Fishery Management Report No. 07-03

Fishery Management Report for Sport Fisheries in the Upper Tanana River Drainage in 2002

by

James F. Parker

February 2007

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

Symbols and Abbreviations

The following symbols and abbreviations, and others approved for the Système International d'Unités (SI), are used without definition in the following reports by the Divisions of Sport Fish and of Commercial Fisheries: Fishery Manuscripts, Fishery Data Series Reports, Fishery Management Reports, and Special Publications. All others, including deviations from definitions listed below, are noted in the text at first mention, as well as in the titles or footnotes of tables, and in figure or figure captions.

Weights and measures (metric)

centimeter	cm
deciliter	dL
gram	g
hectare	ha
kilogram	kg
kilometer	km
liter	L
meter	m
milliliter	mL
millimeter	mm

Weights and measures (English)

cubic feet per second	ft^3/s
foot	ft
gallon	gal
inch	in
mile	mi
nautical mile	nmi
ounce	oz
pound	lb
quart	qt
yard	yd

Time and temperature

day	d
degrees Celsius	°C
degrees Fahrenheit	°F
degrees kelvin	K
hour	h
minute	min
second	s

Physics and chemistry

all atomic symbols	
alternating current	AC
ampere	A
calorie	cal
direct current	DC
hertz	Hz
horsepower	hp
hydrogen ion activity (negative log of)	pH
parts per million	ppm
parts per thousand	ppt, ‰
volts	V
watts	W

General

Alaska Administrative Code	AAC
all commonly accepted abbreviations	e.g., Mr., Mrs., AM, PM, etc.
all commonly accepted professional titles	e.g., Dr., Ph.D., R.N., etc.
at	@
compass directions:	
east	E
north	N
south	S
west	W
copyright	©
corporate suffixes:	
Company	Co.
Corporation	Corp.
Incorporated	Inc.
Limited	Ltd.
District of Columbia	D.C.
et alii (and others)	et al.
et cetera (and so forth)	etc.
exempli gratia (for example)	e.g.
Federal Information Code	FIC
id est (that is)	i.e.
latitude or longitude	lat. or long.
monetary symbols (U.S.)	$, ¢
months (tables and figures): first three letters	Jan,...,Dec
registered trademark	®
trademark	™
United States (adjective)	U.S.
United States of America (noun)	USA
U.S.C.	United States Code
U.S. state	use two-letter abbreviations (e.g., AK, WA)

Measures (fisheries)

fork length	FL
mideye-to-fork	MEF
mideye-to-tail-fork	METF
standard length	SL
total length	TL

Mathematics, statistics

all standard mathematical signs, symbols and abbreviations	
alternate hypothesis	H_A
base of natural logarithm	*e*
catch per unit effort	CPUE
coefficient of variation	CV
common test statistics	(F, t, χ^2, etc.)
confidence interval	CI
correlation coefficient (multiple)	R
correlation coefficient (simple)	r
covariance	cov
degree (angular)	°
degrees of freedom	df
expected value	*E*
greater than	>
greater than or equal to	≥
harvest per unit effort	HPUE
less than	<
less than or equal to	≤
logarithm (natural)	ln
logarithm (base 10)	log
logarithm (specify base)	$\log_2$, etc.
minute (angular)	'
not significant	NS
null hypothesis	H_O
percent	%
probability	P
probability of a type I error (rejection of the null hypothesis when true)	α
probability of a type II error (acceptance of the null hypothesis when false)	β
second (angular)	"
standard deviation	SD
standard error	SE
variance	
population	Var
sample	var

FISHERY MANAGEMENT REPORT NO. 07-03

FISHERY MANAGEMENT REPORT FOR SPORT FISHERIES IN THE UPPER TANANA RIVER DRAINAGE IN 2002

by

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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

The Alaska Department of Fish and Game (ADF&G) is the fish and wildlife management agency for the State of Alaska. The Division of Sport Fish is the management division within ADF&G that is responsible for the management of sport fisheries. The goals of Sport Fish Division are to conserve wild stocks of sport fish, to provide a diversity of recreational fishing opportunities for the public, and to optimize the social and economic benefits from recreational fisheries for all Alaskans.

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. Research prioritization occurs 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 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 Fish and Game funds.

This report is written to make fisheries management information available to the State Board of Fisheries, Fish and Game Advisory Committees, and the public. As a means to assist Board of Fisheries members in acquiring information in a timely manner for proposals that will be addressed at the January 2004 meeting Appendix C3 has been constructed (Page 108).

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^2 (485,000 mi^2) 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

