent sediment-bearing waters from the Granite Mountains from entering the DCR. The first phase of construction was completed in the summer of 2000. Some major and minor modifications to the project were done in 2002-2003. Ongoing plans for the watershed are pending because of flaws in the engineering of the dikes.

Mapping of habitat area and determining means to monitor changes caused by boats to the riparian habitat are types of studies that may be implemented in the near future.

# **SECTION V: ARCTIC GRAYLING GOODPASTER RIVER**

## **BACKGROUND AND HISTORICAL PERSPECTIVE**

The primary sport fishery on the Goodpaster River is for Arctic grayling. To a lesser extent northern pike, whitefish, and burbot are also caught and harvested. Maintaining healthy stocks of Arctic grayling in the Goodpaster River is essential for not only the Goodpaster River fishery, but also for other fisheries in the upper Tanana River drainage. Arctic grayling spawn in the Goodpaster River and a portion of the population migrate to other rivers for summer feeding. The Goodpaster River Arctic grayling fishery occurs during the ice-free season, from approximately 10 May through 15 October. Most anglers participating in this fishery are residents from Fairbanks, Delta Junction, or North Pole; a number of these anglers own cabins on the Goodpaster River.

The Goodpaster River is a large rapid run-off tributary of the Tanana River. It has a drainage area of approximately 1,600 mi<sup>2</sup>, and flows southwest for 140 miles to its confluence with the Tanana River 10 miles north of Delta Junction (Figure 8). The river has 13 named tributaries, the largest of which is the South Fork Goodpaster River (40 mi long). The Pogo mine site is approximately 35 miles upstream from the confluence of the South Fork Goodpaster River. The river is accessible by riverboat or airplane during the summer. Boat launches are at Big Delta on the Tanana River (14 mi downstream) and at Clearwater Lake (7 mi upstream). Riverboat navigation is possible in the lower 60 mi of the river and the lower 10 mi of the South Fork Goodpaster River. Floatplane access is feasible in the lower 23 miles of the river. Private landing strips are at Central Creek (river-mi 60), at Pogo Creek

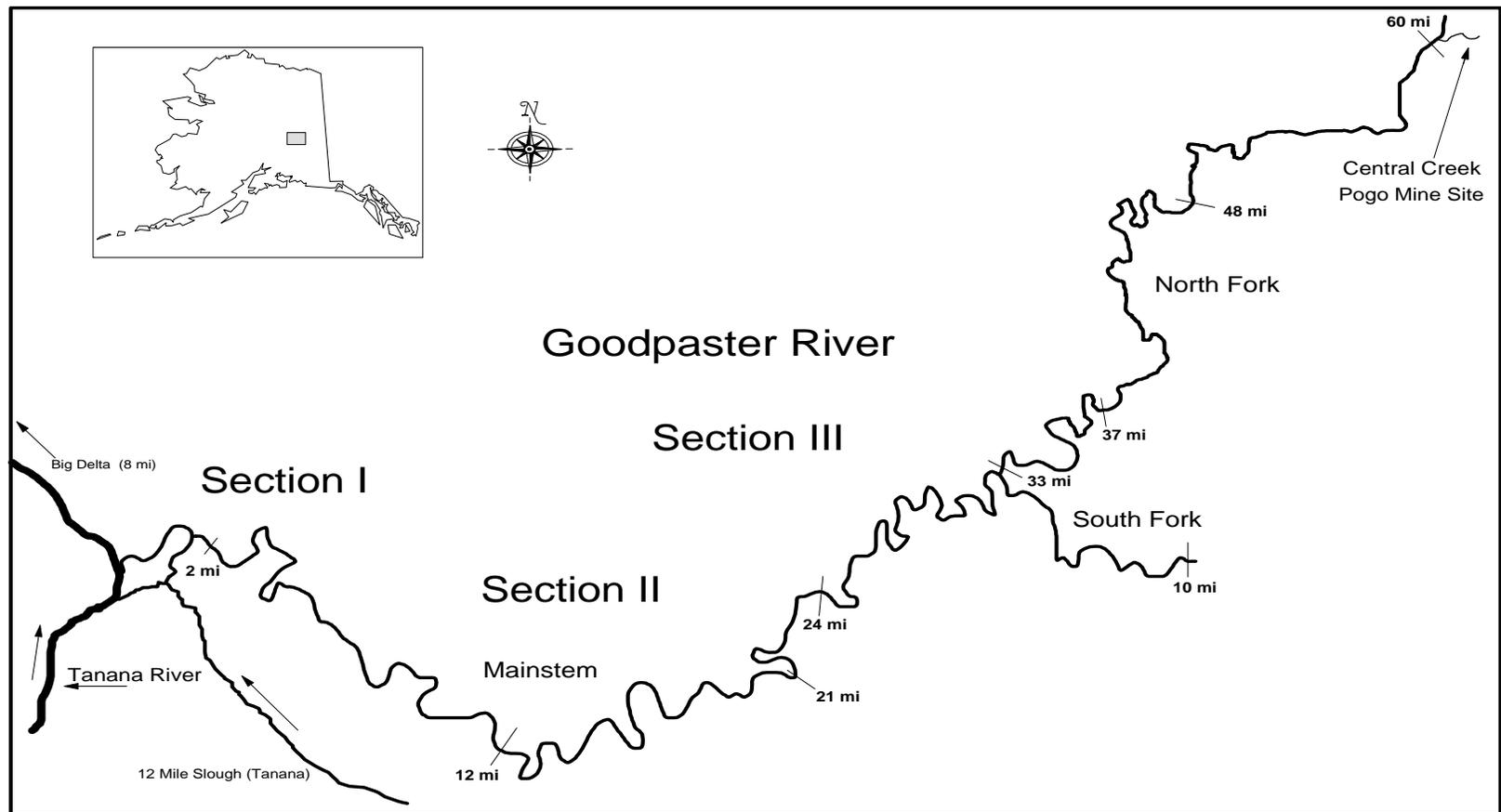


Figure 8.-Map of the Goodpaster River.

(river-mi 68), and at Tibbs Creek a tributary of the Eisenmenger Fork. There are 66 summer cabins on the river, and all but eight are between river-mi 3 and 30. There are no recreational cabins upstream of Central Creek. The length of river sampled in the spring for Arctic grayling is from the confluence of the South Fork Goodpaster River (mile 33) to its mouth.

Access to the Goodpaster River during the winter is via snowmachine from Quartz Lake. The Pogo mine site is located approximately 35 miles upstream from the confluence of the South Fork. In 1998 thru the spring of 1999, Teck-Pogo Corporation upgraded the winter trail from Quartz Lake to the Pogo site, crossing the river 13 times. The winter road was again used in the winter of 2003-2004 to haul materials and road construction machinery to the mine site. In 2004 the 55-mile road from the mouth of Shaw Creek through Shaw Creek Valley across to the Goodpaster River at Wolverine Creek was completed in June.

Mineral exploration by Teck-Pogo Incorporated and future development of the Pogo Creek gold mine (located in the valley of the North Fork Goodpaster River; 68 miles from the mouth) has the potential to impact the habitat of the Goodpaster River. In addition, certain aspects of the permanent road through Shaw Creek (several stream crossings) may require monitoring. With the potential of mining in the upper Goodpaster River watershed, monitoring of the Arctic grayling adult population with funds supplied by Teck-Pogo Incorporated began in 1998.

## **RECENT FISHERY PERFORMANCE**

The Goodpaster River sport fishery occurs mostly in the lower 33 miles of the river. A majority of the sport harvest is Arctic grayling although some northern pike, burbot, and whitefish are harvested as well (Tack 1974). While the Goodpaster River has small anadromous runs of Chinook and chum salmon, fishing for salmon is closed. From 1999-2003, sport harvest of Arctic grayling from the Goodpaster River averaged 415 fish of which 257 were less than 12 inches in length and 157 were greater than 12 inches. The average catch of Arctic grayling during the same 5-year period was 1,966, of which 1,411 fish were less than 12 inches and 555 were greater than 12 inches (Table 17). Harvest of adult Arctic grayling is thought to occur in the Goodpaster River during the spring and fall when the fish are moving. The SWHS indicates that mainly juvenile-sized fish are caught in the Goodpaster River, perhaps because many of the adults leave the lower section during the summer when most of the effort occurs. The Goodpaster River fishery is under no season or size restrictions and operates under general region-wide regulations, which are five per day and in possession.

Angler effort in the fishery has been erratic, ranging from 477 angler-days in 2000, to 3,061 in 1987, averaging 1,462 angler-days from 1983-2003 (Table 17). Catch data first estimated in 1990 shows an upward trend to its highest level in 1998 of 4,705 fish (Table 17). It appears there has been a decline in catch since then, presumably because of fewer anglers on the Goodpaster River. Fluctuations in level of effort may be reflective in the low number of respondents to the SWHS of anglers fishing the Goodpaster River. It is the area manager's belief that fishing effort is more stable from year to year than the SWHS information suggests. This is based upon recreational use patterns on the Goodpaster River. The typical angler owns a cabin on the Goodpaster River and will fish near their place of residence. There are favorite fishing holes that anglers will travel to specific locations on the river where pike and burbot are easier to catch. Non-cabin owners take boats from the Tanana River Bridge or Clearwater Lake to the Goodpaster River to fish grayling since this is the closest river to Delta Junction in which grayling can be caught and kept having a generous limit. In recent years there have been inquiries about flying into the upper watershed at Tibbs Creek airstrip for a float trip. It is not known how many float trips occur however, in the upper river catchability for Arctic grayling is good.

**Table 17.**-Estimates of effort, harvest, and catch for Arctic grayling and other species in the Goodpaster River, from the Statewide Harvest Survey, 1983-2003<sup>a</sup>.

Year	Anglers Days	Harvest		Total	Harvest			Catch		Total	Catch		
		Grayling <12"	Grayling >12"	Grayling Harvest	Pike	Burbot	Whitefish	Grayling <12"	Grayling > 12"	Grayling	Pike	Burbot	Whitefish
1983	1,989	...	...	3,021	0	0	0	...	...		...	...	...
1984	766	...	...	1,194	65	221	65	...	...		...	...	...
1985	2,844	...	...	2,757	0	350	175	...	...		...	...	...
1986	933	...	...	1,508	16	88	0	...	...		...	...	...
1987	3,061	...	...	1,702	0	13	0	...	...		...	...	...
1988	1,037	...	...	1,273	36	109	0	...	...		...	...	...
1989	1,930	...	...	1,964	10	120	0	...	...		...	...	...
1990	2,083	...	...	760	17	0	186	...	...	3,342	34	0	186
1991	786	196	440	636	0	0	0	440	465	905	0	0	0
1992	1,430	281	485	766	26	17	0	2,399	1,200	3,599	120	17	0
1993	1,692	461	127	588	9	86	0	1,217	706	1,923	66	86	0
1994	825	342	358	700	0	0	309	945	864	1,809	66	0	309
1995	2,028	0	325	325	106	23	0	1,673	1,504	3,177	408	23	0
1996	1,244	484	351	595	33	16	0	2,167	754	2,921	142	35	0
1997	2,226	246	398	532	60	0	0	2,552	1,896	4,448	292	0	0
1998	774	206	462	671	0	109	0	2,878	1,827	4,705	34	109	0
1999	1,915	677	175	854	18	51	0	3,297	585	3,882	26	137	0
2000	477	21	42	63	0	0	0	720	570	1,290	95	0	0
2001	787	548	325	873	0	7	0	1,403	412	1,815	9	7	0
2002	912	41	188	229	0	0	0	693	653	1,346	0	0	0
2003	925	0	56	56	22	11	0	942	557	1,499	34	11	0
Averages													
1983-2003	1,462	269	287	1,020	20	58	35	1,640	923	2,619	95	30	35
1998-2003	1,003	257	157	415	8	14	0	1,411	555	1,966	33	31	0

<sup>a</sup> (Mills 1979-1994; Howe et al. 1995; 1996, 2001a-d; Walker et al. 2003; Jennings et al. 2004, 2006a-b).

## **FISHERY MANAGEMENT**

Seasonal migration and stratified summer populations in the Goodpaster River Arctic grayling population must be considered in management planning. Extensive migration occurs in the fall with fish moving to overwintering areas and again in the spring when fish move to spawning areas before dispersing to summer feeding areas. The migrations can be complex even within the tributaries of the Goodpaster River. This migration pattern presents a management situation where sport harvest of Goodpaster River Arctic grayling exists in other rivers. The sustainability of the cumulative harvest on one stock in the Goodpaster, Delta Clearwater, and Richardson Clearwater rivers is unknown. Recent harvests from all of these drainages, however, are low, and should be sustainable without a loss of opportunity for anglers or over-exploitation of the stocks.

The open-water fishery primarily occurs in the lower 33 mi (50 km) of the river during June through August. Adults comprised a majority (88%) of the assessed population in the lower 33 miles of the Goodpaster River in May, 2002 (Parker 2003b). After spawning is complete (around the third week in May) about a quarter of these fish migrate to the DCR and the remainder move upstream (Tack 1974; Ridder 1998b). Fluctuations in Arctic grayling populations within interior Alaska rivers is not unusual given the complex nature of the spawning, summer feeding, and over-wintering migrations that occur annually. Variability in recruitment due to spring floods has produced a “boom and bust” type situation for many grayling stocks in the Tanana River drainage (Clark 1992). Typically when water levels are normal or flood events are minimal, recruitment is good, and conversely when high discharge events occur there are declines in population abundance.

## **MANAGEMENT OBJECTIVES**

The objective for the Goodpaster River recreational fishery is:

1. To maintain the Arctic grayling population such that fish numbers do not fall below 9,000 fish ( $\geq 270$  mm FL) in the assessed portion of the river in May.

Average abundance of adult (>12 inches) Arctic grayling in the Goodpaster River is 12,802 fish (Table 18). To ensure that total harvests of Arctic grayling do not exceed 15% of the average population size annually, harvests over 2,000 fish annually may indicate overexploitation. If over-harvest occurs the population may be declining. If population abundance goes below the 9,000 level then regulatory regulations may be taken to reduce harvest.

**Table 18.**-Abundance, harvest, and exploitation of adult (>12 inches) Goodpaster River Arctic grayling (1995-2002).

Year	GPR Abundance <sup>a</sup>	GPR Harvest in DCR <sup>b</sup>	Harvest in GPR <sup>c</sup>	Total Harvest of GPR Spawners	Exploitation of Assessed GPR Spawners
1995	10,095	325	556	881	0.087
1996	14,145	483	408	891	0.065
1997	12,278	155	258	413	0.033
1998	9,198	0 <sup>d</sup>	474	474	0.056
1999	14,808	0 <sup>d</sup>	176	176	0.010
2000	12,442	0 <sup>d</sup>	42	42	0.004
2001	14,437	44 <sup>d</sup>	325	369	0.023
2002	12,616	0 <sup>d</sup>	188	188	0.015
Mean	12,502	127	303	429	0.039

<sup>a</sup> Spring abundance for the first 33 miles of the Goodpaster River for fish > 12 inches or  $\geq 270$  mm FL, using the Jolly-Seber and Peterson estimates (Parker 2001b, 2003b).

<sup>b</sup> Assuming 60% of the Delta Clearwater River summer stock adults of Goodpaster River origin (Ridder 1998b).

<sup>c</sup> (Mills 1979-1994; Howe et al. 1995; 1996, 2001a-d; Walker et al. 2003; Jennings et al. 2004, 2006a)

<sup>d</sup> Catch-and-release only regulation for the Delta Clearwater River starting in 1997.

This level of harvest includes a percentage of harvest that occurs in the Delta Clearwater River and a portion that occurs in several streams in the local area including Shaw Creek, Tanana River, Blue Creek, Richardson Clearwater River, Volkmar Creek, and others. Investigation of contributions of Goodpaster River Arctic grayling spawners to the Delta Clearwater River (DCR) harvest determined that the largest contributor was the Goodpaster River (60%; Ridder 1998b). In 1995 and 1996 the Goodpaster River (GPR) contributed 10% and 7% of its pre-migration population respectively to the DCR. In 1995 and 1996, the GPR stock exploitation in the DCR was 5.2% and 2.8% respectively (Ridder 1998b). In addition, the GPR contributes fish to other fisheries and has its own grayling fishery with a high total exploitation of 8.7% in 1995, a low total exploitation of 1% in 1999 and 2000, and an average of 4% total exploitation from 1995-2002 (Table 18). These exploitation levels are considered sustainable.

Since 1998, harvests were eliminated from the Delta Clearwater River because of catch-and-release regulations. Harvest in the DCR, under more liberal regulations prior to 1988, averaged over 3,500 and high as 7,700 fish. The potential for unsustainable exploitation of Goodpaster River Arctic grayling stocks, or other stocks, may have existed during those years. For additional information concerning the Goodpaster River and fisheries management, see the 2002 updated Management Plan for the Goodpaster River (Parker 2003c).

We can examine the minimum portion of adults leaving the Goodpaster River in 1999 based upon the estimate of the Delta Clearwater River adult population. Estimated abundance in 1999 of adult grayling (>269 mm FL) in the Delta Clearwater River was 6,977 (Ridder and Gryska 2000). The number of Arctic grayling from the Goodpaster River stock residing in the Delta Clearwater River during the summer of 1999 is about 4,200 fish (60% of the population). This portion of adult Arctic grayling in the Delta Clearwater River represents 28% of the Goodpaster River pre-spawning population (14,808; Table 18) in 1999. Contribution rates for streams such as the Richardson Clearwater River and others are unknown at this time. Arctic grayling harvest is generally limited to the lower 33 miles of the Goodpaster River below the confluence of the South Fork Goodpaster River because of access. Harvest of Arctic grayling above the confluence of the South Fork Goodpaster River is mostly from anglers that float down from the headwaters or use small jet boats or airboats.

Regulatory options to reduce harvest and protect the Goodpaster River Arctic grayling population include: 1) establishment of minimum size limits; 2) designating sections of the river for catch-and-release fishing; 3) establishing a season closure including a winter closure on portions of the Tanana River where grayling overwintered in ice-free water; and, 4) implementing change in bag limits.

Without large harvests in the DCR it would stand to reason that the Goodpaster River Arctic grayling population would increase, when in fact it appears to remain fairly stable (Table 18). It is possible that either several years of low flows because of below average precipitation reduced recruitment or that the population has returned to a more “normal” state and high population sizes in the 1980s were an aberration. If the former is true then habitat significantly affects the health of the Arctic grayling population. If the latter is true then stringent regulations such as occur today on the Delta Clearwater River (catch-and-release) will become standard fare and adjustments to harvest if needed, will occur on the Goodpaster River.

Historically, very little fishing occurs in the upper Goodpaster River above Central Creek. The establishment of a 50-man camp on the river at the Pogo site may potentially double harvest and effort. A fishing policy for Pogo-Teck employees at the site prevents harvest from workers while on duty. However, if a permanent road is build to the mining site more potential angler effort may occur as access is expanded for the general public in years to come.

## **FISHERY OUTLOOK**

Outlook for the Goodpaster River is optimistic. Higher water levels over the past 2-years may provide better survival for juvenile Arctic grayling and thus a higher level of production. In 2003, research activities near the mine site showed few numbers of small fish available to the gear. In 2004, far more small sized fish recruited to the gear compared to 2003.

## **BOARD OF FISHERY ACTIONS**

No recent BOF actions have affected the Arctic grayling fishery on the Goodpaster River. The BOF did adopt in 2004, a management plan and policies for Arctic grayling fisheries within the Arctic-Yukon-Kuskokwim Region (Swanton and Wuttig *In prep*). The BOF adopted a comprehensive document that outlines the distribution, biological attributes and populations of Arctic grayling throughout the region. In addition, the plan outlines Arctic grayling fishery management where fisheries in the region are divided into four categories: high exploitation fisheries, large-fish fisheries, low exploitation fisheries, and, restoration fisheries. These stocks

of fish are managed for long-term sustained yield through the application of simple regulatory and monitoring policies of which three policies are suggested (Swanton and Wuttig *In prep*). The Goodpaster River Arctic grayling stock falls under the Regional Management Policy, with a bag and possession limit of 5 fish with no length limit, a year round season, and no gear restriction beyond the standard background regulations for Region III.

## **CURRENT ISSUES**

Potential effects of discharge from Pogo Mine activities require ongoing monitoring of fisheries and water quality data.