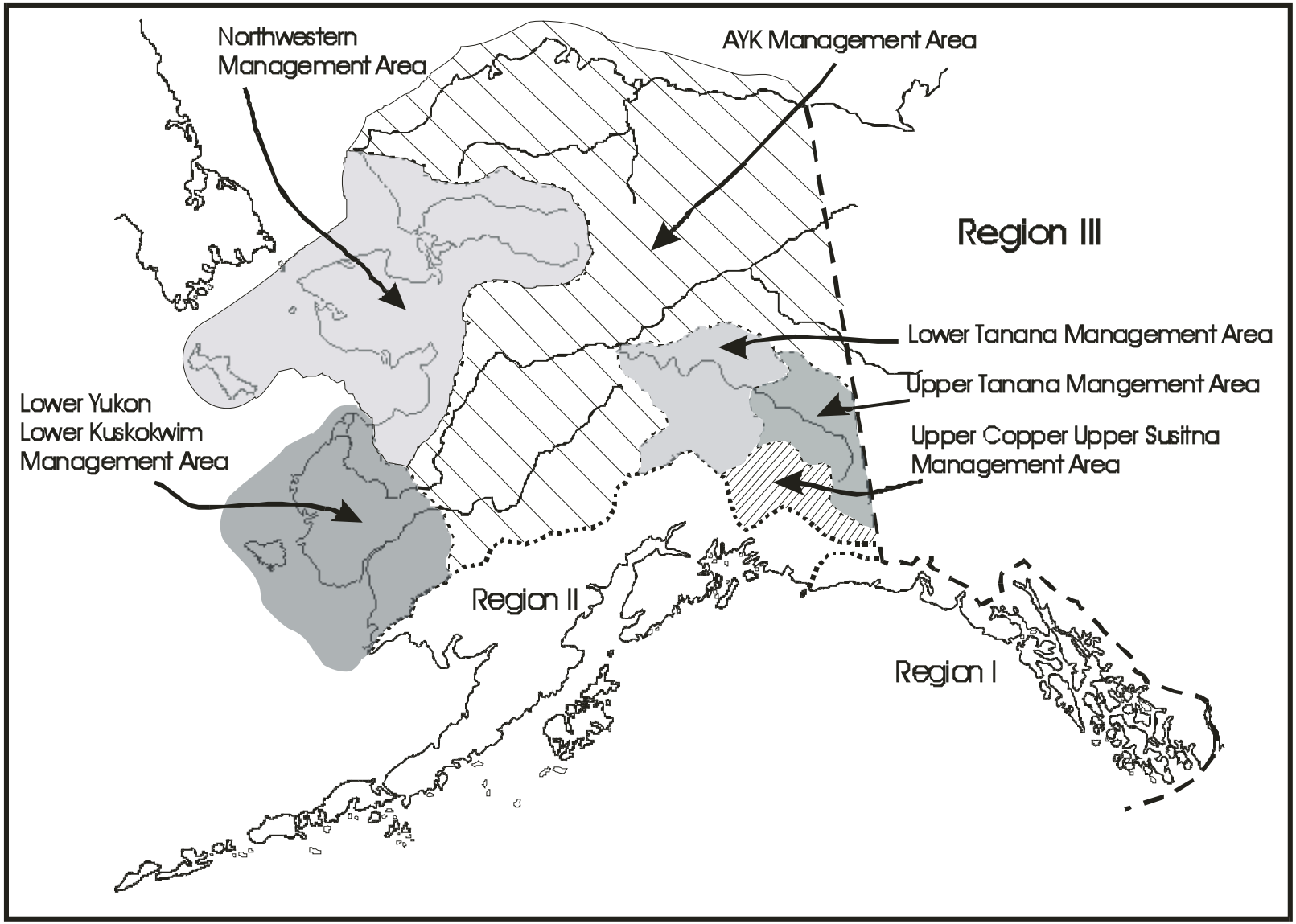

Figure 1.–Map of the sport fish regions in Alaska and the six Region III management areas**.**

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.

For administrative purposes Sport Fish Division has divided Region III into six fisheries management areas (Figure 1). 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 the 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 2001. 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.

Federal subsistence management includes a system of ten federally-funded Regional Advisory Councils (RAC's) to 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 FSB accepts proposals on an annual cycle, addressing proposals regarding federal fisheries regulations during their winter meeting.

In 2003, the FSB adopted new regulations to clarify customary trade practices of subsistence-caught fish, their parts, and their eggs. The rule protects the traditional practices of customary trade of subsistence-harvested fish, but reduces the potential for commercializing those fish by prohibiting customary trade with any business or re-sale by non-rural individuals. The new regulations allows customary trade transactions between rural subsistence users to continue but limit transactions between rural residents and others in that the fish sold must be used for personal or family consumption. The FSB also adopted two other proposals that 1) provide for the harvest of fish to be used in traditional religious ceremonies as part of a funerary or mortuary cycle (outside published seasons and harvest limits) and 2) allow the take of subsistence fish with rod & reel year round. In the current FSB cycle there are no proposals that affect the waters of the Tanana River drainage.

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 are 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.

Recreational angling effort, catch, and harvest of important sport fish species in Alaska has been estimated and reported annually since 1977 (Mills 1980-1994; Howe et al. 1995; 1996, 2001a-d; Walker et al. 2003; Jennings et al. 2004, 2006). This estimation is done through the statewide harvest survey (SWHS); a questionnaire mailed out to a random selection of sport fish license purchasers. Estimates for a particular year usually become available in September of the following year. Effort, catch, and harvest are estimated on a site-specific basis, but estimates of effort directed toward a single species and the resulting species-specific catch-per-unit-effort (CPUE) information are not provided by the report. Utility of the estimates is strongly dependant on the number of responses for a site (Mills and Howe 1992). Estimates based on 12 or fewer responses are useful only to document that fishing occurred. Twelve to 29 responses produce estimates useful for indicating relative order of magnitude and for assessing long-term trends, and estimates based on 30 or more responses generally provide estimates with reasonable variability.

This report summarizes fisheries information for 2002 and preliminary information for 2003. This report is organized into two major sections. Section I provides an overview of the Upper Tanana Management Area. Included are an area description, BOF activities, and information pertaining to management, stocking, research, and access program activities. Section II provides a more detailed summary of each fishery 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 an outlook for the 2004 fishing season.

SECTION I: MANAGEMENT AREA OVERVIEW

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 km2 (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 2002, sport-fishing effort in the Tanana River drainage was 108,462 angler-days (49.2% of the total effort in Region III and 9.8% of the State of Alaska total (Jennings et al. 2006). 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 Dolly Varden populations. 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.

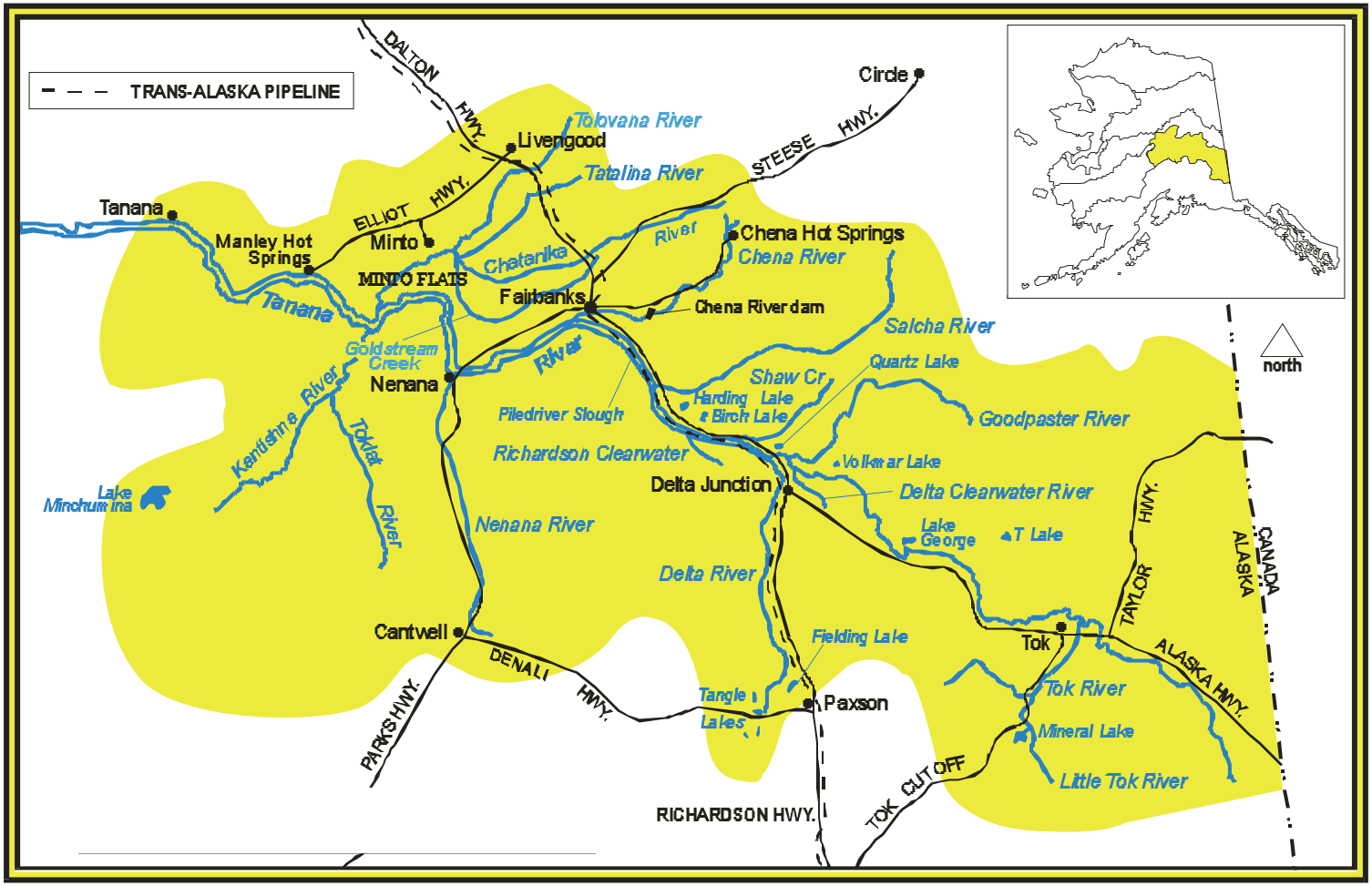

Figure 2.–Map of the Tanana River drainage.