## **ONGOING AND RECOMMENDED RESEARCH AND MANAGEMENT ACTIVITIES**

The Arctic grayling population in the Goodpaster River will be deemed healthy if current management objectives are met. Management data that are needed include: 1) periodic estimates of the spawning population of GPR pre-migrating stock; 2) estimates of harvest of Arctic grayling in the Goodpaster River and other rivers where fisheries exist on Goodpaster River fish; 3) estimates of exploitation levels that can be allocated to satellite fisheries; and, 4) estimate contribution of Goodpaster River stock to summer feeding rivers such as the Richardson Clearwater River where significant sport harvest occurs. Estimates of harvest can be obtained for the Goodpaster River and Delta Clearwater River from the SWHS.

To provide baseline monitoring of the Arctic grayling population with development of the Pogo Mine in the upper watershed, ADF&G estimated summer abundance in 2003 and 2004 above and below the Pogo Mine site. The objective is obtaining density information to evaluate if a catastrophic event occurred once mining operations begin in the upper watershed. Objectives for this study are to estimate the abundance and age and length composition of fish >229 mm FL.

Extensive mining exploration is occurring in the remote upper watershed. Over 500 square miles to date has been staked by several mining companies. The potential future development of the Pogo Creek gold mining operation adjacent to the Goodpaster River necessitates at a minimum, baseline monitoring of the spawning (adult) Arctic grayling population found in the lower Goodpaster River during the spring. Water quality, stream gauging, fish toxicity, population data and other assessments are also underway. Since little else is known about fisheries in the rest of the drainage, a drainage-wide study of abundance and distribution would be ideal. Data collection desired include: 1) distribution of grayling in the upper watershed to Eisenmenger Creek during the summer; 2) estimates of Arctic grayling population in early summer from Pogo Mine down to mile 33; 3) density estimates in sections identified above mile 68 (upstream of Teck-Pogo camp); 4) survey estimates of spawning Chinook and chum salmon conducted on annual basis (Chinook surveys funded by Teck-Pogo); and, 5) juvenile salmon habitat studies (currently funding by Teck-Pogo). These projects, although not a complete list, will help track changes should issues impacting riverine habitat and the health of these stocks arise.

## **SECTION VI: UPPER TANANA AREA LAKE TROUT**

### **BACKGROUND AND HISTORICAL PERSPECTIVE**

Since 1986, over-harvest may have occurred on lake trout populations in the Upper Tanana drainage. Today restrictive regulations exist on many lakes. Specific life history features (slow growth, delayed maturity and non-consecutive spawning) combined with the short growing season at higher altitudes increases the vulnerability of the species to over-harvest (Burr 1987). The impact of even modest fishing pressure can be significant. Lakes containing lake trout in the Upper Tanana area include Fielding, Two Bit, Landmark Gap, Glacier, Sevenmile, 14-Mile, and the Tangle lakes. The department took lake trout eggs from the Sevenmile Lake stock for several years and used these fish in the stocking program. These fish were stocked in several lakes in the Upper Tanana River drainage. Lake trout take over a year to rear in the hatchery because of the late egg-take timing. ADF&G recently abandoned using lake trout in their stocking program until adequate hatchery facilities exist.

### **RECENT FISHERY PERFORMANCE**

Tanana River drainage lake trout harvest in 2003 was 12.1% of the statewide harvest (Jennings 2006b). In 2003, 92% of the Tanana drainage lake trout harvest and 82% of the catch occurred in the Upper Tanana area (Jennings et al. 2006b). The Tanana River drainage harvest in 2003 (860) is about the same as the last 5-year average (858; Table 19) but only about 60% of the 1977-2003 average (1,387; Table 19). The average catch rate (4,193) has been more consistent since 1990 (Table 19) and is close to the last 5-year average (1998-2002) of 3,841 (Table 19). An average of 44% of the lake trout harvested since 1977 came from the Tangle Lakes and Delta River, which are the most popular lake trout fishing sites in the Tanana River drainage (Table 19).

### **MANAGEMENT OBJECTIVES**

The objectives for lake trout fisheries are based upon a harvest guideline to prevent excessive harvest and allow recovery of heavily fished populations. The current harvest guideline is to prevent harvest levels from exceeding 0.5 kilogram per hectare annually. The only additional objective for any lake trout fisheries is for Fielding Lake.

A conservative approach is needed in Fielding Lake to maintain a viable spawning population.

- 1. In Fielding Lake allow harvest such that 50% of the female spawners are protected from harvest.**

In Fielding Lake, the age at which half the female lake trout mature (age-8, or 21 inches) is higher than most lakes. Therefore the current size limit (22 inches) does not allow but 1 or 2 years (Figure 9) of production before new recruits to the spawning population are legal to harvest. The age of maturity of 95% of the population occurs at age 10 or at 23 inches.

**Table 19.**-Summary of sport harvest and catch<sup>a</sup> of lake trout in several lakes within the Tanana River drainage, from 1977-2003<sup>b</sup>.

Year	Harding Lake	Fielding Lake	Tangle Lake <sup>c</sup>	Delta River	Stocked Lakes/Ponds	Other <sup>c</sup>	Total
Harvest							
1998	44	19	290	0	0	171	524
1999	89	43	484	14	14	501	1,145
2000	18	18	376	0	153	568	1,133
2001	44	12	112	0	15	262	445
2002	48	0	414	48	50	149	709
2003	41	83	505	68	126	37	860
1977-2003	87	155	580	32	251	373	1,387
1977-1981	na <sup>d</sup>	295	628	na	na	680	1,201
1982-1986	24	258	1,322	234	24	376	2,368
1987-1991	90	233	328	40	527	305	1,536
1992-1996	143	117	340	3	387	239	1,256
1997-2001	49	18	335	12	46	330	791
1999-2003	48	31	378	26	72	303	858
Catch <sup>a</sup>							
1999	807	279	2,034	81	298	981	4,480
2000	258	221	1,626	0	407	1,500	4,012
2001	435	106	591	0	67	1,105	2,304
2002	597	137	2,464	157	239	1,222	4,816
2003	518	423	1,631	90	384	549	3,595
1999-2003	523	233	1,669	66	279	1,071	3,841
1990-2003	419	362	1,655	43	561	1,141	4,193

<sup>a</sup> Information available from 1990-2002 only. Anglers may have harvested or released fish tallied as "catch."

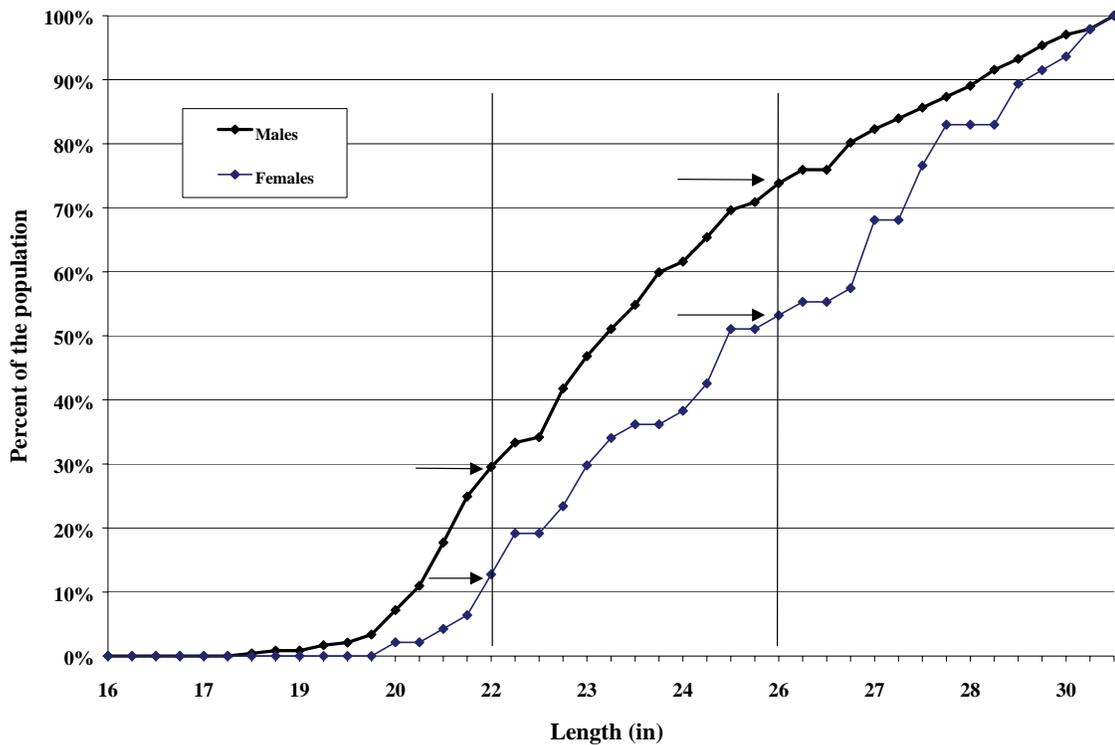
<sup>b</sup> (Mills 1979-1994; Howe et al. 1995; 1996, 2001a-d; Walker et al. 2003; Jennings et al. 2004, 2006a-b)

<sup>c</sup> Includes Tangle River and other streams which occasionally show up in the SWHS.

<sup>d</sup> No reported harvest.

In 1999, the estimated abundance of spawning lake trout was 236 fish, with a 1:1 ratio of males and females (Parker et al. 2001c). Of the spawning population sampled from 1998-2000, 30% of the males and 13% of the females were under the 22-inch minimum size limit (Figure 9). This leaves only 185 fish in the spawning population available for possible harvest. If 50 fish were caught annually, exploitation would be over 27%, which in itself is too high. The department would prefer that harvests not exceed 15% of spawning population and not be prosecuted on half of the female population. Since sampled females in the spawning population are larger than males, the minimum length limit would have to be increased to 25 inches to provide protection on 51% of the females.

A declining catch after 1993 also suggests fewer fish available to anglers (Table 19). Prior to 1993, catch rates were high; over 900 fish in 1993 (Mills 1994). Not until 2003 have the catch rates been over 400 lake trout (Table 19).



**Figure 9.**-The cumulative length distribution of male and female lake trout sampled from 1998 to 2000 in Fielding Lake.

## **FISHERY MANAGEMENT**

In 2003, management staff put together a framework to develop a Regional Lake Trout Management plan. The objective of the plan is to keep harvests of lake trout below defined MSY levels. The Lake Area Model (LAM) is the primary tool for determining if fishing mortality estimated from the SWHS from specific lakes were acceptable. Estimates of MSY from the LAM are likely conservative and are imprecise because of the wide confidence about the regression of observed yields in terms of weight and imprecision in the harvest estimates. The LAM will be used as a benchmark and regulatory actions will be introduced when harvests have exceeded the target threshold.

Attaining the guideline of 0.5 kg/ha/yr by lowering the bag limit has been successful by reducing harvests. In 1987, new regulations restricted the daily bag and possession limit to two fish per day with no size limit. However, in Fielding Lake, harvests averaged 230 fish per year from 1987-1991, when harvests (according to the guideline) should have been 80 fish. In 1993 the bag and possession limit was reduced to one fish by EO and the size limit was raised to 22 inches. This effectively dropped the harvest levels. From 1994 to 2000 harvest dropped to a sustainable average harvest of 39 lake trout annually. In 2002 and 2003, the harvest of 0 and 83 lake trout (Table 19) in Fielding Lake are within the guideline of about 80 fish per year.

The number of mature Lake trout in Fielding Lake is low. A decline in the harvest may be attributed to the increasingly restrictive length regulation, or this resulted from low numbers of legal-sized lake trout present. Based on recent population work at Fielding Lake, a combination of both causes is likely. For example, in 1999 a harvest of 43 lake trout (> 22 in) represented 18% of an estimated 236 (SE = 17) male and female lake trout (> 22 in) available for harvest, yet the estimated yield is below the guideline harvest survey (Parker et al. 2001c). From the literature, the harvest guideline for Fielding Lake based on 0.5 kg/ha/year provides a yield of 269 kg/ha/year. The mean length of 124 lake trout caught in the sport fishery from 1971 to 2001 is 507 mm FL (Parker et al. 2001c). Given the length/weight relationship, the average sized fish caught in the sport fishery is 1.5 kg, or a harvest biomass in 1999 of 66 kg, which is within the recommended guideline (Parker et al. 2001c). However, the exploitation rate (18% in 1999) is high given the low production characteristics of this species. This also suggests that the guideline may not be accurate for this population. In Fielding Lake, female lake trout reach sexual maturity at an average age of 8-years old and at an average length of 21 inches (Burr 1991). An increase in the minimum size limit to 26 inches would allow half of the female lake trout in the spawning population to escape harvest (Figure 9).

## **FISHERY OUTLOOK**

In 1998, a 3-year research project started in Fielding Lake to estimate the population of lake trout. In September of 1998-2000, 96, 92, and 104 fish respectively were captured with a seine on the only known spawning bed. The population estimate for males and females was 236 fish 22-inches and greater. The more recent increase in minimum length, a spawning closure and gear restriction appear to have mixed results in restricting harvest (0 fish in 2002 and 83 in 2003; Table 19).

It is recommended to continue egg-takes (less than 100,000 eggs) from lake trout in Sevenmile Lake for the regional stocking program. This will likely occur again when hatchery capacity exists. A lake trout egg-take conducted in 1999 collected ~ 83,000 eggs resulting in removing 12% of the annual production (Parker and Wuttig 2000). A mark-recapture experiment was

conducted to determine if egg-takes every other year since 1991 were having an effect on the population. In 1999, the population of lake trout was estimated at 1,260 (SE =185; Parker and Wuttig 2000). The estimated abundance in 1999 was not significantly different than abundance found in Sevenmile Lake 10 years earlier (Parker and Wuttig 2000). Production lost to egg-takes would not have an effect on the population.

## **BOARD OF FISHERY ACTIONS**

In 1987, the board restricted the daily bag and possession limit to two fish per day with no size limit. With continued fishing pressure at Fielding, Harding, and Tangle lakes, it was necessary to add additional restrictions. These regulations required lake trout harvested in Fielding and Tangle lakes to equal or exceed 18 inches in total length. Continued high harvest of lake trout in the Tangle Lakes caused a reduction in the daily bag and possession limit to one fish per day and a minimum length limit of 18 inches. Another change to reduce harvest occurred on Fielding and Harding lakes July 1, 1993, when the minimum size limit was changed by emergency regulation from 18 to 22 inches on Fielding Lake and a length limit of 18 inches was established for Harding Lake. This regulation was effective in reducing the harvest in Fielding Lake averaging 210 fish from 1977-1996, to an average of 39 from 1994-2000 (Table 19). The BOF history of regulation changes can be reviewed in Appendix B2.

The BOF in January 2001 raised the minimum size limit to 26 inches and establishing a spawning closure for Fielding Lake during the month of September (closed to all fishing). In addition, a single-hook restriction was established, which by statewide definition is one hook with gap between point and shank of ½ inch or less. In January 2004, the BOF also established a region-wide background lake trout bag limit regulation to two fish with no size limit.

## **CURRENT ISSUES**

Populations such as Fielding and the Tangle lakes in the Upper Tanana area needed protection during spawning when lake trout are very susceptible to fishing. The BOF closed fishing in Fielding Lake during September to prevent lake trout fishing during the spawning period. Other lakes such as Tangle Lakes have indigenous lake trout populations and may require this restriction in the future.

## **ONGOING AND RECOMMENDED RESEARCH AND MANAGEMENT ACTIVITIES**

Future research is currently directed at obtaining an estimate of the spawning population at Tangle Lakes. This research will continue for another year or two. Tangle Lakes supports the largest harvest and catch of any lake in the Interior. Research is desired to develop a hooking mortality factor that is added to lake trout harvest.

# **SECTION VII: TANANA RIVER BURBOT**

## **BACKGROUND AND HISTORICAL PERSPECTIVE**

Before new regulations were put into effect, burbot fishing in lakes occurred primarily in Fielding, Harding, and Tangle lakes. Now very little harvest occurs in these lakes. Since 1987, bag limits in these lakes were reduced to two fish daily, and the use of setlines was eliminated. Burbot stocks in the Tanana River are exploited most heavily near population centers such as Fairbanks, Delta Junction, and near Northway. Burbot movements within the Tanana River tend

to minimize effects of concentrated local fishing effort, and stocks in the Tanana River appear to be lightly exploited (Evenson 1997b).

## **RECENT FISHERY PERFORMANCE**

The 2003 estimated harvest of burbot in the Tanana River drainage by sport anglers was 2,261, about 32% below the 26-year average (Table 20). In 2003, 46% of the burbot harvest came from the Upper Tanana area portion of the Tanana River (Table 5). The Tanana River is split into three reporting areas; lower, middle, and upper Tanana River. In 2003, only 87 burbot were harvested in the lower section, 1,001 harvested in the middle section and 749 harvested in the upper section (Jennings et al. 2006b). The middle section is in both the Fairbanks and Upper Tanana areas. The middle section begins in Nenana and end at Delta Junction and includes popular areas near the mouth of the Chena River and near Shaw Creek. It was estimated based on the relative size of the respective fisheries that about 70% of the burbot harvest is taken in the Fairbanks area while 30% occurs in the Upper Tanana area (Parker and Viavant 2000). In 2003, the burbot harvest from the middle Tanana River section was 671 and 330 burbot in the Upper Tanana River section for a total of 824 burbot harvested (Table 20). In 2003, total burbot harvest in the Tanana River comprises 4.4% of the total Tanana River harvest (Table 4). In 2003, anglers harvested 77% of the burbot they caught for the entire Tanana River drainage (Table 6) and that proportion (80.6%) was slightly higher in the upper Tanana River area (Table 7).

Harvest from area lakes has declined since 1987 when restrictions on number of hooks, set lines, and seasons for many lakes were enacted. From 1981-1984 harvests of burbot at Fielding Lake averaged 330 per year and caused a decline in the adult population. In 1994 the department issued an EO to close the taking of burbot until further notice. The population has since stabilized and in 2001 there was opportunity under restrictive regulations to harvest a burbot in Fielding Lake for the first time in 7 years but no reported harvest in the SWHS. From anglers reporting their harvest verbally to ADF&G, we know that some low level of harvest occurs at Fielding Lake. In 2003, 11 burbot were harvested in Fielding Lake (Table 20). There were also 47 burbot reported harvested in 2003 from George Lake in the Upper Tanana area (Table 20).

## **MANAGEMENT OBJECTIVES**

The management objective for the Tanana River and Tanana drainage lakes is to ensure harvests and incidental mortality of burbot are less than 10% of the population size. Lake burbot populations, particularly in the Upper Tanana area, have very restrictive regulations to prevent over-harvest.

### **1. In Fielding Lake maintain a population size of 1,000 adult burbot > 18 inches in size.**

Simulations show an optimum population size of about 1,000 burbot over 18 inches in size and that 10% exploitation can be sustained. The population has grown to 750 fish in 2000. Indications are it will continue to grow until capacity is reached. This proposal is conservative to start with, if harvest within the next 3 years is below the desired yield, then adjustment to the bag limit can be made during the following Board cycle.

**Table 20.**-Sport harvest and catch of burbot in several waters of the Tanana River drainage<sup>a</sup>, from 1977-2003.

Year	Upper Tanana area Portion of the Tanana River						Fairbanks Waters <sup>d</sup>	Total
	Fielding Lake	Tangle Lake <sup>c</sup>	George Lake	Shaw Creek	Tanana River	Other		
Harvest								
1999	0	8	0	127	761	178	2,074	3,148
2000	0	0	0	557	867	248	2,068	3,740
2001	0	29	0	72	378	36	782	1,297
2002	0	22	0	168	824	275	2,720	4,009
2003	11	9	47	32	1,079	11	1,372	2,561
Average Harvest								
1977-2003 <sup>a</sup>	68	52	51	186	1,822	651	1,433	3,765
1999-2003	2	14	9	191	782	150	1,803	2,951
Catch <sup>b</sup>								
1999	15	28	13	127	994	254	3,141	4,572
2000	48	0	0	582	1,305	431	3,354	5,720
2001	0	29	0	72	562	36	1,306	2,005
2002	0	22	0	183	1,059	323	3,304	4,869
2003	11	19	47	32	1,355	11	1,857	3,332
Average Catch								
1990-2003	21	27	47	194	2,031	454	2,227	5,129
1999-2003	15	20	12	199	1,055	211	2,592	4,100

<sup>a</sup> (Mills 1979-1994; Howe et al. 1995; 1996, 2001a-d; Walker et al. 2003; Jennings et al. 2004, 2006a-b)

<sup>b</sup> Information available from 1990-2001 only. Anglers have harvested or released fish tallied as “Catch”.