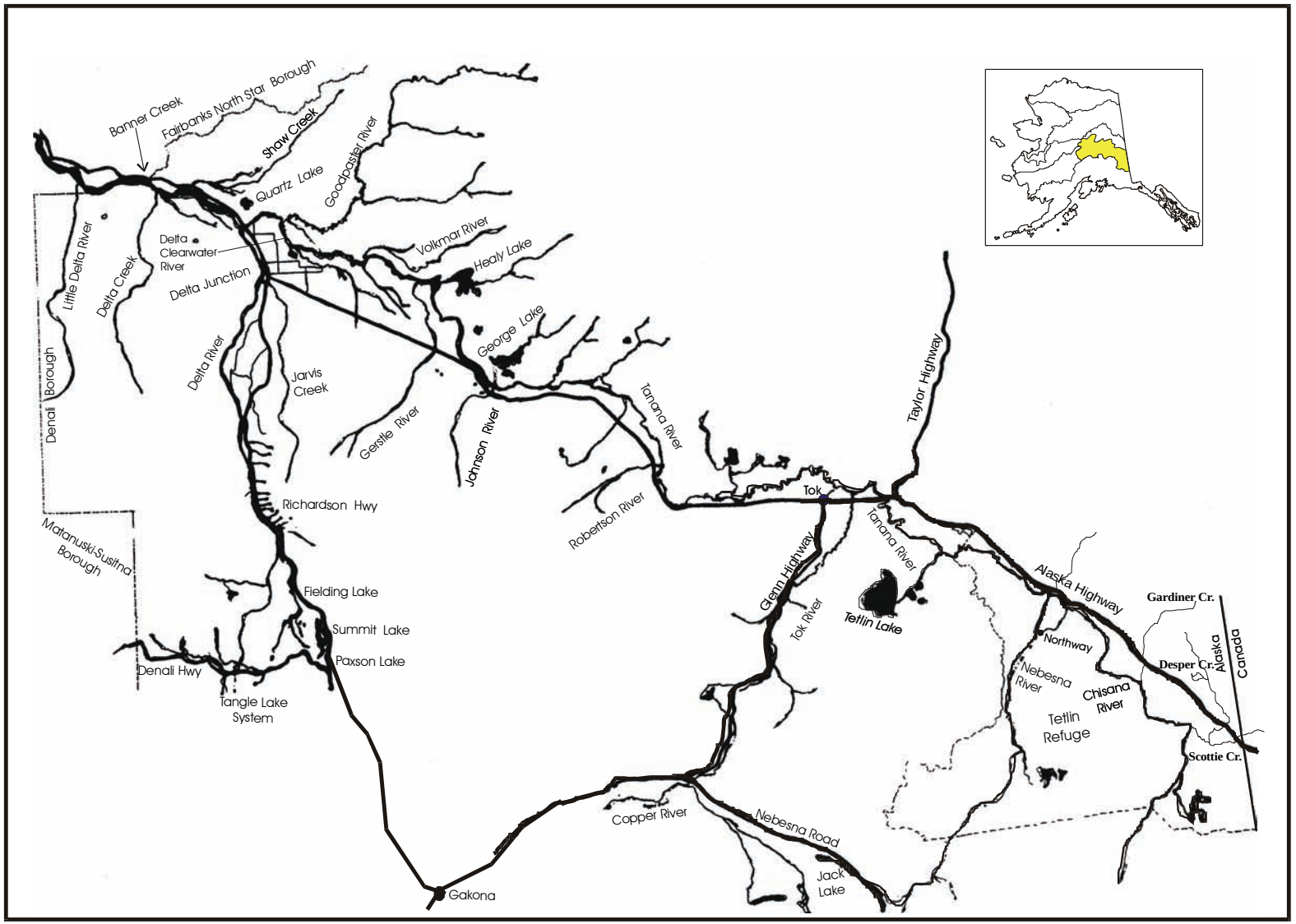

Figure 3.–Map of the Upper Tanana Management Area within the Tanana River drainage.

Recreational angling effort and harvest in the Tanana drainage has been estimated since 1977 using a mail-out survey (Mills 1980-1994; Howe et al. 1995-1996, 2001 a-d; Walker et al. 2003; Jennings et al. 2004, 2006). The survey is designed to provide estimates of effort, harvest, and catch on a site-by-site basis, but do not provide estimates of effort directed towards a particular species. These estimates between the upper and lower Tanana River management areas have been partitioned out and will be reviewed later in this report.

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. 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. 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 2003 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 under the Tanana River portion (5 AAC 70.022 d) of the Arctic-Yukon-Kuskokwim Area.

FEDERAL SUBSISTENCE REGIONAL ADVISORY COUNCIL

The secretary of the Interior appoints members of the Federal Subsistence Board (FSB). He also approves the members of ten Regional Advisory Councils (RACs). The FSB is responsible for Federal Customary and Traditional (C&T) use determinations and subsistence hunting and fishing regulations on federal lands and waters. The 10 Regional Advisory Councils receive regional requests for federal actions on subsistence desires and identifies subsistence needs, uses, methods, and recommend allocations of resources and regulations. The Upper Tanana Area is within the Eastern Interior Regional Advisory Council region (includes Game Management Units 12, 20 and 25). These regional councils until recently have only had to deal with wildlife issues on federal lands. However, the federal government took over fisheries management on federal waters October 1, 1999. This extended fishery jurisdiction to inland waters on federal selected land, federal lands selected but not yet conveyed, federal recreation and conservation areas, and federal forest additions. In addition, the Federal Subsistence Board may extend their authority off of federal land in certain circumstances that affect state resources close to federal waters.

The Eastern Interior RAC (Region 9) met in Nenana on March 25-26, 2002, and in Wasilla on October 16, 2003. The most recent ruling by the FSB for seasons, harvest limits, methods, and means of taking fish for subsistence uses during 2002 includes allowing the take of salmon for religious ceremonies and allowing hook and 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.

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) Fort Greely, (661,000 acres of US Military lands near Delta Junction); 3) Delta River Wild and Scenic River Corridor (37,000 acres, 62 river miles); 4) the Tangle Lakes Archaeological District (460,000 acres); and, 5) the headwaters of the Chisana and Nebesna rivers are with the Wrangle-St. Elias National Preserve adjacent to the Tetlin National Refuge.

FISHERY RESOURCE INVENTORY

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 1980-1994; Howe et al. 1995-1996, 2001a-d; Walker et al. 2003; Jennings et al. 2004, 2006). This cost-effective alternative to creel census information is important to fishery managers to maintain, protect or improve important fisheries. These estimates from the Statewide Harvest Survey (SWHS) report the number of angler-days of sport fishing effort expended by recreational anglers fishing Alaskan waters as well as estimates of 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 25,000 households containing at least one individual who purchased a 2002 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 2002 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 (Jennings 2006). 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.

RECREATIONAL ANGLER EFFORT, HARVEST AND CATCH

From 1977 to 2002, the majority (average 67.6%; Table 1) of sport effort in the AYK occurred in the Tanana River drainage. From 1977 to 2002, anglers in the Tanana drainage expended an average of 139,833 angler-days (Table 1; Figure 4). The fraction of statewide effort expended in the Tanana drainage in 2002 was 4.8%, below that of the 24-year average of 6.8% (Table 1).

Table 1.–Number of angler-days of sport fishing effort expended by recreational anglers fishing the Tanana River drainage, Statewide, and Region III waters, 1977-2002[a].

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
Average 1977-2002	139,833	2,066,015	6.8	206,895	67.6

[a] Mills 1980-1994; Howe et al. 1995-1996, 2001a-d; Walker et al. 2003; Jennings et al. 2004, 2006.