<sup>c</sup> Includes Tangle River.

<sup>d</sup> Fairbanks waters include Harding Lake, Chatanika River, Chena River, Minto Lake and Tolovana River, Piledriver Slough, and Nenana River.

**2. In Fielding Lake maintain a harvest level on the adult burbot population not to exceed 10%.**

Annual harvests of burbot under 75 fish should be sustainable. Burbot harvests are obtained from the SWHS, if harvests are greater than 100, further restrictions will be required.

## **FISHERY MANAGEMENT**

Sustainable levels of harvest in small, high elevation lakes such as Fielding and the Tangle lakes are thought to be low and if harvests should reach 100 fish per year, impacts upon the population should be investigated.

## **FISHERY OUTLOOK**

Abundance and an index of abundance were estimated for burbot in Fielding Lake since 1985. For 1999, the estimated abundance of fully recruited burbot (>450 mm TL) in Fielding Lake was 598 (SE = 62). The index of abundance for 2000 was 760 fish (Parker 2001d). The population currently can sustain a small <75 per year harvest. In the past 5 years anglers have reported catching but not harvested burbot in Fielding Lake (Table 20). This is encouraging that anglers are catching and releasing burbot.

## **BOARD OF FISHERY ACTIONS**

In 2001, the BOF passed proposal 193, allowing a daily bag and possession limit of one burbot in Fielding Lake. In addition, proposal 195, for lake trout, was adopted with changes that affect burbot fishing as well. Proposal 195, as amended, allows use of bait, the use of single hooks only, and fishing is closed from September 1-30. Regulations on Fielding Lake have changed from a 10 fish bag limit to total closure to a very conservative bag restriction on one fish, a chronology of regulations changes are found in Appendix B2.

## **CURRENT ISSUES**

Exploitation rates of burbot in the Tanana River are not considered excessive. However, low productivity in most of the lakes may result in over-exploitation. Burbot stock assessments carried out by ADF&G during the late 1980s indicated that the uppermost river section near Northway supported the lowest density of large burbot among the river sections sampled (~90/km sampled; Evenson 1991). Subsistence and personal-use fisheries for burbot are known to occur in the upper Tanana, but harvests in these fisheries may have been under-reported. Current estimates of stock status or of harvest for the upper Tanana drainage are unavailable. However, since this part of the river showed low relative abundance of burbot compared to other river sections and has seasonally intense effort and harvest, there is concern for local depletion.

Population density of burbot in lakes declined dramatically in the early 1980s due to unsustainable rates of sport fishing exploitation. Stock assessment studies in the 1980s conducted in lakes of the upper Susitna/upper Copper River basin and the Tanana River drainage (Lafferty et al. 1992), confirmed that several lake stocks in the Tanana drainage showed evidence of high exploitation. More recent stock assessment studies conducted in lakes of the Tanana River drainage demonstrate the detrimental effects of long-term high exploitation rates (Parker 2001d).

## **ONGOING AND RECOMMENDED RESEARCH AND MANAGEMENT ACTIVITIES**

The Tanana River burbot populations near the Northway area should be investigated because of seasonal depletion. Since the department is unaware of what kind of fishery occurs on this resource, an attempt to estimate harvest from all fisheries on this stock is recommended.

## **SECTION VIII: UPPER TANANA AREA NORTHERN PIKE**

### **BACKGROUND AND HISTORICAL PERSPECTIVE**

The major northern pike sport fisheries for the Upper Tanana area occur in George, Volkmar and Healy lakes, and also the Goodpaster and Volkmar rivers. There are several lakes and creeks in the Tetlin National Wildlife Refuge that also have abundant pike resources but do not show up in the SWHS. There are no road accessible pike fisheries in the Upper Tanana area, and with the exception of Scottie and Moose creeks and Deadman Lake near the Canadian Boarder. Most of these remote northern pike fisheries are accessed by plane or boat, and primarily fished during open-water. Other lakes in the Upper Tanana area with pike populations are Sand, "T", Mansfield, Dog, Island, Tetlin, Takomahto, Jatahmund, Island, and Wellesley lakes. George Lake, the largest pike fishery in the Upper Tanana area, is accessed by boat, snowmachine, and float and snow-ski equipped airplane, and the fishery occurs year round. Volkmar Lake is accessed primarily by snowmachine, but also by float and ski equipped airplane, and the fishery there occurs primarily in the winter.

Much of the effort directed towards pike in the Tanana drainage is non-consumptive fishing. Pike harvests in 2003 represent 11.1% of the total pike catch in the Tanana drainage (Tables 6 and 21). Although effort is not estimated by species targeted, it is felt that the majority of the effort at George and Volkmar lakes is directed toward northern pike. Lately, effort at George and Volkmar lakes has been more variable, particularly at George Lake. Low snowfall, low creek levels, and open water on the Tanana River during the winter make access to these lakes difficult.

Anglers use hook-and-line gear all year to harvest northern pike. In addition, spears are used during the ice-cover months. Anglers fishing in lakes are very successful in the spring when pike have concentrated for spawning (Hallberg and Bingham 1992). In 1993, 549 households responded to a northern pike survey to gather information on the distribution of participation and harvest, and kinds of gear used by successful pike anglers. Results showed that 84% of participation and 82% of the harvest occur in the open-water months (Bingham and Parker 1995). Open-water fishing occurs slightly more on rivers (51%) than on lakes (49%). Only 14% of the total participation occurred during the ice-covered season, of which 86% of effort was on lakes. Anglers harvested 40% of their pike using spears, which are more effective than using hand-held lines or tip-up's. Anglers reported that a small spearhead, less than 6 inches in width, may not be as efficient in harvesting pike as a spear head that is 6-10 inches (Bingham and Parker 1995). Stock assessment of northern pike populations in the Tanana drainage were primarily done between 1987 and 1994. Assessments were done at George Lake from 1987 through 1991 and at Volkmar Lake from 1985 through 1994 and in 2000.

**Table 21.-**Sport harvest and catch of northern pike in lakes and rivers in the Tanana River drainage, 1999-2003.

Year	Harding Lake	Chena River	E. Twin Lake	George Lake	Healy Lake	Deadman Lake	Volkmar Lake	Minto Lake	Tanana River	Other	Total Harvest	Delta Area Harvest
Harvest <sup>a</sup>												
1999	16	122	76	344	0	122	18	908	163	1,156	2,925	1,016
2000	22	329	154	259	86	123	10	266	192	2,026	3,467	704
2001	0	148	..	610	..	..	..	641	405	2,403	4,207	1,012
2002	0	323	58	223	39	..	127	483	103	2,080	3,436	1,380
2003	0	24	60	738	0	0	24	1,260	120	721	2,947	924
1999-2003	8	189	70	435	25	49	36	712	197	1,677	3,396	1,007
1977-2003	609	495	312	1,201	244	225	300	2,502	224	2,160	8,241	1,124
Catch <sup>a</sup>												
1999	828	921	574	3,380	330	424	85	3,261	1,272	6,711	17,786	7,044
2000	394	1,412	2,979	4,957	248	432	10	1,402	1,140	7,546	20,520	7,134
2001	356	820	..	5,146	..	..	..	2,849	929	10,412	20,512	7,584
2002	58	1,461	352	2,149	255	..	304	8,806	809	10,952	25,146	5,542
2003	327	424	193	4,097	449	546	339	9,706	993	9,517	26,591	6,611
1999-2003	393	1,008	820	3,946	256	280	148	5,205	1,029	9,028	22,111	6,783
1990-2003	2,683	1,616	1,590	3,538	275	327	632	11,380	1,223	10,742	35,681	6,865

<sup>a</sup> (Mills 1979-1994; Howe et al. 1995; 1996, 2001a-d; Walker et al. 2003; Jennings et al. 2004, 2006a-b)

## **RECENT FISHERY PERFORMANCE**

Estimated harvests for northern pike fisheries in the Tanana drainage have been highly variable over time at most locations. Catches in George Lake increased dramatically as more anglers were able to access the lake via boat in 2000 and 2001, but fell off again in 2002 because the outlet was nearly dry. In 2003, catches again improved at George Lake because the outlet was boat accessible during the spring. In George Lake fewer fish were harvested over the past 5 years (435) than over the last 26 years (1,201; Table 21). This is representative of a change in attitude towards harvesting pike in George Lake as well as other waters in the interior.

Harvests over the last 5 years averaged 3,396 in the Tanana River drainage, 29.7% or 1,007 northern pike were harvested in the Upper Tanana area portion of the Tanana River (Table 21). The 5-year average catch of northern pike in the Upper Tanana area (6,783; Table 21) is consistent with catches occurring during the last 13 years (6,865; Table 21). The 5-year average harvest of 1,007 fish in the UTMA is also similar to the 26-year average of 1,124 fish (Table 21). However, in all the Tanana drainage, both harvest and catches have seen significant changes i.e., the 5-year average of 3,396 fish is much less than the 26-year average harvest of 8,241 fish (Table 21). George Lake supports the largest catch of pike in the Upper Tanana area, the recent 5-year average is 3,946 northern pike caught annually (Table 21). The majority of the effort at Volkmar Lake occurs during the winter when anglers access the lake by snowmachine. During the winter the fishery is characterized as consumptive, fish caught by jigging or spearing are easily preserved by freezing. Anglers reported declines in the pike angling success in Volkmar Lake that prompted a reduction in the bag and possession limit to one fish per day during the 1997 BOF meeting. Since the new regulations were put into effect catches and harvests have remained low. A chronology of northern pike regulations in the Tanana River drainage are found in Appendix B4.

## **MANAGEMENT OBJECTIVE**

The department will attempt to limit exploitation rates in northern pike lakes to less than 15% annually.

## **FISHERY MANAGEMENT**

Published estimates of catch and harvest from the SWHS for Volkmar Lake are periodic, with only six estimates in 22 years. In most years' anglers report fishing Volkmar Lake to the SWHS however, the numbers of responses are just below 12, the number necessary for the responses to be published. Volkmar Lake is important enough of a fishery that these unpublished estimates of harvest and catches are of interest.

There was an average of 417 angler days per year from 1981-1999 (Parker 2001a). Harvest of northern pike in Volkmar Lake appeared to be sustainable up until 1994 (Parker and Viavant 2000). About 3,100 spawning-sized fish (>449 mm) were estimated in the spring of 1993 (Pearse 1994). In 1992, the harvest was 231 fish resulting in an exploitation rate of 7%. In 1994, abundance was 2,300 over 449 mm (Pearse and Hansen 1995) and the exploitation rate was 14% based on an estimate of 320 fish harvested in 1993. A sustainable harvest for a population of 2,000 spawners is about 300 pike. Therefore, in 1994 the harvest was slightly above the maximum sustainable level (Pearse and Hansen 1995). In 1995, the harvest was 1,084 which was not sustainable and may have been responsible for the population decline experienced

by anglers in 1996 and 1997. The harvest rate per angler-day is 0.9 for Volkmar Lake, which allows < 460 angler-days.

Improved access is blamed for the recent increase in effort. In February 1994, there were 12 icehouses on the lake (the most ever recorded) and many reports to staff of increased fishing use. For management purposes, an estimate of angler-days over 600 should be of concern. The new regulations have been effective in reducing harvest to less than 50 per year but have reduced opportunity as well.

## **FISHERY OUTLOOK**

Abundance of northern pike in Volkmar Lake was estimated in the summer of 2000. The size of the population is small and it will take several years for Volkmar Lake northern pike fishery to become the fishery anglers were accustomed to prior to 1996. The population in George Lake is thought to be healthy; effort and catch has recently increased largely due to better access into the lake.

## **BOARD OF FISHERY ACTIONS**

During late 1997 the BOF reduced the bag and possession limit in Volkmar Lake to one fish with no size limit. Anglers from Delta Junction testified that effort in 1996 was high but harvest was poor, with few large fish. The department saw no decline in the number of icehouse permits issued in 1996 (as a gauge of effort) and supported the bag reduction to one fish with no size limit, proposed by a local angler, as a conservation measure. The department feels that the reduction of the bag limit is sufficient (average harvest of 36 over the past 5 years; Table 21) to reduce effort and harvest to acceptable levels.

Several proposals relating to northern pike in the Tanana drainage were considered by the BOF during the 1997 AYK meeting. The Board adopted a department proposal to remove the area-wide spring spawning closure for flowing waters (except the Tolovana drainage) and relax the drainage-wide spawning closure to increase the season by 20 days (moving the spring closure from April 1 to April 21), with the exception of popular fisheries such as Harding, George (including its outlet), and Volkmar lakes.

In 2000, the BOF adopted a for the Chisana River drainage upstream from the Northway bridge that reduced the northern pike daily bag and possession limit to two fish, with only one fish over 30 inches. This proposal seeks to protect stocks of fish in streams that cross the Alaska Highway from the Boarder to Northway. A comprehensive history of northern pike regulations in the Tanana River drainage can be found in Appendix B3.

## **CURRENT ISSUES**

The public desires a greater number of large fish in Volkmar Lake. To increase the proportion of large fish captured, more medium sized pike must be allowed to recruit. A maximum size limit of 26 inches or a slot limit up to 26 inches and over 40 inches may accomplish this objective.

## **ONGOING AND RECOMMENDED RESEARCH AND MANAGEMENT ACTIVITIES**

A population study of northern pike in Volkmar Lake is necessary in the future to determine if the population has recovered.

## **SECTION IX: UPPER TANANA AREA STOCKED WATERS**

### **BACKGROUND AND HISTORICAL PERSPECTIVE**

The ADF&G stocks game fish in 48 lakes in the Upper Tanana Management Area (UTMA). The stocking program is designed to provide additional fishing opportunities near communities and popular recreational destinations where fish resources and angling opportunity are limited and where fishing effort and harvest are highest. Remote lakes also are stocked to provide opportunities for anglers who want a more challenging experience or those who want to enjoy more tranquil settings. Lakes in the stocking program range in size from a few acres to several hundred acres and are accessible by road, trail, ATV or aircraft. Most of the fisheries are year-round and half of the angling effort on some lakes occurs during winter.

The stocked waters in the UTMA are classified into large and small fisheries. Large fisheries have more than 5,000 angler-days of effort, annually. Quartz Lake is the only large fishery in the UTMA and Big "D" Pond is the only one classified as Urban. Donnelly Lake is the only special management –rural lake. Monte and Rainbow lakes are special management-remote and all other lakes are collectively called high yield-rural or high yield-remote stocked lakes.

ADF&G questionnaires sent to license holders in the Tanana drainage show wild stocks of Arctic grayling are targeted more by anglers than were other species. Rainbow trout was the next most commonly targeted species. However, surveys conducted in 1980, 1985, and again in 1988 indicate that the proportion of anglers fishing specifically for rainbow trout increased and that the proportion of anglers targeting Arctic grayling decreased.

Today ADF&G provides diverse year-round sport fishing in the UTMA for rainbow trout, coho salmon, Arctic grayling, and Arctic char. Goals of the fish-stocking program in the UTMA are to:

1. reduce harvest pressure on wild stocks;
2. provide angling opportunity for increasing numbers of anglers;
3. diversify angling opportunity by stocking popular species and species not typically found along the road system; stock a variety of lakes, and, improve access; and,
4. rehabilitate depleted wild stocks when required.

Meeting public demand for recreational fishing opportunities in Alaska while at the same time maintaining and protecting the wild fishery resources has become increasingly complex. Today, Alaska is experiencing increased tourism and continued forest, mineral, and petroleum development. All of these activities impact Alaska's wild fish stocks and the fisheries that depend on them.

Stocking serves to divert angling pressure away from fragile wild stocks and maintain angling opportunities for increasing numbers of anglers. Accordingly, stocking has become a vital component of the statewide sport fish program. Results from angler opinion surveys of Tanana drainage residents conducted by ADF&G in 1985 and in 1988 indicated that about 80% of the respondents approved of stocking fish as a means to improve fishing.

## **RECENT FISHERY PERFORMANCE**

From 1994 through 2003, the stocking program in the UTMA generated from 12,278 to 26,711 angler-days annually and averaged about 17,779 angler-days (Table 22). In 2003, effort on stocked waters was 36% (Tables 22 and 3) of the total annual estimated fishing effort for both stocked and wild species in the UTMA. Over the same period, annual catch of stocked fish ranged from 39,586 to 95,263 fish and annual harvest ranged from 13,636 to 31,238 fish (Table 22). These numbers represent about 36% to 61% of the total annual catch and from 57% to 83% of the total annual harvest of both wild and stocked fish in the UTMA. Five-year moving averages for number of anglers, effort, catch and harvest are shown in Figure 10. While the number of anglers and the amount of effort has generally decreased, the number of fish caught has increased and the number of fish harvested has remained steady.

Over the last 10 years the average catch and harvest of stocked fish in the UTMA show that 64% of the catch and 67% of harvest of stocked fish in the UTMA was composed of rainbow trout (Figure 11). Coho and Chinook salmon (landlocked silvers and kings) were next significant in numbers of fish caught and harvested followed by Arctic char, Arctic grayling, and lake trout in decreasing order (Figure 11).

In 2003, the average catch rate per angler-day of effort for stocked fish in the UTMA was 3.8 fish and the recent 10-year average was 3.5 fish (Table 22). Fish stockings for 2002 through 2004 are summarized in Table 23 and projected fish stockings for 2005 and 2006 are summarized in Table 24.

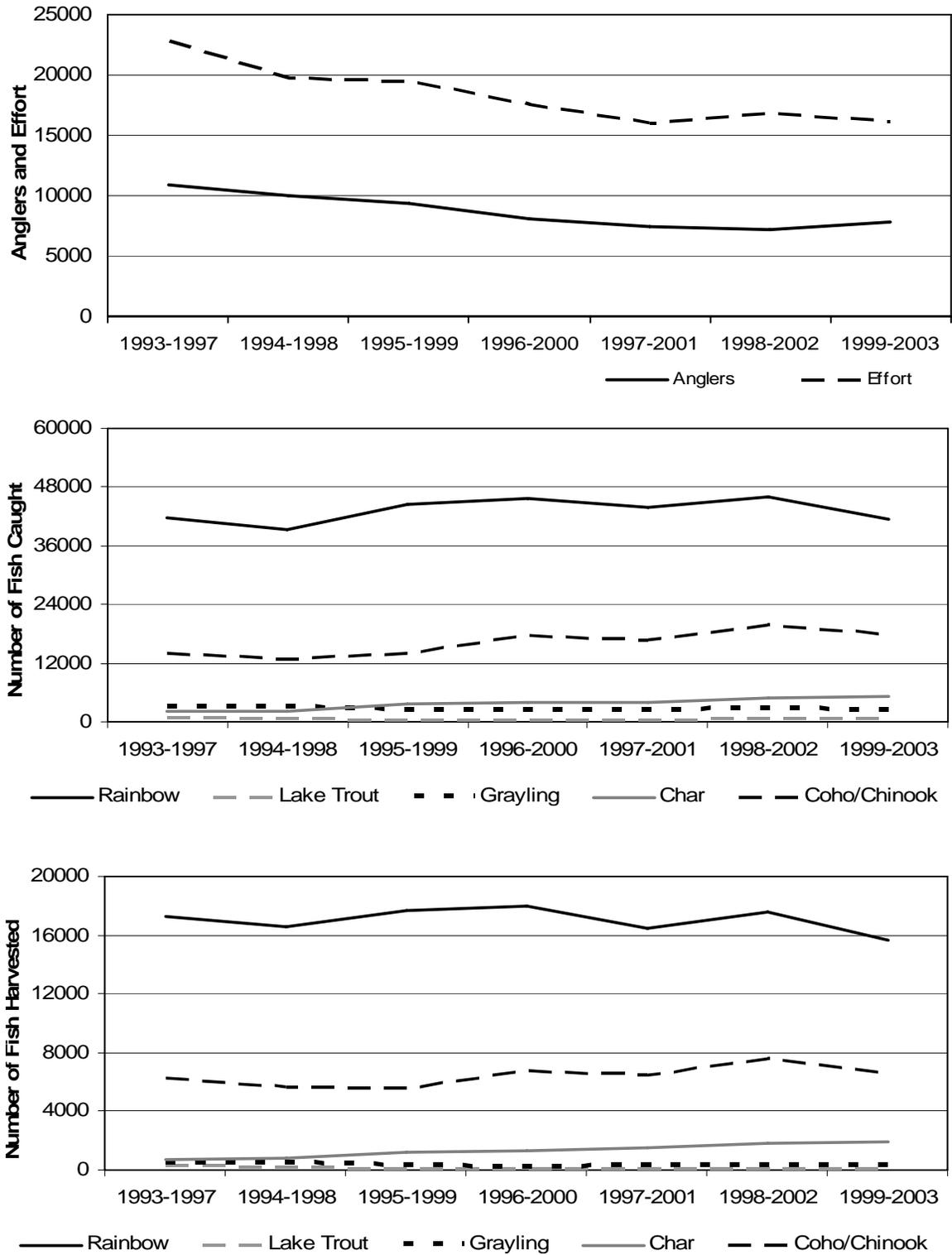
ADF&G will continue to stock lakes that provide fishing opportunities and where stocked fish exhibit good survival and growth, or provide put and take fisheries. New lakes will be evaluated as candidates in the stocking program based on public requests for new fisheries. A summary of the lake stockings in 2003 and 2004 are found in Appendices A1 and A2.

A new stocked waters management plan has been developed and was adopted by the BOF in 2004. The purpose of the plan is to provide the department and the BOF the capability to manage the stocked waters program in accordance with sport angling opportunity desired by the public.

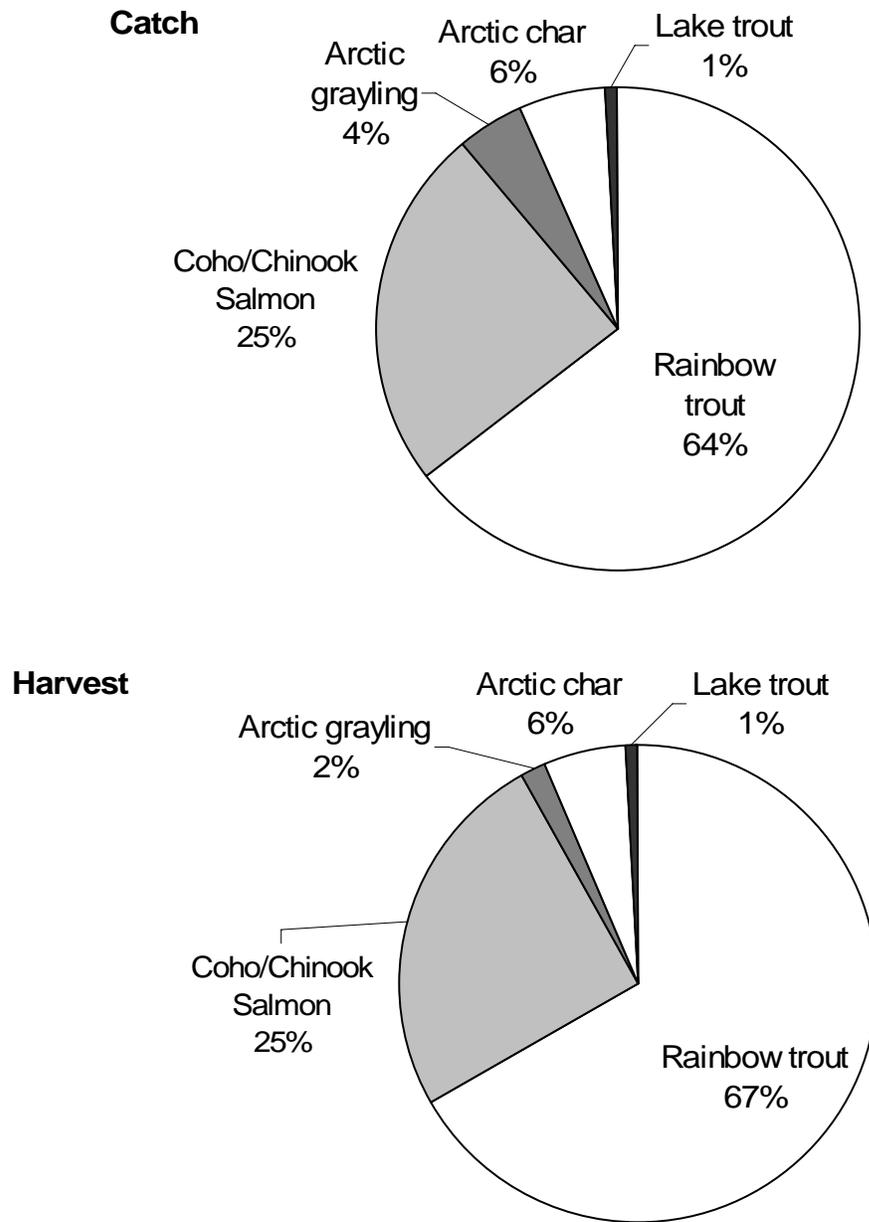
**Table 22.-Effort, harvest, and catch statistics by species for stocked fisheries in the UTMA 1993-2003.**

	Year										Average 1994-2003
	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	
Number of anglers <sup>a</sup>	11,522	13,413	9,980	7,128	7,696	8,461	7,259	6,180	5,952	6,154	8,375
Days fished (effort)	24,380	26,711	21,482	12,278	13,613	23,126	17,243	12,642	15,800	10,510	17,779
	Harvest										
Rainbow trout	16,396	18,198	16,328	12,394	19,303	21,914	19,854	9,063	17,762	9,657	16,087
Coho/Chinook salmon	6,723	4,910	6,724	3,129	6,710	6,533	10,720	5,123	8,684	2,010	6,127
Arctic grayling	1,162	440	381	322	123	135	33	720	387	175	388
Arctic char	522	694	767	688	1,409	2,356	1,498	1,575	2,268	1,668	1,345
Lake trout	810	262	61	111	7	300	82	37	144	126	194
Total	25,613	24,504	24,261	16,644	27,552	31,238	32,187	16,518	29,245	13,636	24,140
	Catch										
Rainbow trout	37,811	41,979	35,003	32,652	49,049	63,723	48,663	24,461	44,606	26,230	40,418
Coho/Chinook salmon	12,865	10,960	15,597	9,207	15,924	18,201	29,026	11,429	23,816	7,052	15,408
Arctic grayling	5,289	1,437	3,046	1,939	3,097	3,145	1,059	3,333	3,294	991	2,663
Arctic char	1,899	1,656	2,351	1,342	3,400	9,200	3,507	2,323	6,001	4,923	3,660
Lake trout	1,678	541	162	370	136	994	340	218	886	390	572
Total	59,542	56,573	56,159	45,510	71,606	95,263	82,595	41,764	78,603	39,586	62,720
Catch / effort	2.4	2.1	2.6	3.7	5.3	4.1	4.8	3.3	5.0	3.8	3.5

<sup>a</sup> Estimates of the numbers of anglers in this table are inflated because some anglers fish at more than one location. As a result, they are counted more than once.



**Figure 10.**—Five-year averages for fishing effort (angler-days) and number of fish caught and harvested from stocked fisheries in UTMA, 1993-2003.



**Figure 11.**—Ten year average catch and harvest composition by species for all stocked lakes in the UTMA, 1994-2003.

**Table 23.**—Summary of stocking activities for the UTMA, 2002-2004.

Species	Catchable	Subcatchable	Fingerling	Total
2002				
Arctic char			11,314	11,314
Coho salmon			12,600	12,600
Rainbow trout	23,495		344,765	368,260
Total	23,495		368,679	392,174
2003				
Arctic grayling			1,500	1,500
Coho salmon			70,826	70,826
Rainbow trout	29,477		104,312	133,789
Total	29,477		176,638	206,115
2004				
Arctic grayling			9,000	9,000
Arctic char		8,105	13,829	21,934
Chinook salmon	6,000			6,000
Coho salmon			35,877	35,877
Rainbow trout	29,388		564,092	593,480
Total	35,388	8,105	622,798	666,291

**Table 24.**—Summary of projected game fish stockings for the UTMA, 2005-2006.

Species	Lifestage	Target Size (in)	2005 Projected		2006 Projected	
			Number of Lakes	Number of Fish	Number of Lakes	Number of Fish
Arctic char	Subcatchable	5-6	12	22,450	5	2,375
Chinook salmon	Catchable	6-8	2	6,000	2	6,000
Arctic grayling	Catchable	6-8	0	0	0	0
Coho salmon	Fingerling	2-4	4	49,100	1	3,000
Rainbow trout	Fed fry	1½	3	180,000	3	180,000
Rainbow trout	Fingerling	2	3	163,000	31	292,800
Rainbow trout	Catchable	5-6	7	23,700	7	23,700
Rainbow trout	Broodstock	12-16	3	225	3	190

Stocked waters fisheries are divided into three management categories: high yield, conservative yield, and special management. In addition, water bodies are further stratified into sub categories based on size of drainage, ease of access, and proximity to major human populations: Large, urban, rural, and remote.

**MANAGEMENT OBJECTIVES**

**Quartz Lake Sport Fishery**

Quartz Lake is classified as the only “large high yield lake” in the UTMA. Quartz Lake is about 25 miles north of Delta Junction along the Richardson Highway. ADF&G currently stocks Quartz Lake (1,500 acres) with rainbow trout, landlocked silver (coho) salmon and king (Chinook) salmon, and Arctic char. By stocking a variety of game fish species into Quartz Lake, ADF&G provides a diversity that is attractive to anglers. The availability of stocked game fish in roadside lakes creates year-round fishing opportunity that is otherwise unavailable in interior Alaska.

More restrictive regulations have been implemented to protect wild stocks in the UTMA. As fishing and harvest pressures upon these stocks have increased, the stocking of hatchery fish has become an increasingly effective management option for meeting the demand for recreational fishing opportunities in the UTMA. Quartz Lake and the other stocked lakes absorb effort that might otherwise be directed toward wild stocks in the Tanana drainage that are vulnerable to over-fishing.

Quartz Lake supports both a winter ice fishery and an open-water fishery. Creel surveys conducted by ADF&G indicate that about half of the annual fishing effort occurs during the open water period (May through September) and the other half occurs when the lake is covered with ice (October through April). Due to recent changes by the BOF the Quartz Lake fishery is managed less as a consumptive fishery, allowing anglers to harvest fewer fish (10 in combination) and only one large (> 18 inches) fish in the daily bag limit of any of the stocked species. Daily bag and possession limits are:

Species	Daily Bag and Possession Limit	Size Limit
All species	10 in combination	Only 1 fish >18 inches

**Objectives**

1. Provide 20,000 annual angler days or more of sport fishing effort.
2. Provide diverse sport angling opportunities through the annual or alternate year stocking of rainbow trout, coho salmon, and Arctic char.
3. Maintain an annual mean catch rate in excess of two sport fish per angler-day while allowing anglers to keep the portion of their catch they so desire.

**Actions**

1. Biennially stock 11,000 fingerling Arctic char.
2. Annually stock 80,000 fingerling coho salmon.
3. Annually stock 350,000 fingerling rainbow trout.

Fish stockings for 2001 through 2004 are summarized in Table 25 and projected fish stockings for 2005 and 2006 are summarized in Table 26. ADF&G has recently changed the number and size of fish that are stocked to reflect changes to hatchery production and low survival of fingerling rainbow trout.

**Evaluations**

1. Sport fishing effort and harvest will be estimated through the SWHS.
2. Performance or status of stocking cohorts may be evaluated through on-site creel surveys and/or field sampling.

**Fishery Statistics**

During the period 1994 through 2003, the annual effort on stocked species ranged from 6,956 to 17,820 angler-days and averaged about 11,973 angler-days (Table 27). Five-year moving averages from 1993 through 2003 for number of anglers, effort, catch and harvest are shown in Figure 12. While the number of anglers and the amount of effort has shown decline, the number of fish caught has remained steady. Arctic char has been a popular addition and the catch and harvest of Arctic char has been increasing. Since 1994, about 63% of the catch and 64% of the harvest was comprised of rainbow trout (Figure 13). Coho and Chinook salmon (landlocked silvers and kings) were next significant in numbers of fish caught and harvested followed by Arctic char (Figure 13). In 2003, the catch rate for Quartz Lake was about 3.8 fish per angler-day of effort (Table 27) and exceeded the objective of two fish per angler-day.

**Upper Tanana Urban Lakes Sport Fishery Enhancement**

The ADF&G has recently begun stocking catchable size fish in lakes and ponds in urban areas such as Delta Junction. Urban lakes are close to and easily accessible to a large number of anglers. Fishing effort per surface acre for these lakes is often greater than that for larger but more distant rural lakes. The urban fishing program will provide fishing opportunity and different fish species to anglers who don't have the time or ability to travel to more distant lakes and rivers.

Currently in the UTMA, only Big "D" Pond is in the "Urban-High Yield" fishing classification. The department characterizes this lake as being within short driving distance from a population center and accessed via the road system. These systems receive multiple stockings throughout the year with catchable size fish to accommodate higher levels of angling pressure. The current level of fishing effort at Big "D" Pond is not high enough to be reported in the SWHS but the fishery is popular with local residents. In response to public request, the department will continue to search for other lakes in the upper Tanana Valley to include in the urban fishing program.

Daily bag and possession limits for stocked fish in Urban Lakes are:

Species	Daily Bag and Possession Limit	Size Limit
All species	10 in combination	Only 1 fish > 18 inches

**Table 25.**–Summary of stocking activities for Quartz Lake, 2002-2004.

Species	Catchable	Subcatchable	Fingerling	Total
<b>2002</b>				
Arctic char			6,285	6,285
Rainbow trout	16,570		329,167	345,737
Total	16,570		335,452	352,022
<b>2003</b>				
Coho salmon			61,826	61,826
Rainbow trout	20,591	28,724	76,712	126,027
Total	20,591	28,724	138,538	187,853
<b>2004</b>				
Arctic char			9,504	9,504
Chinook salmon	5,000			5,000
Coho salmon			33,189	33,189
Rainbow trout	17,810		236,410	254,220
Total	22,810		279,103	301,913

**Table 26.**–Summary of projected game fish stockings for Quartz Lake, 2005-2006.

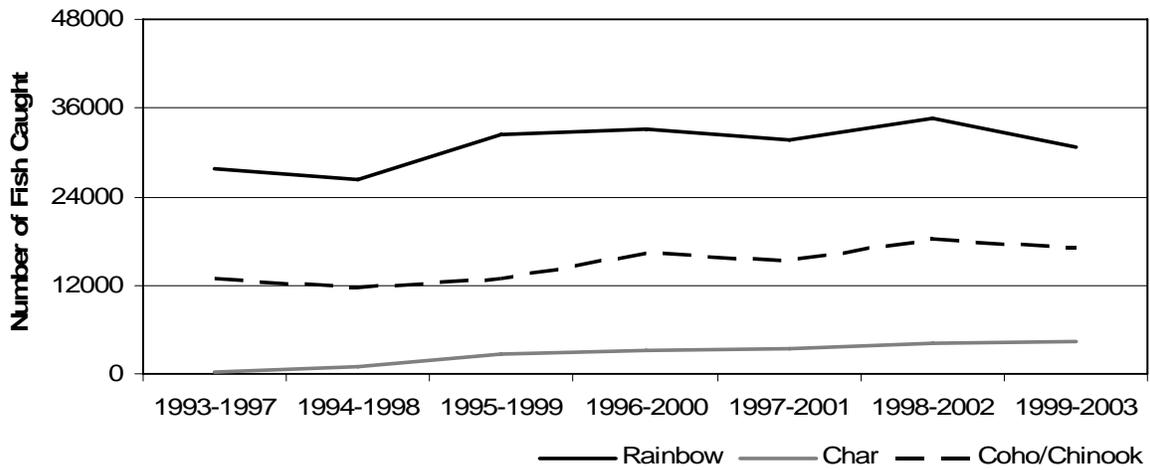
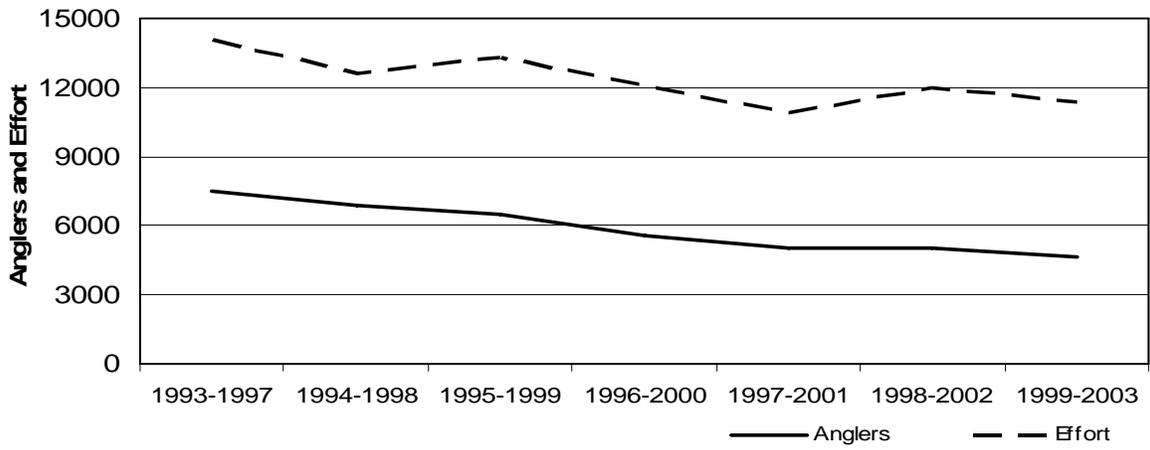
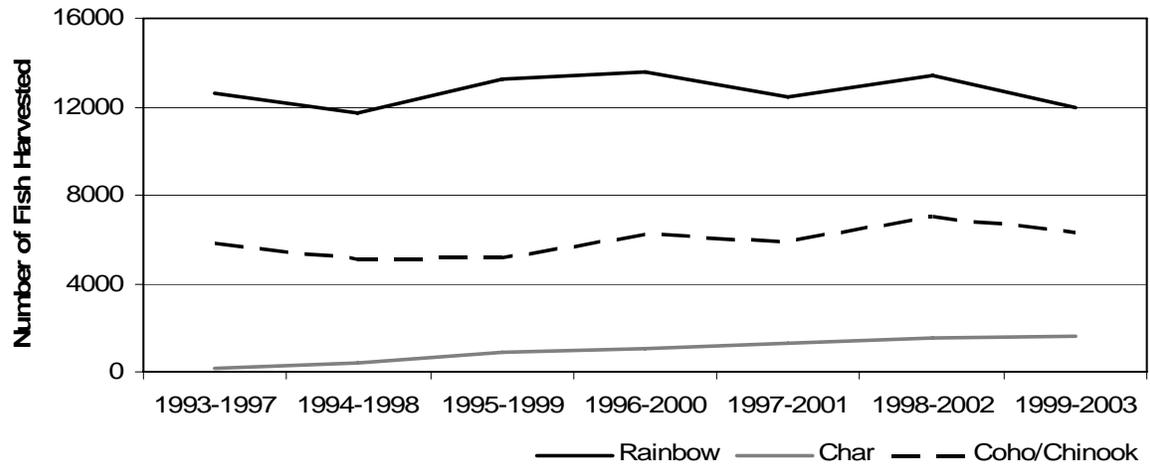
Species	Lifestage	Target Size (in)	2005 Projected	2006 Projected
Arctic char	Subcatchable	5-6	9,500	0
Chinook salmon	Catchable	6-8	0	0
Coho salmon	Fingerling	3-4	30,000	30,000
Rainbow trout	Fingerling	2	150,000	150,000
Rainbow trout	Subcatchable <sup>a</sup>	4-6	0	0
Rainbow trout	Catchable	6-8	16,900	16,900

<sup>a</sup> Up to 180,000 fed fry will be released into rearing ponds on Fort Greely in the summer, recaptured in the fall, and transferred to Quartz Lake.