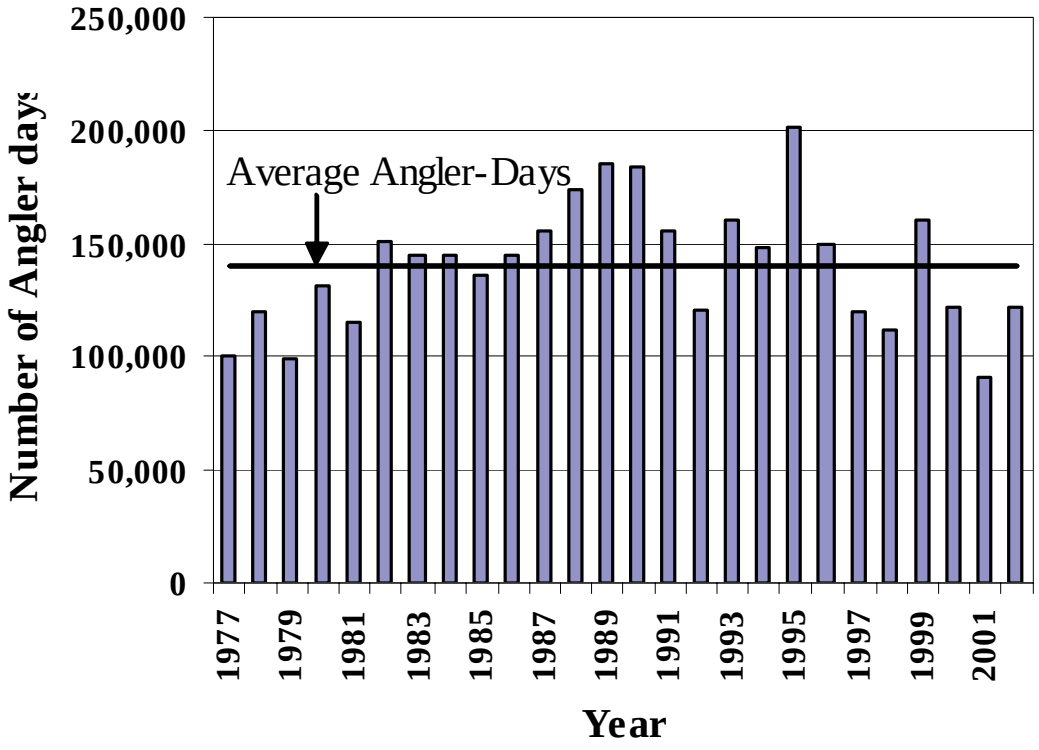

Figure 4.–Angler effort in the Tanana River drainage from 1977 - 2001.

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 number 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 (1998-2002), the number of anglers in the UTMA averaged 33% of the entire Tanana drainage while the number of trips averaged 26%, and the average number of angler-days averaged 34,395 or 29% of the Tanana drainage (Table 2). The number of angler-days in 2002 was 31,145, below the recent 5-year average of 34,395 (Table 2). From 1998 to 2002, the average harvest of 34,007 fish in the UTMA was 44% (Table 2) of the Tanana drainage total. In 2002, the harvest in UTMA (31,941) was less than the 5 year average (34,007).

Table 2.–Effort and harvest in the Tanana River drainage and Upper Tanana area, 1997–2002[a].

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%
Average 1998-2002	8,629	33%	19,285	26%	34,395	29%	34,007	44%

[a] Howe et al. 1995-1996, 2001a-d; Walker et al. 2003; Jennings et al. 2004, 2006.

From 1998 to 2002, recreational anglers in the Tanana River drainage harvested an average of 76,444 fish, accounting for an average of 2.4% of the annual estimated statewide recreational fish harvest and 47.2% 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 in the Tanana drainage compared to the 1998-2002 average of 76,444 (Table 4).

Table 3.–Five-year averages and remaining latest years of fish harvested by recreational anglers fishing Tanana River drainage, statewide, and Region III waters, 1977–2002**[a].**

Year	Tanana Drainage Harvest	Alaska Harvest	Percent Tanana Drainage of Alaska Harvest	Region III Harvest	Percent Tanana Drainage of Region III 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%
1998-2002	76,444	3,242,684	2.4%	161,831	47.2%

[a] Mills 1980-1994; Howe et al. 1995-1996, 2001a-d; Walker et al. 2003; Jennings et al. 2004, 2006.

Table 4.–Number of fish by species harvested by recreational anglers fishing Tanana River drainage waters, 1977-2002[a].

	Salmon				Non-Salmon									
Year	Chinook	Coho[b]	Coho[c]	Chum	Rainbow Trout	Lake Trout	Char[d]	Arctic Grayling	Northern Pike	Whitefish	Burbot	Sheefish	Other Fish	Total
							Harvests							
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
1998-2002	554	606	13,017	195	38,938	791	4,574	10,366	3,381	669	3,097	92	164	76,444
% of Total	0.7%	0.8%	17.0%	0.3%	50.9%	1.0%	6.0%	13.6%	4.4%	0.9%	4.1%	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%	

a Mills 1980-1994; Howe et al. 1995-1996, 2001a-d; Walker et al. 2003; Jennings et al. 2004, 2006.

b Anadromous salmon.

c Landlocked coho and Chinook salmon.

d Includes Arctic char and Dolly Varden.

From 1977 to 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 50.9% of the total Tanana drainage harvest over the past 5 years (Table 4) and 44.3% of the total Tanana drainage harvest in 2002 (Table 4). A total of 14,937, or 38.7% of the total Tanana drainage rainbow trout harvest were harvested in the UTMA in 2002 (Table 5). From 1998–2002 the combined average harvest of rainbow trout and landlocked coho salmon stocked in area lakes accounted for 67.9% 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 2002, combined, Chinook salmon, chum salmon, whitefish, sheefish, and other fish species accounted for a little over one percent of the total Upper Tanana area harvest in 2002 (Table 5).