**Table 27.**—Effort, catch, and harvest statistics by species for Quartz Lake 1994-2003.

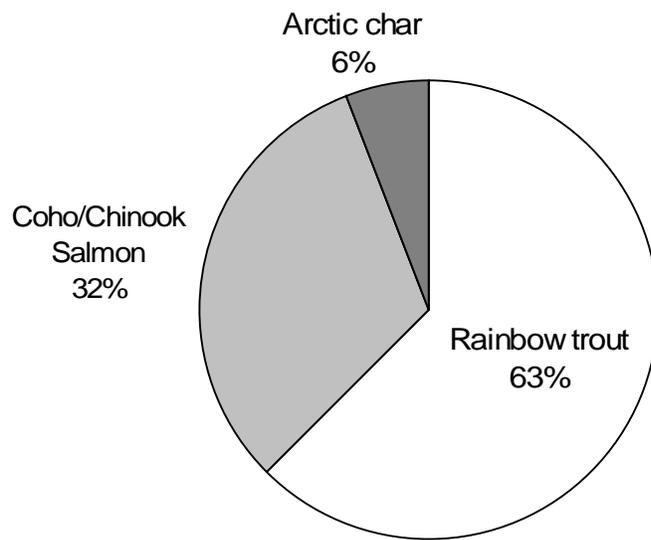
	<b>Year</b>									
	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
	<b>Effort</b>									
Number of anglers	7,962	9,133	6,853	4,445	5,821	6,140	4,628	4,113	4,432	4,005
Number of days fished (effort)	14,031	17,569	14,163	6,956	10,175	17,820	11,047	8,325	12,477	7,169
	<b>Catch</b>									
Rainbow trout	23,675	28,684	23,051	19,729	36,416	54,463	32,358	14,821	34,849	16,846
Coho/Chinook salmon	11,212	10,210	15,404	8,902	13,320	16,740	27,464	10,715	23,699	6,464
Arctic char	0	413	706	497	2,726	8,859	2,502	1,847	4,393	3,966
<b>Total</b>	34,887	39,307	39,161	29,128	52,462	80,062	62,324	27,411	62,941	27,276
Catch rate (catch / effort)	2.5	2.2	2.8	4.2	5.2	4.5	5.6	3.3	5.0	3.8
	<b>Harvest</b>									
Rainbow trout	11,556	12,585	11,687	8,496	14,335	19,066	14,358	6,060	13,207	7,076
Coho/Chinook salmon	5,706	4,633	6,724	2,999	5,526	6,018	9,866	5,080	8,684	1,892
Arctic char	0	174	330	313	1,201	2,321	1,066	1,509	1,700	1,292
<b>Total</b>	17,262	17,392	18,741	11,808	21,062	27,405	25,290	12,649	23,591	10,260

<sup>a</sup> Estimates of the numbers of anglers in this table are inflated because some anglers fish at more than one location. As a result, they are counted more than once.

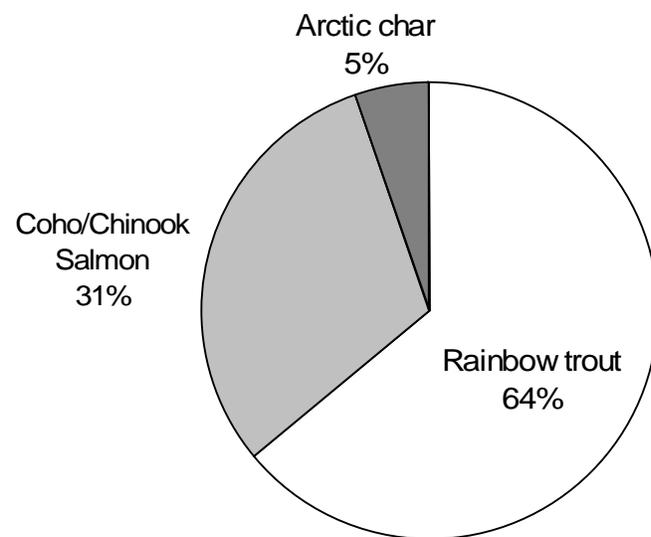


**Figure 12.**—Five-year averages for fishing effort (angler-days) and number of fish caught and harvested from Quartz Lake, 1993-2003.

**Catch**



**Harvest**



**Figure 13.**-Ten year average catch and harvest composition by species for Quartz Lake, 1994-2003.

## Objectives

1. Manage important native fish populations according to sustained yield principles.
2. Provide sport angling diversity by stocking a mix of fish species.
3. Publicize and promote the fishing opportunities available to anglers.
4. Improve public access where needed.

## Actions

Annually stock a maximum of 3,000 all female rainbow trout. Fish stockings for specific lakes are listed in Table 28. Projected fish stockings for 2005 through 2006 are summarized in Table 29.

## Evaluations

1. Sport fishing effort and harvest will be estimated through the SWHS.
2. Population status may be assessed by periodic on-site sampling or as a component of research projects.

## Fishery Statistics

ADF&G could not estimate effort, catch, and harvest for Big "D" Pond because either none of the fishery participants received a SWHS questionnaire or fewer than 12 participants responded to the questionnaire.

**Table 28.**-Summary of stocking activities for small urban lakes in the UTMA 2002-2004.

Species	Catchable	Subcatchable	Fingerling	Total
<b>2002</b>				
Rainbow trout	2,414			2,414
<b>2003</b>				
Rainbow trout	1,691			1,691
<b>2004</b>				
Rainbow trout	1,460			1,460

**Table 29.**-Summary of projected game fish stockings for small urban lakes in the UTMA, 2005-2006.

Species	Lifestage	Target Size (in)	2005 Projected		2006 Projected	
			Number of Lakes	Number of Fish	Number of Lakes	Number of Fish
Rainbow trout	Catchable	5-6	1	1,500	1	1,500

## Upper Tanana Rural Lakes Sport Fishery

The ADF&G has been stocking small rural lakes in the upper Tanana Valley for more than 20 years. Rural lakes are characterized as located outside of major population centers with either road or short (< 5 mile) trail access. These systems receive a single stocking of fish per year and are exposed to moderate or low angler pressure. This program provides increased fishing opportunities and offers a diversity of species in rural areas where minimal or no opportunities exist for sport fishing. It also diverts effort from wild populations in areas for which the department has conservation concerns.

The rural small lakes stocking program is intended to provide fishing opportunities and diversify the game species and fishing experiences available to anglers. This program has created seasonal and year-round fishing opportunities in waters that do not normally support popular game fish. Most of the rural lakes in the UTMA area are less than 100 surface acres and they receive a lot of fishing pressure relative to their size. Recently, anglers have expressed their concern that more of the lakes are not producing sufficient numbers of catchable fish from stockings of fingerlings to meet demand.

Daily bag and possession limits for stocked fish in lakes are:

Species	Daily Bag and Possession Limit	Size Limit
All Species	10 in combination	Only 1 fish > 18 inches

### Objectives

1. Manage important native fish populations, when present, according to sustained yield principles.
2. Provide a minimum of 6,000 angler-days of sport fishing effort.
3. Provide sport angling diversity by stocking a mix of game fish.
4. Publicize and promote the fishing opportunities available to anglers.
5. Improve public access where needed.

### Actions

Fish stockings for specific lakes are listed in Table 30. Fish stockings for 2002 through 2004 are summarized in Table 31 and projected fish stockings for 2005 and 2006 are summarized in Table 32

### Evaluations

1. Sport fishing effort and harvest will be estimated through the SWHS.
2. Population status may be assessed by periodic on-site sampling or as a component of research projects.

**Table 30.-**Actions for rural stocked lakes in the UTMA.

Lake	Lake Size in Acres	Species	Stocking Years
<b>Richardson Highway</b>			
81 Mile Rich. H. Pit	3	Rainbow	Annual
Bluff Cabin Lake	72	Rainbow	Even Years
Donnelly Lake	65	Char, Rainbow	Even Years, Even Years
Little Lost Lake ( <i>at Quartz</i> )	102	Rainbow	Annual
Rapids Lake	5	Rainbow	Even Years
Shaw Pond	3	Char, Rainbow	Even Years, Annual
<b>Meadows Road</b>			
Bolio Lake	138	Rainbow, Grayling	Annual, Annual
Bullwinkle Lake	4	Rainbow	Even Years
Chet Lake	8	Char, Rainbow	Even Years, Even Years
Doc Lake	3	Rainbow	Even Years
Ghost Lake	5	Char, Rainbow	Even Years, Even Years
"J" Lake	15	Char, Grayling	Even Years, Odd Years
Luke Lake	8	Grayling	Odd Years
Mark Lake	18	Char, Coho, Rainbow	Even Years, Annual, Even Years
Nickel Lake	5	Char, Rainbow, Grayling,	Even Years, Even Years, Odd Years
No Mercy Lake	3	Rainbow	Even Years
North Twin Lake	20	Rainbow	Even Years
Sheefish Lake	8	Char	Even Years
South Twin Lake	20	Rainbow	Annual Years
Weasel Lake	8	Rainbow	Even Years
<b>Coal Mine Road</b>			
Backdown Lake	6	Char, Rainbow	Even Years, Even Years
Brodie Lake	5	Char, Grayling, Chinook	Even Years, Odd Years, Annual
Coal Mine Road #5	13	Rainbow	Even Years
Dick's Pond	5	Char	Even Years
Ken's Pond	5	Char, Rainbow	Even Years, Even Years
Last Lake	5	Char, Rainbow	Even Years, Even Years
Paul's Pond	5	Grayling	Odd Years
Rangeview Lake	5	Char, Grayling	Even Years, Odd Years
Rockhound Lake	3	Rainbow	Even Years
<b>Alaska Highway</b>			
Craig Lake	17	Rainbow	Odd Years
Donna Lake	58	Rainbow	Odd Years
Four Mile Lake	100	Char, Rainbow	Even Years, Even Years
Hidden Lake ( <i>Tetlin R.</i> )	20	Rainbow	Odd Years
Jan Lake	45	Coho, Rainbow	Odd Years, Even Years
Lisa Lake	50	Rainbow	Odd Years
Little Donna Lake	30	Rainbow	Odd Years
Robertson Lake #2	15	Rainbow	Even Years

**Table 31.**—Summary of stocking activities for small rural lakes in the UTMA 2002-2004.

Species	Broodstock	Catchable	Subcatchable	Fingerling	Total
<b>2002</b>					
Arctic char				5,029	5,029
Coho salmon				12,600	12,600
Rainbow trout		6,925		15,598	22,523
Total		6,925		33,227	40,152
<b>2003</b>					
Arctic grayling				1,500	1,500
Coho salmon				9,000	9,000
Rainbow trout		8,886		27,600	36,486
Total		8,886		38,100	46,986
<b>2004</b>					
Arctic grayling				9,000	9,000
Coho salmon				1,532	1,532
Rainbow trout		10,118		276,282	286,400
Chinook salmon		1,000			1,000
Arctic char			4,605	4,325	8,930
Total		11,118	4,605	291,139	306,862

**Table 32.**—Summary of projected game fish stockings for small rural lakes in the UTMA, 2005-2006.

Species	Lifestage	Target Size (in)	2005 Projected		2006 Projected	
			Number of Lakes	Number of Fish	Number of Lakes	Number of Fish
Arctic char	Subcatchable	5-6	10	8,050	4	875
Arctic grayling	Fingerling	3	7	11,000	0	0
Coho salmon	Fingerling	2-4	2	14,100	0	0
Rainbow trout	Fed fry <sup>a</sup>	1	3	180,000	3	180,000
Rainbow trout	Fingerling	2-4	1	4,000	24	87,800
Rainbow trout	Catchable	6-8	6	6,800	6	6,800
Rainbow trout	Broodstock	12-16	3	225	3	190

<sup>a</sup> Up to 180,000 fed fry will be released into rearing ponds on Fort Greely in the summer, recaptured in the fall, and transferred to Quartz Lake.

## Fishery Statistics

From 1994 through 2003, annual effort on stocked species ranged from 1,233 to 8,323 angler-days and averaged about 4,295 angler-days (Table 33). Five-year moving averages from 1993 through 2003 for number of anglers, effort, catch and harvest are shown in Figure 14. For the last 10 years the number of anglers has declined along with effort. The numbers of fish caught and harvested have also declined. Since 1994, about 65% of the catch and 69% of the harvest of stocked game fish was made up of rainbow trout. Arctic grayling was next significant in numbers of fish caught and harvested, followed by Arctic char, coho and Chinook salmon (landlocked silvers and kings), and lake trout in decreasing order (Figure 15). Average catch rate for stocked fish in rural lakes in the UTMA was about 3.0 fish per angler-day of effort (Table 31).

## Upper Tanana Remote Lakes Sport Fishery Enhancement

The ADF&G stocks remote lakes in the upper Tanana Valley to provide fishing opportunities for popular game species in locations where fishing opportunities do not exist or are limited. Remote lakes are defined by access either by a long trail or via fixed wing aircraft. These lakes are generally stocked once per year, or in some cases alternate years. These lakes vary in size from 14 to 320 acres. Generally, the remote lakes are stocked with fingerlings (2-4 inches) because smaller fish are easier and less expensive to transport than larger fish. Aircraft or ATVs are used to transport the fish to these lakes for stocking. All of the remote lakes can produce sufficient numbers of catchable fish from fingerling stockings to sustain the existing fisheries. Because these lakes are more difficult to reach the level of effort and harvest is less than that for comparable size lakes near the road system. For this reason these lakes generally have larger fish and more of them.

Daily bag and possession limits for stocked fish in lakes are:

Species	Daily Bag and Possession Limit	Size Limit
All species	10	Only 1 fish > 18 inches

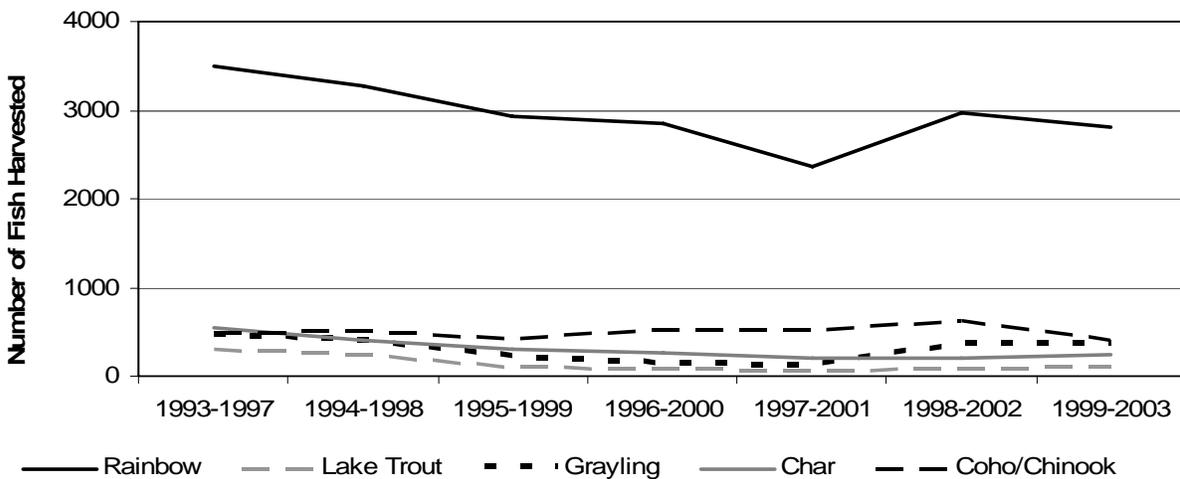
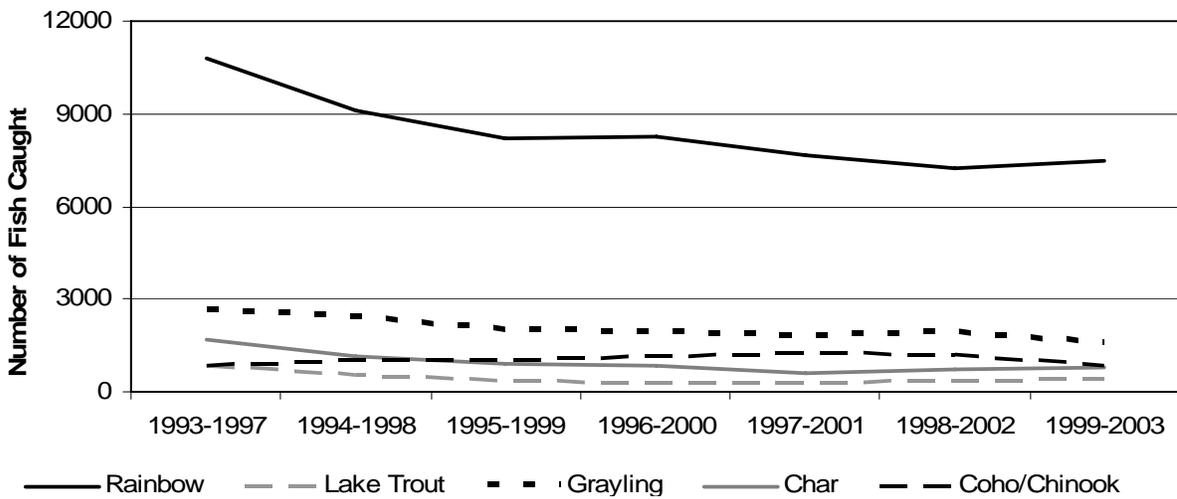
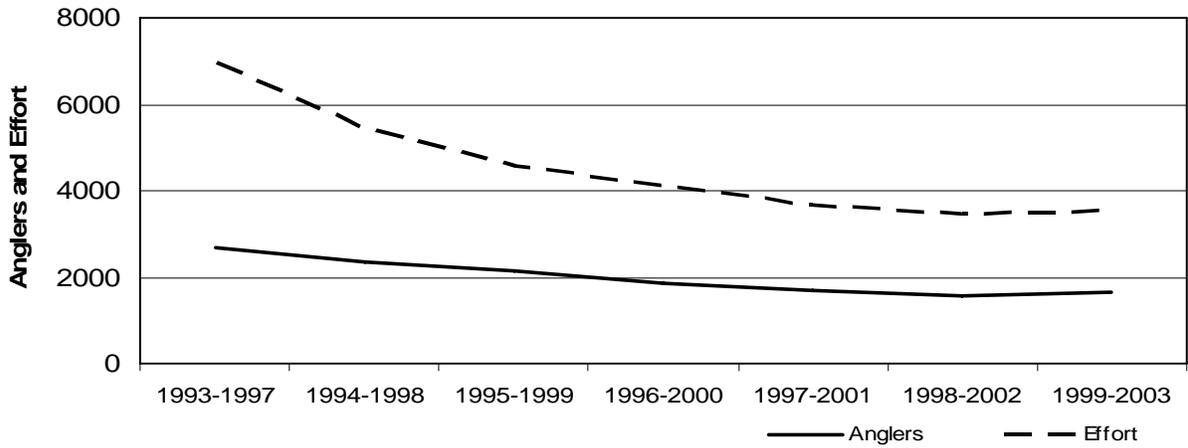
## Objectives

1. Manage important native fish populations, when present, according to sustained yield principles.
2. Provide a minimum of 1,000 angler-days of sport fishing effort.
3. Provide sport angling diversity by stocking a mix of game fish.
4. Publicize and promote the fishing opportunities available to anglers.
5. Improve public access where needed.

**Table 33.-Effort, harvest, and catch statistics by species for small rural lakes in the UTMA 1994-2003.**

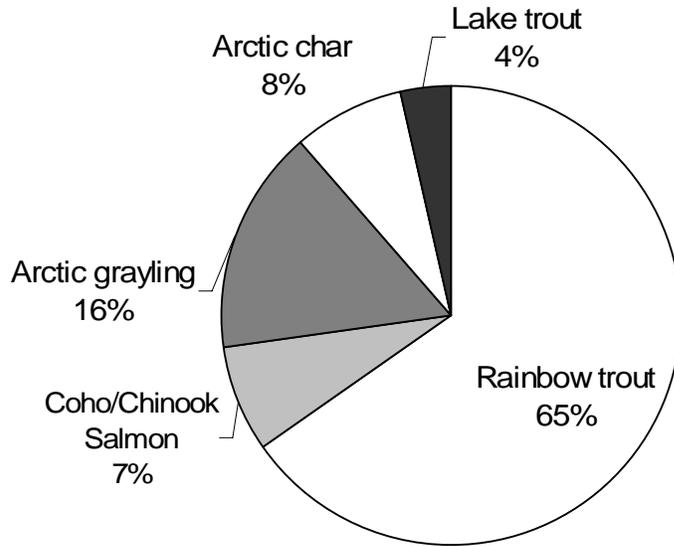
	Year									
	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
	<b>Effort</b>									
Number of anglers <sup>a</sup>	2,600	3,466	2,418	1,998	1,243	1,634	2,037	1,640	3,183	1,772
Number of days fished (effort)	8,323	7,084	5,353	4,018	2,477	3,916	4,806	1,233	2,859	2,881
	<b>Catch</b>									
Rainbow trout	10,250	10,018	8,760	9,512	7,102	5,528	10,434	5,836	7,408	8,249
Coho/Chinook salmon	1,620	672	193	215	2,465	1,452	1,446	632	60	588
Arctic grayling	4,860	1,185	2,081	1,448	2,563	2,761	838	1,459	1,941	898
Arctic char	1,779	1,220	1,523	807	513	341	952	395	1,550	822
Lake trout	1,610	520	148	297	131	748	285	142	448	386
Total	20,119	13,615	12,704	12,278	12,774	10,830	13,955	8,464	11,407	10,943
Catch rate (catch / effort)	2.4	1.9	2.4	3.1	5.2	2.8	2.9	6.9	4.0	3.8
	<b>Harvest</b>									
Rainbow trout	3,063	3,862	3,729	2,723	2,952	1,384	3,408	1,306	5,836	2,153
Coho/Chinook salmon	984	277	0	120	1,180	515	778	16	632	118
Arctic grayling	929	417	353	260	110	20	13	173	1,459	151
Arctic char	511	516	403	337	206	35	379	13	395	376
Lake trout	795	241	47	90	7	142	77	11	142	126
Total	6,281	5,313	4,532	3,529	4,455	2,097	4,654	1,519	8,464	2,924

<sup>a</sup> Estimates of the numbers of anglers in this table are inflated because some anglers fish at more than one location. As a result, they are counted more than once.

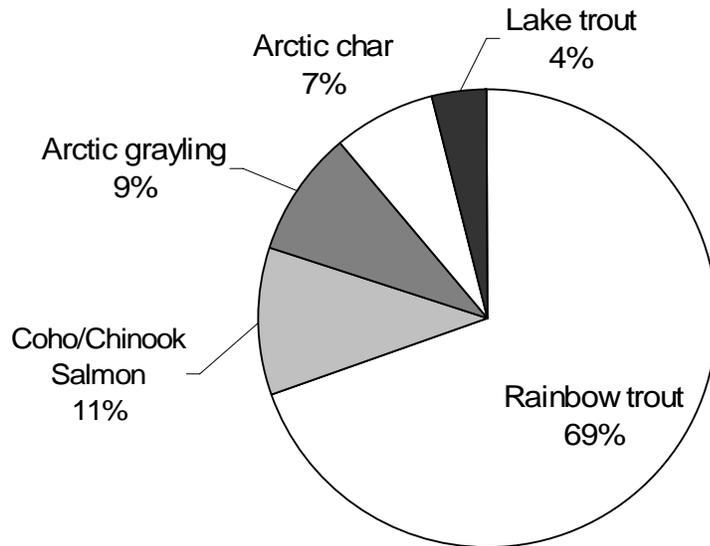


**Figure 14.**—Five-year moving averages for fishing effort (angler-days) and number of fish caught and harvested from small rural lakes in the UTMA 1993-2003.

**Catch**



**Harvest**



**Figure 15.**—Ten year average catch and harvest composition by species for small rural lakes in the UTMA, 1994-2003.

## **Actions**

Fish stockings for specific lakes are listed in Table 34. Fish stockings for 2002 through 2004 are summarized in Table 35 and projected fish stockings for 2005 and 2006 are summarized in Table 36.

## **Evaluations**

1. Sport fishing effort and harvest will be estimated through the SWHS.
2. Population status may be assessed by periodic on-site sampling or as a component of research projects.

## **Fishery Statistics**

During the period 1994 through 2003, annual effort on stocked species ranged from 347 to 1,917 angler-days and averaged about 1,083 angler-days (Table 37). Five-year moving averages from 1993 through 2003 for number of anglers, effort, catch and harvest are shown in Figure 16. The number of anglers and the amount of effort has generally declined but the catch and harvest of fish, especially rainbow trout, has increased. Since 1994, 98% of the catch and 99% of the harvest of stocked game fish was made up of rainbow trout. Lake trout contribute 1% to 2% to catch and harvest (Figure 17). Average annual catch rate for stocked fish in remote lakes in the UTMA is about 3.3 fish per angler-day of effort (Table 37).

## **FISHERY MANAGEMENT**

The Division of Sport Fish strategy is to stock species most suited to a particular lake's physical characteristics and at a size to account for lake productivity, harvest pressure, and to minimize transport costs. Rainbow trout and Arctic grayling do well in most lakes in the UTMA and support summer fisheries. Coho and Chinook salmon also do well in most lakes and provide an aggressive fish during winter when other species are less active. Arctic char and lake trout are long lived and grow to large size which makes them attractive to anglers. In some lakes more than one species is stocked to provide diversity and to take advantage of different seasonal behavior. The most popular combination is rainbow trout and coho salmon.

The state hatcheries in Anchorage are able to provide different size fish from sac-fry (1 inch) to catchables (6-10 inches), and even excess brood fish (12-18 inches). Because lakes have different capabilities for producing catchable fish, ADF&G requests different size fish to meet certain stocking objectives and to minimize the costs for maintaining a fishery. Fingerling coho salmon are stocked in Quartz Lake because the lake produces sufficient numbers of catchable fish from fingerling stockings. However, recent population assessments in Quartz Lake have shown that the survival of rainbow trout fingerlings from August through June is less than 1%. For this reason, ADF&G is now stocking catchable rainbow trout and rearing rainbow trout fingerlings in small ponds to a larger size before stocking the fish into Quartz Lake. Also, to increase the survival of fingerling rainbow trout ADF&G also reduced the number of coho salmon stocked into Quartz Lake. In other lakes stocked with combinations of rainbow trout and coho salmon, such as Dune Lake, ADF&G captured few age-1 rainbow trout that were stocked as fingerlings. In contrast, the survival of rainbow trout fingerlings is better in lakes such as Koole Lake and Rainbow Lake, which are stocked with only rainbow trout.

**Table 34.**-Actions for remote stocked lakes in the upper Tanana Valley.

Lake	Lake Size in Acres	Species	Stocking Years
Forest Lake	25	Rainbow	Even Years starting in 2004
Fourteen Mile Lake	90	Rainbow	Even Years starting in 2004
Koole Lake	320	Rainbow	Even Years starting in 2004
Monte Lake	90	Rainbow	Even Years starting in 2004
Rainbow Lake	96	Rainbow	Even Years starting in 2004
South Johnson Lake	14	Rainbow	Even Years starting in 2004
Square Lake	100	Char	Even Years starting in 2004

**Table 35.**-Summary of stocking activities for small remote lakes in the UTMA 2002-2004.

Species	Catchable	Subcatchable	Fingerling	Total
<b>2002<sup>a</sup></b>				
<b>2003<sup>b</sup></b>				
<b>2004</b>				
Arctic char		3,500		3,500
Coho salmon			1,156	1,156
Rainbow trout			48,400	48,400

<sup>a</sup> Fish were not stocked in remote lakes in 2002.

<sup>b</sup> Fish were not stocked in remote lakes in 2003.

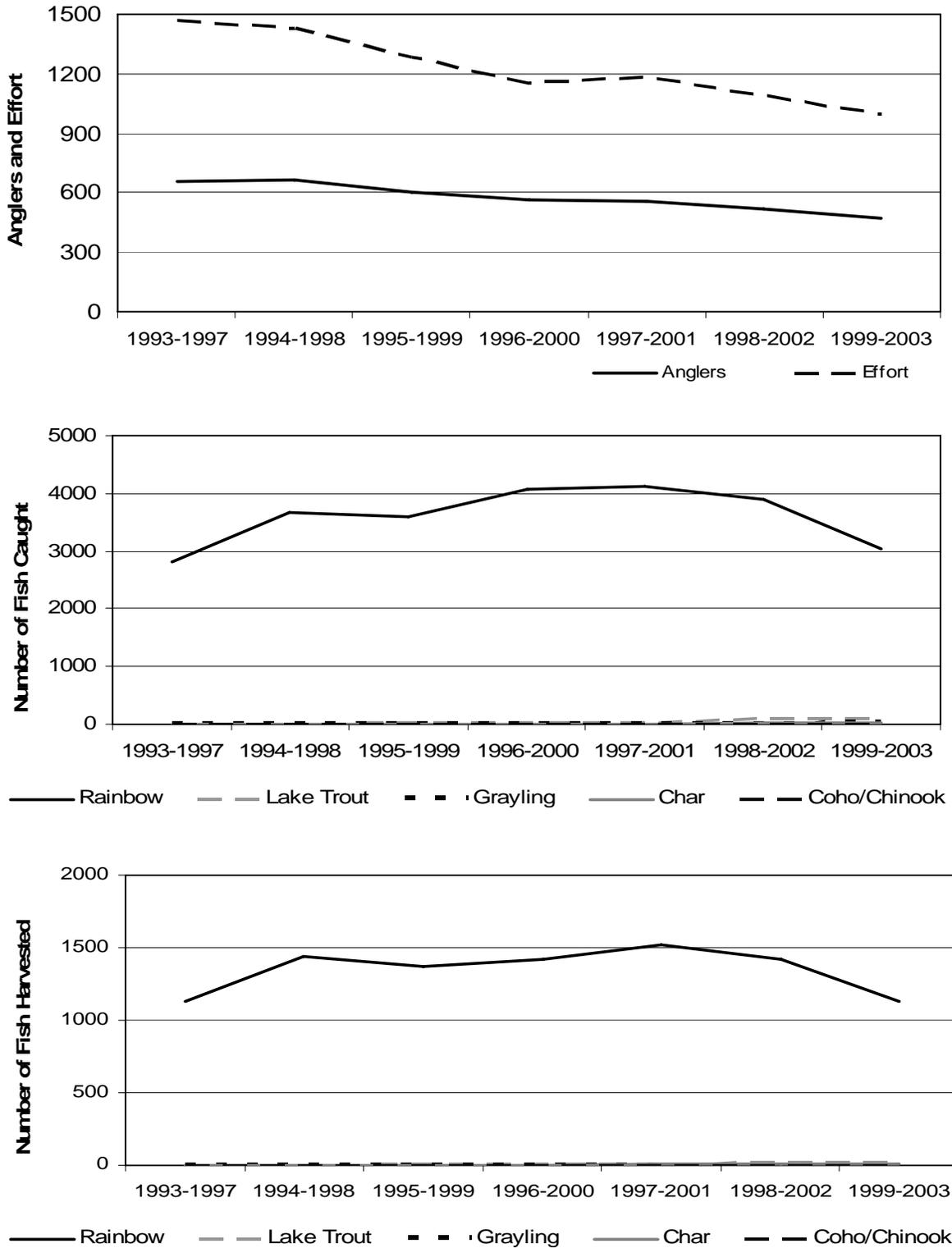
**Table 36.**-Summary of projected game fish stockings for small remote lakes in the UTMA, 2005-2006.

Species	Lifestage	Target Size (in)	2005 Projected		2006 Projected	
			Number of Lakes	Number of Fish	Number of Lakes	Number of Fish
Arctic char	Subcatchable	5-6	0	0	1	1,500
Arctic grayling	Fingerling	3	0	0	1	1,000
Coho salmon	Fingerling	2-4	1	5,000	0	0
Rainbow trout	Fingerling	2-4	1	9,000	5	52,000

**Table 37.-**Effort, catch, and harvest statistics by species for small remote lakes in the UTMA 1994-2003.

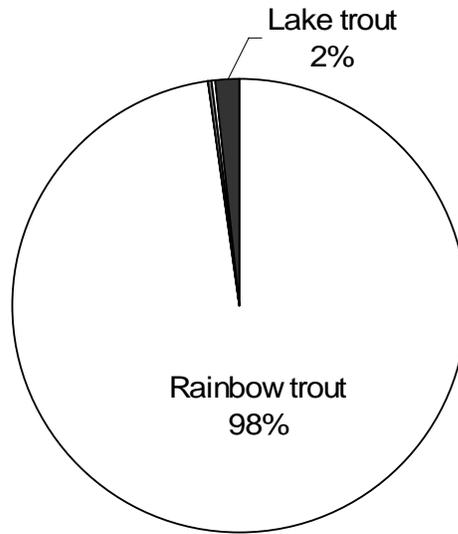
	Year									
	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
	<b>Effort</b>									
Number of anglers <sup>a</sup>	899	735	577	583	543	593	507	307	239	289
Number of days fished (effort)	1,917	1,855	1,458	1,096	815	1,183	1,214	555	385	347
	<b>Catch</b>									
Rainbow trout	3,841	3,219	2,708	3,253	5,265	3,519	5,613	2,941	2,161	991
Arctic grayling										93
Arctic char								33	37	67
Lake trout	59	0	0	0	0	137	0	48	317	2
Total	3,900	3,219	2,708	3,253	5,265	3,656	5,613	3,022	2,515	1,153
Catch rate (catch / effort)	2.0	1.7	1.9	3.0	6.5	3.1	4.6	5.4	6.5	3.3
	<b>Harvest</b>									
Rainbow trout	1,736	1,723	730	1,130	1,857	1,414	1,975	1,210	637	396
Arctic grayling										24
Arctic char								33	0	0
Lake trout	15	0	0	0	0	55	0	16	8	0
Total	1,751	1,723	730	1,130	1,857	1,469	1,975	1,259	645	420

<sup>a</sup> Estimates of the numbers of anglers in this table are inflated because some anglers fish at more than one location. As a result, they are counted more than once.

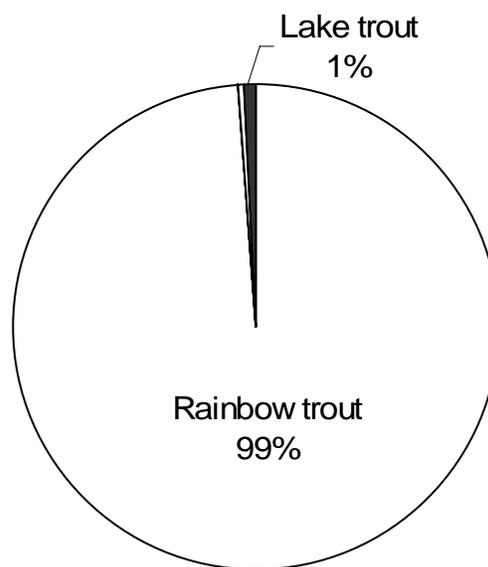


**Figure 16.**—Five-year moving averages for fishing effort (angler-days) and number of fish caught and harvested from small remote lakes in the UTMA 1993-2003.

**Catch**



**Harvest**



**Figure 17.**—Ten year average catch and harvest composition by species for small remote lakes in the UTMA, 1994-2003.

In small roadside lakes such as Little Lost Lake, Rich 81, and J Lake, ADF&G stocks catchable rainbow trout and Arctic grayling. Several of the small lakes receive a lot of fishing pressure relative to their size. As a result, they can't produce sufficient numbers of catchable fish (from stockings of fingerlings) to meet angler demand. ADF&G also stocks some of the high use lakes early in spring and again one or more times during summer to provide sufficient numbers of fish through out the year. Prior to altering the stocking strategy, anglers were expressing frustration with these fisheries because by spring there were too few large fish remaining in the lakes.

ADF&G generally stocks remote lakes with fingerlings because smaller fish are easier and less expensive to transport by aircraft compared to larger fish. All the remote lakes produce sufficient numbers of catchable fish from fingerling stockings to sustain the existing fisheries. Because remote lakes are more difficult to reach, the level of effort and harvest is less than that for comparable size lakes near the road system. Generally, the remote lakes produce larger fish and more of them for the same reasons.

Recently the department started stocking catchable rainbow trout in lakes near Delta Junction that winter-kill either annually or occasionally. Lakes such as Little Lost Lake and Bolio Lake don't always support fish through winter. By stocking such lakes with catchable size fish ADF&G has created instant and popular fisheries. The department's goal is to stock only enough fish to support the spring and summer fishing season because any fish left in the lake may not survive through winter. This recent change to the stocking program has increased the number of lakes that can be stocked and increased angler opportunity.

## **Stocking Products**

The state fish hatcheries at Ft. Richardson and Elmendorf Air Force Base near Anchorage produce rainbow trout, Arctic grayling, Arctic char, coho and Chinook salmon. Lake trout are no longer produced by the Anchorage fish hatcheries. Fish are transported by truck to the stocking location or to staging areas where they are transferred to off road vehicles or aircraft for transport to more remote locations.

### **Rainbow Trout**

Rainbow trout is the primary hatchery product used in lake stocking. All rainbow trout are from a captive brood stock maintained at Fort Richardson Hatchery. The brood stock is descended from wild Swanson River rainbow trout. The stocking program uses two types of rainbow trout: 1) mixed sex diploid fish which are normal fish capable of reproduction; and 2) all-female triploid fish which are female fish not capable of reproduction (sterile).

The department generally stocks three sizes of rainbow trout. Catchable rainbow trout are 1-year old and are about 6-10 inches. Fingerling rainbow trout are usually 2 to 4 months old and are 2-3 inches. Rainbow trout fry are less than 2 months old and usually weighed less than a gram. Sub-catchable rainbow trout are 6 months to 1-year old and are 4-6 inches but they are no longer produced.

### **Arctic Grayling**

All stocked Arctic grayling are from eggs taken from wild stocks in the Chena River (Tanana River drainage) and either Moose Lake or Meier's Lake (Gulkana River drainage). Only the Chena River stock is used in the UTMA. No captive brood stock is maintained in the hatchery. ADF&G produces only fingerling Arctic grayling for stocking. These fish are usually 2 to 4

months old and are 2-3 inches. Catchable Arctic grayling are no longer produced due to poor rearing conditions at Elmendorf Hatchery.

### **Arctic Char**

A brood stock of Arctic grayling is now kept at Fort Richardson Hatchery. The brood stock is descended from the wild population in Lake Aleknagik, Bristol Bay. The hatchery currently produces two sizes of Arctic char. Catchable Arctic char are 1½ years old and are 6-10 inches. Subcatchable Arctic char are 6 months old and are 5-7 inches.

### **Coho Salmon**

All coho salmon used for lake stocking are from eggs taken from hatchery-produced adults. Brood stock use may vary depending on availability. Only fingerlings are now produced for stocking in lakes. These fish are 2 to 4 months old and are 2-4 inches. Fingerling coho salmon will be produced only when there is sufficient rearing space.

### **Lake Trout**

Lake trout are no longer produced at the two Anchorage hatcheries.

### **Egg Takes**

The Region III stocking program currently assists the hatcheries with egg takes by capturing and holding fish until they are ready for spawning. When Clear Hatchery was closed in 1997, staff in the Fairbanks regional office assumed responsibility for conducting egg takes in the Tanana drainage and the Upper Copper/Upper Susitna drainages. Other assumed responsibilities included locating wild donor stocks, evaluating the population status of the donor stocks, and collecting and holding adults until they were ready for artificial spawning.

### **Net-Catch Sampling**

ADF&G has numerous requests from anglers for current information on the species and size of fish in lakes in the UTMA. Anglers use this information to plan fishing trips. Every other year ADF&G staff usually samples fish populations in 4 to 6 lakes in the UTMA. Most of these lakes are stocked so there are usually no conservation concerns driving the need for information on these fish populations. However, anglers are interested in the species and the size of the fish in these lakes. ADF&G also uses this information to update information in the Guide to Stocked Waters, the Internet web site, and informational leaflets. An additional benefit is that biologists are able to observe the fish populations in several lakes and get a rough idea of their status. From these observations the biologist can decide if a fish population needs further investigation and plan a study to address a specific concern.

### **Lake Mapping and Limnology**

Each year ADF&G inspects and maps a number of lakes. The actual number of lakes that are visited depends on the time available, the priority of other projects and for some lakes if aircraft or ATVs are available. When a lake is mapped, ADF&G staff obtains depth data that are later used to produce bathometric maps for anglers and to describe morphology and other lake characteristics for fishery managers. When ADF&G staff is at these lakes they often combine several activities such as net sampling (described above), water chemistry assays, dissolved oxygen and temperature profiles, inspect barriers, and evaluate land-locked status.

## **Statewide Stocking Plan: Region III Update**

The 5-year stocking plan for Region III is updated each year in response to public comment, changes in Fishery Management Plans and hatchery production, and to comply with current policies. Comments received from the public and current policies are reviewed to determine what changes will be required to update the stocking plan each year. The updated stocking plan for Region III is submitted to the Sport Fish regional office in Anchorage in November for inclusion into the draft Five Year Statewide Stocking Plan for Recreational Fishing. After a comment period the finalized plan is usually published and available by 1 February.