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 2002[a].

Species	Tanana River Harvest	Upper Tanana Area Harvest	Percent UTMA of Tanana Harvest	Tanana River Catch	Upper Tanana Area Catch	Percent UTMA of Tanana Catch
Salmon:						
Chinook	478	0	0.0%	3,227	9	0.3%
Coho[b]	541	517	95.6%	5,694	5,442	95.6%
Coho[c]	17,693	5,625	31.8%	47,019	16,079	34.2%
Chum	307	0	0.0%	1,109	102	9.2%
Non-Salmon:						
Rainbow Trout	38,562	14,937	38.7%	108,597	39,330	36.2%
Lake Trout	709	624	88.0%	4,816	3,840	79.7%
Char[d]	6,645	2,270	34.2%	15,147	6,073	40.1%
Arctic Grayling	12,987	4,972	38.3%	177,070	63,422	35.8%
Northern Pike	3,436	1,380	40.2%	25,146	5,542	22.0%
Whitefish	1,086	280	25.8%	1,597	387	24.2%
Burbot	4,009	1,289	32.1%	4,869	1,565	32.1%
Sheefish	92	48	52.2%	98	48	49.0%
Other Fish	251	0	0.0%	278	0	0%
Total	86,796	31,941	22.5%	394,667	141,838	35.9%

[a] Jennings et al. 2004, 2006.

[b] Anadromous salmon.

[c] Landlocked coho and Chinook salmon.

[d] 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 2002, a total of 394,667 fish were caught in the Tanana drainage (Table 6) of which 141,838 (35.9%; Table 7) were caught in the UTMA. The proportion of fish caught in the UTMA in 2002 (35.9%) was lower than in 2001 (39.6%; Parker *In prep*.), however, more fish were caught during 2002 in the UTMA than in 2001. Recreational anglers in the UTMA kept 22.5% of their catch in 2002, similar to 22.0% of the catch harvested in the Tanana drainage (Tables 6 and 7).

In 2002, Arctic grayling were caught in the greatest numbers in the Tanana drainage while rainbow trout were harvested more in numbers than any other species (Table 7). In 2002, the catch of Arctic grayling was 177,070 and 108,597 rainbow trout were caught which is less typical of catches in past years. The harvest rate is much greater for rainbow trout in the UTMA (38%) compared to 7.8% for Arctic grayling (Table 7). UTMA burbot, which are typically harvested, rather than released, were harvested at a rate of 82.3% (Table 7) in the Tanana drainage and essentially the same in the UTMA at 82.4% (Table 7).

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. In January the management staff will discuss fishery by fishery the objectives and course of action if necessary 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. 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 2002 (Jennings et al. 2004, 2006).

Species	Catch	Harvest	Percent Harvested
Salmon:			
Chinook	3,227	478	14.8%
Coho[a]	5,694	541	9.5%
Coho[b]	47,019	17,693	37.6%
Chum	1,109	307	27.7%
Non-Salmon:			
Rainbow Trout	108,597	38,562	35.5%
Lake Trout	4,816	709	14.7%
Char[c]	15,147	6,645	43.9%
Arctic Grayling	177,070	12,987	7.3%
Northern Pike	25,146	3,436	13.7%
Whitefish	1,597	1,086	68.0%
Burbot	4,869	4,009	82.3%
Sheefish	98	92	93.9%
Other fish	278	251	90.3%
Total	394,667	86,796	22.0%

[a] Anadromous salmon.

[b] Landlocked coho and Chinook salmon.

[c] 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 2002 (Jennings et al. 2004, 2006).

Species	Catch	Harvest	Percent Harvested
Salmon:			
Chinook	9	0	0.0%
Coho[a]	5,442	517	9.4%
Coho[b]	16,079	5,625	36.5%
Chum	102	0	0.0%
Non-Salmon:			
Rainbow Trout	39,330	14,937	39.1%
Lake Trout	3,840	624	16.2%
Char[c]	6,073	2,270	38.1%
Arctic Grayling	63,422	4,972	8.1%
Northern Pike	5,542	1,380	22.6%
Whitefish	387	280	77.6%
Burbot	1,565	1,289	86.2%
Sheefish	48	48	100.0%
Other Fish	0	0	0.0%
Total	159,326	31,941	22.5%

[a] Anadromous salmon.

[b] Landlocked coho and Chinook salmon.

[c] 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 2002, only 37,998 salmon were caught commercially in the entire Yukon River drainage (Table 8). To protect low numbers of returning chum salmon ADF&G issued an emergency closure, so no commercial effort occurred on the later returning fall chum and coho salmon in the Tanana River drainage.

Table 8.–Commercial salmon harvest in Tanana River drainage and percent of Yukon River drainage harvest in 2002 (K. Boeck, Commercial Fish Biologist, ADF&G, Fairbanks; personal communication).

	2002		
Species	Tanana Total	Yukon Total	% Tanana
Chinook	1,066	24,430	4.4
Summer Chum	3,218	13,568	23.7
Fall Chum	0	0	0.0
Coho	0	0	0.0
Total	4,284	37,998	11.3

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.

The Tanana River from its confluence of the Gerstle River to the Little Delta River is crucial 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 seeps into the Tanana River, providing spawning habitat for fall chum and coho salmon, which are the last salmon species to spawn during the year.

The furthest major upriver Chinook spawning system is the Goodpaster River with Chinook entering the river in July. The most recent Chinook salmon aerial survey was completed July 25, 2003. The escapement count was performed by Northern Ecological Service personnel using a helicopter. Survey conditions were fair to good with varying cloud cover and clear water. A total of 2,952 live and 52 dead Chinook salmon were observed on 432 spawning redds (Morsell 2002). The number of Chinook salmon carcasses observed suggests that spawning may not have reached its peak, and the total peak run estimate may have been under estimated (Morsell 2002).

Limited commercial fisheries have occurred for freshwater species such as sheefish, burbot, northern pike and whitefish. The majority of the non-salmon harvest is from subsistence use. Commercial fisheries have existed for non-salmon species, particularly whitefish, however; no commercial permits were issued in 2002 and 2003 for the Tanana River drainage.

SUBSISTENCE AND PERSONAL USE SALMON HARVESTS

In 2002, combined subsistence and personal-use harvests of salmon in the Tanana River was 14,704 fish or 9.4% of the Yukon River total in 2002 (Table 9). Better than expected returns of Chinook and chum salmon in 2003 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. Subsistence and personal-use fisheries are allowed in most of the Tanana drainage. A subsistence permit is not required for non-salmonids species from the mouth of the Tanana River up to and including the Wood River. However, a subsistence permit is needed for northern pike in the waters of the Tolovana River upstream from its confluence with the Tanana River. Subsistence fishing is closed in the Tanana River from the eastern edge of the Salcha River upstream to the mouth of the Volkmar River on the North bank of the Tanana, and the mouth of the Johnson River on the South bank of the Tanana River. In the closed area, however, whitefish and suckers can be taken under the authority of a whitefish and sucker personal-use permit. 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.

Table 9.–Subsistence and personal use salmon harvest in the Tanana River drainage and percent of Yukon River drainage harvest in 2002.[a]

	2002		
Species	Tanana Total	Yukon Total	% Tanana
Chinook	1,193	42,746	2.8%
Summer Chum	687	72,436	0.9%
Fall Chum	3,205	19,393	16.5%
Coho	9,619	15,261	63.0%
Total	14,704	149,836	9.8%

[a] Brase and Hamner 2002.

The BOF in 2001 adopted a proposal 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 almost non-existent, 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 2003 were strong. The fall chum run size projection to the Tanana River of 230,000 fish was well above average. In addition the coho salmon run to the Tanana River was assessed to be well above average. Due to a limited market, commercial salmon fishing periods were only scheduled for Sub-district 6-B.

Catch-per-unit-effort of coho salmon caught in test fish wheels near Nenana indicates the strength of the coho escapement into upper Tanana River drainage spawning streams such as the Delta Clearwater River. The test wheels, which were swamped with coho salmon, indicated an extraordinary run developing in 2003.

The 2003 escapement index of 102,800 coho salmon is the largest recorded run into the Delta Clearwater River. The next highest run was in 1994 when 62,625 coho salmon were observed (Parker *In prep*).

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[1] 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 of Alaskan angler surveys 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 and 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 place on fisheries we can discern if the public benefit outweigh 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.

[1] Howe, A. L. Unpublished. Delta Clearwater River Valuation. Alaska Department of Fish and Game, Memorandum January 7, 1987, Anchorage.

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[a].

Population	Expenditures Per Trip	Adjusted Mean Net Economic Value Per Trip	Estimated Angler-Trips	Net Economic Value	Cost for Management and Research	Cost Benefit Ratio
Fisheries for all species in 1996 or FY97 budget cycle[a]						
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
Arctic grayling fisheries for 1996 or FY97 budget cycle[a]						
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
Burbot, northern pike, and lake trout fisheries for 1998 or FY99 budget cycle[a]						
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
Salmon fisheries for 1997 or FY98 budget cycle[a]						
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
Five largest stocked lakes in Tanana River drainage 1995 or FY96 budget cycle[a]						
All five stocked lakes	$54.54	--	75,689	$3,998,458		
Total				$3,998,458	$475,008	8

[a] John W. Duffield et al. 2001a-d.

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 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

The success of the interior Alaska stocking program has been largely due to the state hatcheries at Fort Richardson and Elmendorf near Anchorage. Today both hatcheries produce over five million fish (five species) for the benefit of sport anglers. During the last 10 years, production of sport fish species has taken precedence over anadromous salmonids at both hatcheries (Arvey et al. 1995). Fish production at both hatcheries is dependent on surface and ground water supplies and waste heat from associated power plants and these resources are not guaranteed. Because of production problems at the two existing state hatcheries, the Region III stocking program has developed a pilot hatchery in Fairbanks to test the feasibility of rearing fish using waste heat from local power production.

Rainbow trout are the dominant game fish stocked in the Tanana drainage, and are also the most harvested species (38,562) in the Tanana drainage during 2002 (Table 6). Other species stocked are Arctic char, Arctic grayling, and silver salmon. In the Upper Tanana area there are 48 lakes in the stocking inventory for 2002 and 2003. Quartz Lake is the largest lake both in size (600 acres) and recreational opportunity. There were 126,516 rainbow trout and 61,826 coho salmon stocked in Quartz Lake in 2003. About half the effort at Quartz Lake is during the open water months and half during the ice-covered period (ADF&G 2002). The remaining 47 lakes are considered part of the "small lakes sport fishery" and average 34 acres in size. These lakes are stocked either annually, or, in the case of the more remote lakes, every other year. New lakes suitable for stocking were recently added to the lake inventory. Kenna Lake in the Jarvis Creek drainage was stocked in 2000 with 500 sub-catchable lake trout. Square Lake in Mosquito Flats north of Tok was stocked in 2001 with 2,000 subcatchable Arctic char. Dude Lake is another candidate lake for stocking but has indigenous Dolly Varden present in small numbers.

ACCESS PROGRAM

The Wallop-Breaux amendment to the Federal Aid in Sport Fish Restoration Act mandates that at least 15% of Sport Fish Restoration Program funds 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. 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).