## **Fish Transport Permits**

Each fish stocking and egg take requires a Fish Transport Permit (FTP). The Five Year Stocking Plan, regional management plans, and active FTPs are crosschecked prior to stocking or taking eggs to determine if an active FTP exists. Any FTP needed for stocking or for an egg take is submitted for approval. Lists of active, expired, and pending FTPs for the UTMA are maintained at the Sport Fish regional office in Fairbanks.

## **Hatchery Review**

Fish hatchery management and operational plans for Ft. Richardson and Eielson Air Force Base hatcheries are reviewed to ensure the plans account for the correct number, size, species, brood stock, and other special requirements for fish requested through the Five Year Stocking Plan and regional management plans. Requests from the various regions are checked against hatchery production capabilities to determine if requests are feasible. Hatchery and stocking managers discuss options to decrease impact of egg takes on wild donor stocks and to make the stocking program more efficient.

## **Pamphlets**

Pamphlets about stocked waters in the UTMA are updated each year with information collected on fish populations such as the species present and their size. Other information includes recent stocking histories, location and bathymetric maps, and available facilities.

## **BOARD OF FISHERY ACTIONS**

In January 2004, the BOF adopted a Regional Stocked Waters Management Plan. The plan created three management categories: high yield lakes, conservative yield lakes, and, special management lakes. Almost all stocked lakes in the region are categorized under the plan as high yield. The BOF directs the department to manage the stocked waters according to a framework designed to meet public demand and provide diversity of opportunity. The department may manage specific fisheries to provide or maintain qualities desired by the angling public.

The regulations adopted by the board are designed to maintain the characteristics of each fishery category. Waters stocked in the AYK, Upper Copper River and Upper Susitna River areas for the first time will be classified high yield (with a daily bag and possession limit of 10 fish in combination and only one fish over 18 inches). The board recognizes region wide regulations for stocked waters and two categories of exceptions, conservative yield (one lake, Dune Lake, is categorized under the plan as conservative yield, with combined bag limit of 5 fish, of all species combined, only one over 18 inches), and special management (where a bag limit of 1 fish over 18 inches) waters in this category are: Little Harding Lake, Harding Lake, Summit Lake, Monte Lake, Donnelly Lake, and Rainbow Lake).

Stocked waters may be reclassified into a different category only by the board through proposals from the public, department, or board and if the proposals meet the criteria established for the proposed category. Requests for reclassification and special management will be submitted to the board only during the appropriate cycle.

### **CURRENT ISSUES**

Sport Fish Region III staff has pursued establishing a full size fish hatchery in Fairbanks for stocking lakes in the Interior. Fish production at Fort Richardson and Elmendorf hatcheries are dependant on surface and ground water supplies as well as waste heat from military power plants. The power plant at Fort Richardson was scheduled to shut down 1 October 2003. The power plant at Elmendorf Air Force Base is scheduled to shut down in 2005. Boilers have been installed at the Fort Richardson hatchery to heat water for the broodstock, incubation, smolt, and fingerling programs. The rainbow trout catchable program is currently at the Elmendorf Air Force Base hatchery. When its power plant closes, catchable production will be reduced or eliminated.

It appears that angler behavior at Quartz Lake has changed in recent years. Anglers are targeting rainbow trout for harvest (from 10,000 in 1997 to 20,000 in 1999) while releasing more of their catch of coho salmon. This practice has probably resulted in a greater number of coho salmon in Quartz Lake. ADF&G suspects that fewer rainbow trout survive to age-1 because there are more coho salmon which prey on fingerling rainbow trout. The number of surviving rainbow trout is less than 1% and is insufficient to support the fishery. Research information, primarily stock assessment in Quartz Lake, was used to evaluate the fishery and adapt/modify the stocking program to meet changing angler behavior and to increase the number of age-1 rainbow trout in the population.

### **ACKNOWLEDGMENTS**

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## **APPENDIX A**

**Appendix A1.**-Stocking records for Upper Tanana area lakes, 2003.

Location	Species	Date	Number Stocked	Average Length (in)	Size
Big "D" Pond	Rainbow Trout	23-Jun-2003	1,691	8.3	Catchable
Bolio L	Grayling	20-Aug-2003	1,000	1.9	Fingerling
Bolio L	Rainbow Trout	23-Jun-2003	2,678	9.3	Catchable
Brodie L	Grayling	20-Aug-2003	500	1.9	Fingerling
Craig L	Rainbow Trout	20-Aug-2003	2,000	2	Fingerling
Donna L	Rainbow Trout	20-Aug-2003	7,600	2	Fingerling
Hidden L	Rainbow Trout	20-Aug-2003	4,000	2.1	Fingerling
Jan L	Coho Salmon	3-Jun-2003	9,000	2.6	Fingerling
L Donna L	Rainbow Trout	20-Aug-2003	4,000	2	Fingerling
Lisa L	Rainbow Trout	20-Aug-2003	10,000	2	Fingerling
Little Lost L	Rainbow Trout	23-Jun-2003	2,689	9.3	Catchable
Quartz L	Coho Salmon	3-Jun-2003	61,826	2.6	Fingerling
Quartz L	Rainbow Trout	27-May-2003	13,294	8	Catchable
Quartz L	Rainbow Trout	25-Jun-2003n	1,590	8.3	Catchable
Quartz L	Rainbow Trout	9-Jul-2003	2,952	8.3	Catchable
Quartz L	Rainbow Trout	9-Jul-2003	2,755	9.6	Catchable
Quartz L	Rainbow Trout	20-Aug-2003	76,712	2.1	Fingerling
Quartz La	Rainbow Trout	3-Sep-2003	28,724	4	Subcatchable
Rich 81	Rainbow Trout	23-Jun-2003	302	9.3	Catchable
S Twin L	Rainbow Trout	23-Jun-2003	526	9.3	Catchable
Shaw Pond	Rainbow Trout	23-Jun-2003	1,000	9.3	Catchable

<sup>a</sup> These fish were reared in ponds on Fort Greely for 2 months. They were captured in the fall and moved to Quartz Lake.

**Appendix A2.-Stocking records for Upper Tanana area lakes, 2004.**

Location	Species	Date	Number Stocked	Average Length (in)	Size
Backdown L	Arctic Char	19-Aug-04	450	2.6	Fingerling
Backdown L	Rainbow Trout	2-Aug-04	1,200	1.7	Fingerling
Big "D" Pond	Rainbow Trout	28-May-04	1,460	8.7	Catchable
Big L <sup>a</sup>	Rainbow Trout	10-Aug-04	129,387	2	Fingerling
Bluff Cabin L	Rainbow Trout	14-Jul-04	7,000	1.9	Fingerling
Bolio L	Grayling	2-Aug-04	2,000	1.5	Fingerling
Bolio L	Rainbow Trout	4-Jun-04	2,300	8.7	Catchable
Brodie L	Arctic Char	19-Aug-04	375	2.6	Fingerling
Brodie L	Chinook Salmon	20-Sep-04	1,000	7.8	Catchable
Brodie L	Grayling	2-Aug-04	1,000	1.5	Fingerling
Bullwinkle L	Rainbow Trout	17-Aug-04	803	2.1	Fingerling
Chet L	Arctic Char	19-Aug-04	250	2.6	Fingerling
Chet L	Rainbow Trout	28-May-04	500	9.1	Catchable
Chet L	Rainbow Trout	17-Aug-04	1,600	2.2	Fingerling
Coal Mine #5	Rainbow Trout	2-Aug-04	2,000	1.7	Fingerling
Craig L	Rainbow Trout	14-Jul-04	2,000	1.9	Fingerling
Dicks Pond	Arctic Char	19-Aug-04	375	2.6	Fingerling
Doc L	Rainbow Trout	17-Aug-04	506	2.1	Fingerling
Donna L	Rainbow Trout	14-Jul-04	7,600	1.9	Fingerling
Donnelly L	Rainbow Trout	17-Aug-04	6,513	2.1	Fingerling
Forest L	Rainbow Trout	14-Jul-04	2,000	1.9	Fingerling
Four Mile L	Arctic Char	16-Sep-04	4,605	3.3	Fingerling
Four Mile L	Rainbow Trout	16-Sep-04	20,000	2.6	Fingerling
Ghost L	Arctic Char	19-Aug-04	300	2.6	Fingerling
Ghost L	Rainbow Trout	17-Aug-04	1,012	2.1	Fingerling
J L	Arctic Char	19-Aug-04	150	2.6	Fingerling
J L	Grayling	2-Aug-04	2,000	1.5	Fingerling
J L	Rainbow Trout	22-Jun-04	500	9	Catchable
Jan L	Rainbow Trout	14-Jul-04	9,000	1.9	Fingerling
Kenna L	Rainbow Trout	14-Jul-04	3,000	1.9	Fingerling
Kens Pond	Arctic Char	19-Aug-04	375	2.6	Fingerling
Kens Pond	Rainbow Trout	2-Aug-04	1,000	1.7	Fingerling
Koole L	Coho Salmon	19-Jul-04	1,156	2.5	Fingerling
Koole L	Rainbow Trout	14-Jul-04	18,000	1.9	Fingerling
L Donna L	Rainbow Trout	14-Jul-04	4,000	1.9	Fingerling

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Location	Species	Date	Number Stocked	Average Length (in)	Size
Last L	Arctic Char	19-Aug-04	375	2.6	Fingerling
Last L	Rainbow Trout	2-Aug-04	1,000	1.8	Fingerling
Lisa L	Rainbow Trout	14-Jul-04	9,000	1.9	Fingerling
Little Lost L	Rainbow Trout	28-May-04	2,521	9.1	Catchable
Luke L	Grayling	2-Aug-04	1,000	1.5	Fingerling
Mark L	Arctic Char	19-Aug-04	200	2.6	Fingerling
Mark L	Coho Salmon	28-May-04	1,532	2.2	Fingerling
Mark L	Rainbow Trout	2-Jun-04	500	9.1	Catchable
Mark L	Rainbow Trout	17-Aug-04	3,621	2.1	Fingerling
Monte L	Rainbow Trout	14-Jul-04	15,000	1.9	Fingerling
N Twin L	Rainbow Trout	4-Jun-04	800	8.7	Catchable
N Twin L	Rainbow Trout	22-Jun-04	100	9	Catchable
N Twin L	Rainbow Trout	19-Jul-04	200	10.8	Catchable
N Twin L	Rainbow Trout	17-Aug-04	2,029	2.1	Fingerling
Nickel L	Arctic Char	19-Aug-04	100	2.6	Fingerling
Nickel L	Grayling	2-Aug-04	1,000	1.5	Fingerling
Nickel L	Rainbow Trout	28-May-04	600	9.1	Catchable
Nickel L	Rainbow Trout	2-Aug-04	1,000	1.7	Fingerling
No Mercy L	Rainbow Trout	17-Aug-04	610	2.1	Fingerling
Paul's Pond	Grayling	2-Aug-04	1,000	1.5	Fingerling
Quartz L	Arctic Char	19-Aug-04	9,504	2.6	Fingerling
Quartz L	Chinook Salmon	22-Sep-04	5,000	8.1	Catchable
Quartz L	Coho Salmon	14-May-04	30,407	2.3	Fingerling
Quartz L	Coho Salmon	28-May-04	2,782	2.2	Fingerling
Quartz L	Rainbow Trout	14-May-04	6,291	8.9	Catchable
Quartz L	Rainbow Trout	4-Jun-04	9,519	8.7	Catchable
Quartz L	Rainbow Trout	22-Jun-04	2,000	9	Catchable
Quartz L	Rainbow Trout	19-Jul-04	51,746	1.9	Fingerling
Quartz L	Rainbow Trout	17-Aug-04	60,071	2	Fingerling
Quartz L	Rainbow Trout	26-Aug-04	49,397	2.3	Fingerling
Quartz L	Rainbow Trout	26-Aug-04	75,196	2.2	Fingerling
Rainbow L	Rainbow Trout	14-Jul-04	12,000	1.9	Fingerling
Rangeview L	Arctic Char	19-Aug-04	375	2.6	Fingerling
Rangeview L	Grayling	2-Aug-04	1,000	1.5	Fingerling
Rapids L	Rainbow Trout	2-Aug-04	1,000	1.8	Fingerling

-continued-

**Appendix A2.**–Page 3 of 3.

Location	Species	Date	Number Stocked	Average Length (in)	Size
Rich 81	Rainbow Trout	28-May-04	300	9.1	Catchable
Robertson L #2	Rainbow Trout	14-Jul-04	3,000	1.9	Fingerling
Rockhound L	Rainbow Trout	17-Aug-04	601	2.1	Fingerling
S Johnson L	Rainbow Trout	14-Jul-04	1,400	1.9	Fingerling
S Twin L	Rainbow Trout	28-May-04	500	9.1	Catchable
S Twin L	Rainbow Trout	22-Jun-04	150	9	Catchable
S Twin L	Rainbow Trout	19-Jul-04	199	10.8	Catchable
Shaw Pond	Arctic Char	19-Aug-04	300	2.6	Fingerling
Shaw Pond	Rainbow Trout	27-May-04	948	8.7	Catchable
Sheefish L	Arctic Char	19-Aug-04	700	2.6	Fingerling
Square L	Arctic Char	16-Sep-04	3,500	3.3	Fingerling
Weasel L	Rainbow Trout	2-Aug-04	800	1.7	Fingerling
West Pond <sup>a</sup>	Rainbow Trout	10-Aug-04	60,000	2	Fingerling

<sup>a</sup> These fish were reared in ponds on Fort Greely for 2 months. They were captured in the fall and moved to Quartz Lake.



## **APPENDIX B**

**Appendix B1.**—History of Arctic grayling sport fish regulations for the Delta Clearwater River from statehood to 2001.

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**1962**

**Initial Regulations after Statehood**

- **Entire Tanana drainage** – Daily bag limit is 10 per day 10 in possession no more than **two fish** may be over **20-inches**.

**1977**

**Bag, Possession, and Size Limit**

- **Entire Tanana drainage** – Daily bag limit is **5 per day 10 in possession** no more than **two fish** daily or four in possession may be over **20-inches**.

**1985**

**SIZE LIMIT**

- **No size limit.**

**1987/88**

The Board of Fisheries did not meet in the winter of 1986. Sweeping changes to regulations in the Tanana River drainage were not addressed. EOs were made in 1987 and became permanent regulations in 1988. The following (new) regulations are as such:

**BAG, POSSESSION, SEASON, SIZE LIMIT, SPECIAL REGULATION**

Delta Clearwater River

- Bag limit for grayling is 5 per day, **5 in possession**
- **Open season for grayling is First Saturday in June through March 31.**
- **12-inch minimum size limit.**
- **Only unbaited, artificial lures or flies may be used.**
- **Grayling caught April 1 to the first Saturday in June must be released immediately.**

**1995**

**SEASONS**

**DELTA CLEARWATER RIVER**

- **April 1 through May 31**, Arctic grayling Catch-and-release only.
- **June 1 through March 31**, Arctic grayling Daily Bag and possession limit is 5 fish; all must be 12 inches or larger.

**1996-1997**

**BAG LIMIT**

**DELTA CLEARWATER RIVER**

- Daily bag and possession limit (by EO) is 2 fish over 12 inches.

**1997&1998**

**BAG LIMIT**

**DELTA CLEARWATER RIVER AND CLEARWATER LAKE**

- **Catch-and-release only for the entire year.**
- Only unbaited, **single** hook, artificial lures may be used from **January 1 - August 31.**
- Only unbaited, artificial lures may be used from **September 1 – December 31.**

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**-continued-**

**2001- (Present)**

**If the BOF decides to allow harvest** the department supports the Delta Fish and Game Advisory Committee's amended Proposal 212, before the BOF in January 2001. It calls for the following regulatory **change in Bag, size, and season** for Arctic grayling in:

**Delta Clearwater River and Clearwater Lake.**

- The Daily **Bag and possession limit is 1 per day.**
- The **maximum size limit is 12-inches**, all fish greater than 12 inches must be released.
- The **open season** for Arctic grayling fishing is **July 1-July 31**
- **August 1 – June 30, Catch-and-release only** for Arctic Grayling.

**Continue the following existing regulations.**

- Unbaited, single hook, artificial lures may be used from January 1 - August 31.
- Only unbaited, artificial lures may be used from September 1 – December 31.

**Appendix B2.-Board of Fisheries regulation history including actions taken in January 2001 regarding Lake Trout and Burbot in Fielding Lake.**

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**Lake Trout**

**PRIOR TO 1988**

**Bag, size, and possession limit**

- Bag limit is **10** per day **10** in possession no more than **two fish may be over 20-inches**

**1988**

**Bag, size, and possession limit**

- **Bag limit is 2 per day, 2 in possession 18-inch minimum size limit**

**1993**

**Bag, size, and possession limit**

- Bag limit is 1 per day, 1 in possession.
- 18-inch minimum size limit increased to **22-inch minimum size**.

**Burbot**

**PRIOR TO 1985**

**Bag, size, and possession limit**

- Bag limit is **10** per day **no** possession limit, if taken with spear or bow and arrow. No limit if taken by hooks and line. Artificial light may be used when taking burbot by spear from September 1 through December 31. No size limit. May be taken in all lakes year-round with underwater spear by persons completely submerged, in accordance with applicable bag limits.

**1985**

**Set-line restriction**

- **Burbot may be taken by setline from October 15 through May 15.**

**1988**

**Bag, size, possession limit, and gear restriction**

- Bag limit is **2** per day, **2** in possession.
- **No size limit.**
- **No setlines may be used.**

**1994**

- **Closed to fishing burbot.**

**2001**

5 AAC 70.022 is repealed and readopted to read:

**5 AAC 70.022. WATERS; SEASONS; BAG, POSSESSION, AND SIZE LIMITS; AND SPECIAL PROVISIONS.** (d) This subsection contains bag, possession, and size limits for the waters of the Tanana River portion of the Arctic-Yukon-Kuskokwim Area (all waters of the Tanana River drainage).

(9) in Fielding Lake (species present),

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(D) lake trout is *closed from September 1 – September 30, and may be taken from October 1 - August 31*, with a bag and possession limit of one fish *which must be 26 inches or more in length, except as specified in 5 AAC 70.023 (10)*;

(F) Arctic grayling is *closed from September 1 – September 30, and may be taken from October 1 - August 31*, with a bag and possession limit of five fish with no size limit, *except as specified in 5 AAC 70.023 (10)*;

(G) whitefish is *closed from September 1 – September 30, and may be taken from October 1 - August 31*, with a bag and possession limit of 15 fish with no size limit, *except as specified in 5 AAC 70.023 (10)*;

(J) burbot is *closed from September 1 – September 30, and may be taken from October 1 - August 31*, with a *bag and possession limit of 1 fish with no size limit*, except as specified in 5 AAC 70.023 (10);

5 AAC 70 is amended by adding a new section to read:

**5 AAC 70.023. SPECIAL PROVISIONS.** (d) This subsection gives the special provisions for the waters of the Tanana River portion of the Arctic-Yukon-Kuskokwim Area (all waters of the Tanana River drainage).

(10) in Fielding Lake the use of set lines is prohibited for the taking of burbot;

(11) in Fielding Lake only the *use of a single hook* is allowed.

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**Appendix B3.**—Information pertaining to barbless hook studies in scientific literature, information is followed by a citation.

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- Does not demonstrate any decrease in mortality by requiring barbless hooks (**Schaeffer and Hoffman 2002; Schill and Scarpella 1997**)
- The mortality of trout species caught on artificial lures and flies is low (3.8%-4.9%) however, the mortality difference between barbed (4.8%) and barbless hooks (2.6%) was nearly double for barbed hooks (**Taylor and White 1992**).
- Hook Placement between barb and barbless hooks did not differ most fish are hooked in the jaw (**Schaeffer and Hoffman 2002; Schaefer 1989**).
- Using barbless hooks reduced unhooking injuries (**Schaeffer and Hoffman 2002**).
- Unhooking time is significantly shorter with barbless hooks (**Schaeffer and Hoffman 2002**).
- Losses of fish with barbless hooks were significantly higher (**Schaeffer and Hoffman 2002**).
- Fish that are caught in sensitive areas such as the gills or in the back of the mouth are likely to die regardless of barbed or barbless hook (**Schaeffer and Hoffman 2002; Schaefer 1989**).
- With large sized Arctic grayling, comparison between single barbed hook flies and barbless single hook flies there was no mortality with either gear (**McKinley 1993**)

McKinley, T. R. 1993. Mortality of Arctic char and large Arctic grayling captured and released with sport fishing gear. Alaska Department of Fish and Game, Fishery Data Series No. 93-1, Anchorage.

Schaeffer, J.S.; Hoffman, E. M. 2002. Performance of barbed and barbless hooks in a marine recreational fishery. North American Journal of Fisheries Management, Vol. 22(1), pp 229-235.

Schafer, W. F. 1989. Hooking mortality of Walleyes in a Northwestern Ontario Lake. North American Journal of Fisheries Management, Vol. 9(2), pp 193-194

Schill, D. J. and Scarpella R. L. 1997. Barbed hook restrictions in Catch-and-release Trout Fisheries: A social issue. North American Journal of Fisheries Management, Vol. 17(4), pp 873-881.

Taylor, M. J. and White, Karl R. 1992. A Meta-Analysis of Hooking Mortality of Nonanadromous Trout. North American Journal of Fisheries Management, Vol. 12(4), pp 760-767.

**Appendix B4.**—History of northern pike sport fish regulations in the Tanana River drainage from statehood to 2001.

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**1959**

**REGULATIONS BEFORE STATEHOOD**

- Tanana drainage between Kantishna River and Cathedral Rapids/Black Rapids - Bag limit is 10 per day 10 in possession - no size limit-may be taken only with hook and line or spear. Outside of this area - no limit, take by trap, seine, gill net, spear, or hook and line.

**1962**

**INITIAL REGULATIONS AFTER STATEHOOD**

- Tanana drainage between Kantishna River and Cathedral Rapids/Black Rapids - Bag limit is 10 per day 10 in possession - no size limit-may be taken only with hook and line or spear. Outside of this area - no limit, take by trap, seine, gill net, spear, or hook and line.

**1969**

**ADDED SIZE LIMIT**

- Open Season year-round.
- Daily bag and possession limit is 10.
- No more than two fish may be over 36 inches.
- May be taken only with hook and line or spear.

**1970**

**SIZE LIMIT, AREA, AND USE OF SPEARS**

- **Entire Tanana drainage** - bag limit is 10 per day 10 in possession
- No more than **two fish may be over 30-inches.**
- May be taken by hook and line only.

**1973**

**Winter Use of Spears**

- Open season for **taking** northern pike **by spear** is from October 1- May 31 (bag and size limit unchanged).

**1978**

**Use of Spears Underwater**

- **Northern pike may be taken by spear by persons completely submerged from January 1 through December 31** (all other regulations unchanged)

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**1987/88**

The BOF did not meet in the winter of 1996. Sweeping changes to regulations in the Tanana River drainage were not addressed. EOs were made in 1987 and became permanent regulations in 1988. The following (new) regulations are as such:

**BAG AND POSSESSION LIMITS**

**ALL WATERS**

- Bag limit for northern pike is **5 per day, 5 in possession, only 1 fish over 30 inches in length.**

**SEASONS**

**ALL WATERS**

- In all waters of the Tanana River drainage excluding the Tolovana River drainage, the open season for northern pike fishing is January 1 – December 31.
- In the Tolovana River drainage, including Minto Flats, Goldstream Creek, Chatanika River, and Tatalina River, the open season for northern pike is June 1- October 14.

**USE OF SPEARS OR BOW AND ARROWS**

Northern pike may be taken by spear or **bow and arrow** from **September 1 through April 30** and may be speared by persons completely submerged from **January 1 through December 31.**

**1993**

During the 1992 Board of Fishery meeting (new) season regulations for northern pike:

**SEASONS**

**ALL WATERS**

- In all waters of the Tanana River drainage excluding the Tolovana River drainage, the open season for northern pike fishing is **June 1 – March 31**
- In the Tolovana River drainage, including Minto Flats, Goldstream Creek, and Tatalina River, **but excluding the Chatanika River**, the open season for northern pike is June 1- October 14.

**USE OF SPEARS OR BOW AND ARROWS**

Northern pike may be taken by spear or bow and arrow for **September 1 through March 31** and may be speared by persons completely submerged from **June 1 through December 31.**

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**1998-2000**

**SEASONS**

The Tanana River drainage is open to northern pike sport fishing the entire year-except:

**FLOWING WATERS**

- In flowing waters of the Tanana River drainage, excluding the Tolovana River drainage, the open season for northern pike fishing is **January 1 – December 31**.
- In the Tolovana River drainage, including Minto Flats, Goldstream Creek, but excluding the Chatanika River, the open season for northern pike is June 1- October 14.

**LAKES**

- In lakes of the Tanana River drainage, excluding Harding, Volkmar, and George Lake, the open season for northern pike **June 1 - April 20**.
- In Harding Lake, Volkmar Lake, and George Lake (including George Creek), the open season for northern pike is **June 1 – March 31**).

**2001- (Present)**

Proposal 191 before the BOF in January 2001 calls for the following regulatory **change in season** for northern pike in **lakes** of the Tanana River drainage.

**SEASONS**

The Tanana River drainage is open to sport fishing the entire year-except:

**FLOWING WATERS**

- In flowing waters of the Tanana River drainage, excluding the Tolovana River drainage, the open season for northern pike fishing is January 1 – December 31.
- In the Tolovana River drainage, including Minto Flats, Goldstream Creek, but excluding the Chatanika River, the open season for northern pike is June 1- October 14.

**LAKES**

- In all lakes of the Tanana River drainage, the open season for northern pike **May 20 - April 20**.



## **APPENDIX C**

**Appendix C1.-Summary of Arctic grayling estimates and standard errors within the Delta Clearwater River, 1977-2000<sup>a</sup>.**

Year	N[150]	SE[N150]	N[240]	SE[N240]	N[270]	SE[N270]	N[Age 5+] <sup>a</sup>	SE[Age 5+]	Recruitment	
									N[Age 5] <sup>a</sup>	SE[Age 5]
1977	nd	---	nd	---	nd	---	9,702	1,234	5,862	1,335
1978	nd	---	nd	---	nd	---	8,826	1,279	4,461	1,484
1979	nd	---	nd	---	nd	---	6,258	885	4,134	1,146
1980	nd	---	nd	---	nd	---	6,175	832	3,467	856
1981	nd	---	nd	---	nd	---	9,829	1,461	6,907	1,640
1982	nd	---	nd	---	nd	---	9,369	1,159	4,554	1,173
1983	nd	---	nd	---	nd	---	12,760	1,746	7,828	1,999
1984	nd	---	nd	---	nd	---	11,063	1,276	4,931	1,295
1985	nd	---	nd	---	nd	---	10,767	1,388	4,458	1,267
1986	nd	---	nd	---	nd	---	7,840	1,148	2,724	708
1987	nd	---	nd	---	nd	---	7,684	1,289	3,571	933
1988	nd	---	nd	---	nd	---	8,845	1,962	1,957	578
1989	nd	---	nd	---	nd	---	6,482	1,751	2,420	601
1990	nd	---	nd	---	nd	---	4,477	1,766	2,301	619
1991	nd	---	nd	---	nd	---	nd	---	1,754	686
1992	nd	---	nd	---	nd	---	nd	---	2,219	1,066
1993	nd	---	nd	---	nd	---	nd	---	945	692
1994	nd	---	nd	---	nd	---	nd	---	1,179	1,491
1995	nd	---	nd	---	nd	---	nd	---	Nd	---
1996	nd	---	3,000	370	2,750	340	2,490	310	670	100
1997	9,000	920	7,420	920	6,490	800	4,600	590	810	140
1998	nd	---	5,570	780	4,740	480	4,500	630	1,820	300
1999	nd	---	6,977	401	6,684	211.3	6,271	369	1,760	140
2000	nd	---	8,045	946	7,634	900	6,891	821	1,748	255
					<b>Average</b>					
	N/A	---	6,203	---	5,660	---	7,622	---	3,153	---

<sup>a</sup> Estimates for 1977 - 1990 are from CAGEAN modeling (Clark and Ridder 1994) and reflect population at start of fishing season. Estimates for 1996 - 1999 are from mark-recapture experiments and reflect the population in July (Ridder 1998b, 1999; Ridder and Gryska 2000; and Gryska 2001).

nd = no data

N/A = non applicable

**Appendix C2.-Recreational fishing effort, harvest and catch of Arctic grayling, coho salmon, chum salmon and whitefish in the Delta Clearwater River from the Statewide Harvest Survey, 1977-2003<sup>a</sup>.**

Year	Angler Days	Grayling Angler Days	Harvest Grayling <12"	Harvest Grayling >12"	Total Harvest Grayling	Harvest Coho	Harvest Chum Salmon	Harvest WF	Catch of Grayling <12"	Catch of Grayling >12"	Total Catch Grayling	Catch Coho	Catch Chum Salmon
1977	6,881	6,798	...	...	6,118	31	19	28	...	...	...	...	...
1978	7,210	6,873	...	...	7,657	126	59	0	...	...	...	...	...
1979	8,398	8,398	...	...	6,492	0	0	53	...	...	...	...	...
1980	4,240	4,173	...	...	5,680	25	25	29	...	...	...	...	...
1981	4,673	4,553	...	...	7,362	45	0	203	...	...	...	...	...
1982	4,231	4,175	...	...	4,779	21	21	94	...	...	...	...	...
1983	5,867	5,698	...	...	6,546	63	63	262	...	...	...	...	...
1984	5,139	3,611	...	...	4,193	571	182	325	...	...	...	...	...
1985	8,722	6,790	...	...	5,809	722	174	1,015	...	...	...	...	...
1986	10,137	2,867	...	...	2,343	1,005	246	208	...	...	...	...	...
1987	5,397	3,123	...	...	2,005	1,068	42	66	...	...	...	...	...
1988	5,184	3,092	...	...	2,910	1,291	0	1,114	...	...	...	...	...
1989	5,368	2,500	...	...	3,016	1,049	29	34	...	...	...	...	...
1990	4,853	2,263	...	...	1,772	1,375	0	0	...	...	12,424	3,271	55
1991	5,594	2,605	0	2,165	2,165	1,721	98	91	3,033	4,965	7,998	4,382	98
1992	3,756	1,765	0	797	797	615	68	294	2,669	3,417	6,086	1,555	289
1993	4,909	2,307	0	437	437	48	0	0	3,074	2,638	5,712	1,695	101
1994	3,984	3,028	375	1,036	1,411	509	0	10	4,269	5,037	9,306	3,009	66
1995	6,261	4,758	0	926	926	463	72	0	1,620	4,354	5,974	5,195	441
1996	3,424	2,602	0	1,218	1,218	937	0	0	3,354	5,624	8,978	2,435	110
1997	2,161	1,642	0	0	0	794	0	0	2,980	1,685	4,665	4,174	57
1998	3,415	2,595	0	0	0	479	0	0	4,842	11,293	16,135	2,350	0
1999	5,705	4,336	0	0	0	75	0	14	2,444	9,328	11,772	1,634	203
2000	2,647	2,012	0	0	0	255	12	36	2,339	6,351	8,690	1,911	12
2001	4,670	3,549	0	47	0	816	0	44	3,554	9,020	12,575	5,393	65
2002	4,580	3,481	51	0	51	517	0	20	3,180	9,733	12,913	5,311	23
2003	6,006	4,565	0	0	0	1,272	0	0	3,729	13,847	17,576	14,665	50
Means													
1977-2003	5,312	3,858	36	514	2,735	589	49	161	3,161	6,715	10,057	4,070	112
1998-2003	4,722	3,588	20	9	28	587	3	14	3,049	9,656	12,705	5,783	71

<sup>a</sup> (Mills 1979-1994; Howe et al. 1995; 1996, 2000a-d; Walker et al. 2003; Jennings et al. 2004; 2006a-b.

**Appendix C3.-Board of Fisheries changes in 2004 to sport fishing regulations in the Arctic-Yukon-Kuskokwim Region (entire memo, Swanton 2005)**

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During the January, 2004, Board of Fisheries meeting in Fairbanks, 37 proposals were considered that would change sport fishing regulations in the Arctic-Yukon-Kuskokwim Region. The Board adopted 11 of these proposals, resulting in changes to some sport fishing regulations in the Region. These new regulations take effect about April 15, 2004, with the release of the 2004-2005 Regulation Summary. Changes are listed below by area, and then by species. If a regulation is not listed in this news release, that regulation remained unchanged.

**Region-Wide Changes**

Arctic grayling bag, possession, and length limits.

The Board adopted a Regional Arctic Grayling Management Plan. The plan created three management categories with associated regulatory options; Background Regulations, Conservative Harvest Regulations, and Special Management Regulations.

The plan categorized the following waters as Conservative Harvest management with a bag and possession limit of two fish, with size limits specific to the water bodies: Snake River (Nome), Pilgrim River (Nome); 5-mile Clearwater (Fairbanks), Mendeltna Creek (Glennallen); Aniak, Holitna, Kanektok and Goodnews Rivers (Kuskokwim). Wild Arctic grayling waters classified as Special Management are: Nome and Solomon Rivers (Nome); Nome Creek (Fairbanks), Chena River (Fairbanks); Piledriver Slough (Fairbanks); and the Delta Clearwater River (Delta Junction).

The regulations adopted under the plan as background regulations changed the general Arctic grayling regulations in some areas. The Board also adopted proposals removing the length limit in the Dalton Highway Corridor. Regulations for waters already under special regulations did not change. Specific changes from previous regulations are listed in the table below.

Water	Previous Regulation	New Regulation
Yukon River drainage	10/day, no size limit	<b>5/day, no size limit</b>
North Slope drainage	10/day, no size limit	<b>5/day, no size limit</b>
Northwestern drainages	10/day, no size limit	<b>5/day, no size limit</b>
Kuskokwim/Goodnews	10/day, no size limit	<b>5/day, no size limit</b>
Dalton Hwy Corridor/Yukon	5/day, 12 inch minimum	<b>5/day, no size limit</b>
Dalton Hwy Corridor/North Slope	5/day, 12 inch minimum	<b>5/day, no size limit</b>

Stocked Waters bag, possession, and length limits.

The Board also adopted a Regional Stocked Waters Management Plan. The Plan created three Management Categories; High Yield Lakes, Conservative Yield Lakes, and Special Management Lakes. Almost all stocked lakes in the Region are categorized under the Plan as High Yield. One lake, Dune Lake, is categorized under the Plan as Conservative Yield, with combined bag limit of 5 fish (of all species combined), only one over 18".

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Special management waters, where a bag limit of 1 fish over 18 inches will be in place are: Little Harding Lake, Harding Lake, Summit Lake, Monte Lake, Donnelly Lake, and Rainbow Lake, which are all within either the Fairbanks or Delta Junction Management Areas.

The regulations for High Yield Lakes are applied region-wide, and changed the general regulations for stocked waters in some areas. All regulations for stocked waters that were previously under special regulations remained unchanged.

Species	Previous Regulation	New Regulation
Rainbow trout	10/day, no size limit	<b>10/day in combination, only one fish over 18 inches.</b>
Arctic char	10/day, no size limit	
King salmon Coho salmon	10/day in combination, no size limit	
Arctic grayling	Area General Regulation	<b>Area General Regulation</b>

Wild Lake Trout and Arctic char/Dolly Varden bag and possession limits.

The general bag and possession limit for these species changed for all lakes of the Region, except for the Tanana drainage and Upper Copper/Upper Susitna drainages.

Yukon, Kuskokwim/Goodnews, North Slope, and Northwest drainage areas.

Species	Previous Regulation/Lakes	New Regulation/Lakes
Lake trout	4/day, no size limit	<b>2/day in combination, no size limit.</b>
Arctic char/Dolly Varden	2/day, no size limit	

**Kuskokwim/Goodnews Drainages Changes**

Rainbow trout bag, possession, and size limits.

Regulations were changed in four drainages to bring alignment with the Statewide Wild Trout Management Plan. No other rainbow trout regulations changed in the Kuskokwim/Goodnews drainages.

Kuskokwim/Goodnews area rainbow trout.

Waters	Previous Regulation	New Regulation
Arolik River drainage	2/day, only one over 20"	<b>2/day, only one fish over 20", annual limit of 2 fish over 20"</b>
Kasigluk River drainage	1/day, 14 inches or less	
Kisaralik River drainage downstream of the Akiak Village Lodge site (60° 49.5'N, 160° 55.0 W)	1/day, 14 inches or less	
Kwethluk River drainage upstream of it's confluence with Pocahontas Creek (60° 31.96'N, 161° 05.47'W)	1/day, 14 inches or less	

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Aniak River resident species bag and possession limits.

The Board adopted a proposal that changed all resident species regulations (except for rainbow trout) to mirror the Holitna drainage regulations. Rainbow trout regulations in the Aniak River drainage remain catch-and-release only.

Species	Previous Regulation	New Regulation
Arctic grayling	3/day in aggregate, but only one of each species may be retained, no size limit	<b>2/day, no size limit</b>
Arctic char/Dolly Varden		<b>3/day, no length limit, flowing waters only</b>
Lake trout		<b>2/day, no length limit</b>
Sheefish		<b>2/day, no length limit</b>
Northern pike		<b>5/day, only one over 30"</b>
Burbot		<b>15/day no length limit</b>

**Northwestern Drainages Area Changes**

Unalakleet River salmon bag and possession limits.

The Board adopted three proposals which changed the regulations for salmon in the Unalakleet River drainage. These changes are listed in the table below.

Species	Previous Regulation	New Regulation
King salmon, over 20"	1/day	<b>2/day, of which only one may be over 20", annual limit of 4 king salmon over 20", harvest record required</b>
King salmon, under 20"	10/day	
Coho salmon	5/day in combination, no size limit.	<b>10/day, of which only 4 in combination may be chum, coho, or sockeye salmon, no size limit.</b>
Sockeye salmon		
Chum salmon		
Pink salmon		

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The Board of Fisheries failed to adopt or took no action on 26 proposals relating to sport fishing regulations in the Arctic-Yukon-Kuskokwim Region. The intent of each of these proposals is listed below.

- Proposal 101.** Close Quartz Lake, and eventually reduce the bag limit to 5 fish.
- Proposal 114.** Reduce the bag limit in Quartz Lake to 10 rainbow trout.
- Proposal 116.** Increase the bag limit for Arctic grayling in the Tok River from 2 to 5 fish.
- Proposal 113.** Require only barbless hooks in the Delta Clearwater River.
- Proposal 117.** Allow a one Arctic grayling bag limit in the Chena River from June 1 to July 15.
- Proposal 102 & 118.** Institute methods and means restrictions in the Arolik River.
- Proposal 103.** Designate portions of the Goodnews and Kanektok Rivers as fly fishing only waters.
- Proposal 106.** Close the lower Kanektok River to sport fishing.
- Proposal 104.** **Liberalize salmon bag limits, seasons, and gear restrictions on the Aniak River.**
- Proposal 105.** **Institute an annual limit for king salmon for non-resident anglers on the Kanektok River.**
- Proposal 143.** **Prohibit jet boats and restrict horsepower on the Kwethluk River.**
- Proposal 144.** Prohibit sport fishing on the Kwethluk River.
- Proposal 145.** Align sport fishing open/closed periods with the subsistence fishing schedule on the Kuskokwim River.
- Proposal 146.** **Allow the use of bait in the Kanektok River.**
- Proposal 147.** **Institute horsepower restrictions in the Goodnews River**
- Proposal 148.** Institute an annual limit for king salmon in the Kanektok, Arolik, and Goodnews rivers.
- Proposal 149.** Reduce the limit for “other salmon” in the Arolik, Goodnews, and Kanektok rivers to 2 fish.
- Proposal 115.** Increase the bag limit for Lake Trout in Bray and Beaver lakes from 4 to 10.
- Proposal 119.** Eliminate the requirement to register ice houses with ADF&G.
- Proposal 174.** Align sport fishing open/closed periods with the subsistence fishing schedule on the Yukon River.
- Proposal 165.** Close the mouths of all spawning streams in the Yukon drainage to all fishing.
- Proposal 173.** Open the Goodpaster River to catch-and-release fishing for king salmon.
- Proposal 124.** Close all sport fishing in the Northwestern drainages Area whenever subsistence fishing is closed.
- Proposal 125.** Require a harvest report for all sport fishing for salmon in Norton Sound.
- Proposal 128.** Restrict the times/days of the week that sport fishing guides can operate on the Unalakleet River.