No major access projects were conducted in the Upper Tanana area during the reporting period. In February 1999, the department provided expertise to develop a rehabilitation project for three lakes on Fort Greely's Meadow's Road. Longnose suckers had become reestablished in the lakes (Chet, J, and Nickel). The U.S. Army paid to have a gabion structure built across the outlet of J-Lake and purchase chemicals (rotenone) to kill fish. The gabion was completed in August of 2000. The military has undergone an Environmental Impact Statement process and put the project out for public review. They did not receive any negative public feedback. In 2002, a permit was obtained from Department of Environmental Conservation to apply rotenone. In March of 2003 rotenone was applied to these three lakes.

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 is due to be operational by September 30, 2004. This requires completing the facilities at various dates from late 2003 into spring 2004 to allow subsequent equipment installation. Currently, it is projected that this time frame will be extended since the program may be 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. There is a need to stock more catchable size fish into the Fort Greely lakes along Meadows Road. This will allow less expansion of new fishing effort into the Upper Tanana area if that fishing pressure can be contained closer to the work project. Verbal angler reports including one from the army conservation officer indicate that heavy use of the Fort Greely Lakes occurred in 2003.

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 Army indicates this is their preferred option.

The development of North Texas Study Area expansion and configuration of the facility footprint, may exclude from the public from some of the 13 lakes stocked by ADF&G along Meadows Road. 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 formally filed comments to the Army through the Habitat Division.

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. This exploration has shown the potential for a significant deposit of minerals in 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 much of any mineral royalty 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 Lakes system, which is rich in sport fishing opportunity and has an annual average of 5,000 angler-days of use. The Delta River National Wild and 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.

Alaska Gas Producer's Pipeline

In 2001, the Alaska Gas Producer's Pipeline Team's (AGPPT) Alaska Highway alignment project conducted fish sampling on streams and rivers the proposed pipeline crosses. Much of the proposed route follows the TAPS oil pipeline within ½ mile. No further sampling activity occurred in 2002 or 2003.

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 L. Delta	Little Delta River	Arctic grayling	Fish distribute seasonally throughout the drainage, summer residence in clear spring tributaries.
	Delta Creek	Arctic grayling, whitefish, silver salmon	Fish distribute seasonally throughout the drainage, summer residence in clear spring tributaries.
	Kiana Creek (Between Little Delta River and Delta Creek)	Arctic grayling, whitefish	Important AG spawning stream
	100 mile Creek (Tributary to Delta Creek, 15.5 miles above mouth)	Arctic grayling	AG migrate to 100-Mile Creek for summer feeding and migrate out to Tanana for the winter
	Koole Lake	Rainbow trout	Stocked every other year
	Richardson Clearwater River	Arctic grayling, whitefish, silver salmon	Important AG fishery, coho - chum spawning stream.
	Rainbow Lake	Rainbow trout	Stocked every other year.
	Clear Creek	Arctic grayling, whitefish, silver salmon, chum salmon	AG summer residence, silver salmon spawning.
	Delta River	Arctic grayling, silver salmon, chum salmon	Important chum salmon spawning stream first two miles of river. Silver salmon. AG on Clear spring seeps.
East of Delta River	Delta Clearwater River	Arctic grayling, silver salmon, burbot, whitefish, chum salmon	Important AG fishery, silver and chum salmon spawning stream, high resident population of round whitefish.

Pogo Mine

Gold exploration has lead 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 pubic comments taken through the summer of 2003, it appears all the concerns have been addressed and the various permits will be issued in time to build a winter road to Pogo to prepare for mining.

Starting in 1998, Teck-Pogo 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, 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. In the Upper Tanana area, a Fish and Wildlife technician 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. An informational brochure was completed for the Meadows Road stocked lakes area. 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) provides several annual aquatic education opportunities for the school district. For example, schools from Fairbanks to Tok participate in collecting coho eggs from the Delta Clearwater River. 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 2003, live coho salmon were taken from the Delta Clearwater River to Fairbanks to expose more schools to the program. The information and education program has developed a structured I&E plan with three goals. The goals are to maintain an effective professional trained staff, encourage participation in sport fishing, and build support for angling and management policies (Greiner 2001).

SECTION II: UPPER TANANA AREA RECREATIONAL EFFORT

The Statewide Harvest Survey (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 2002, a total of 21,801 anglers took 62,945 trips for a total of 108,462 angler-days reported for the Tanana drainage statistical area "U". Of the Tanana drainage total in 2002, 31,145 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 21,801 anglers fished the Tanana drainage in 2002 and 33% (7,763) of them fished the Upper Tanana area (Table 2). In 2002, anglers took a total of 62,945 trips in the Tanana drainage and 26% (16,145) of those trips were in the Upper Tanana area (Table 2). Anglers in the Upper Tanana area harvested 37% (31,941) of the total Tanana drainage harvest of 86,796 (Table 4). Effort data between the two management areas has only been extracted since 1996 and is relatively consistent, averaging 29% from 1998 to 2002 (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 accessible (Figure 5), and has the largest recreational fishery for coho salmon in the Tanana River drainage (ADF&G 1993). Effort estimates targeting coho salmon are not available from the SWHS, however data from mail-out surveys conducted in 1994 and 1995 indicate that 21% of the effort for the Delta Clearwater was directed at coho salmon in 1995 (Howe and Fleischman 2001).

Escapement counts of coho salmon are accomplished by a boat survey. The boat survey count is expanded by 21.3% to account for coho in spring areas of the river not accessible by boat (Table 13). From 1977 to 2002, 97% of the coho salmon sport harvest in the Tanana drainage came from the DCR (Tables 12 and 14). 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 occurs in mid-October. Property owners living near the spring have reported coho salmon spawning as late as January. The spring influence provides 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 were 4 years of age, 14% were 3 years and the remaining 7% were 5 years of age (Parker 1991). The majority of coho fingerling rear in the DCR for 3 years before smolting, and spend 1-year in the ocean before returning. 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.

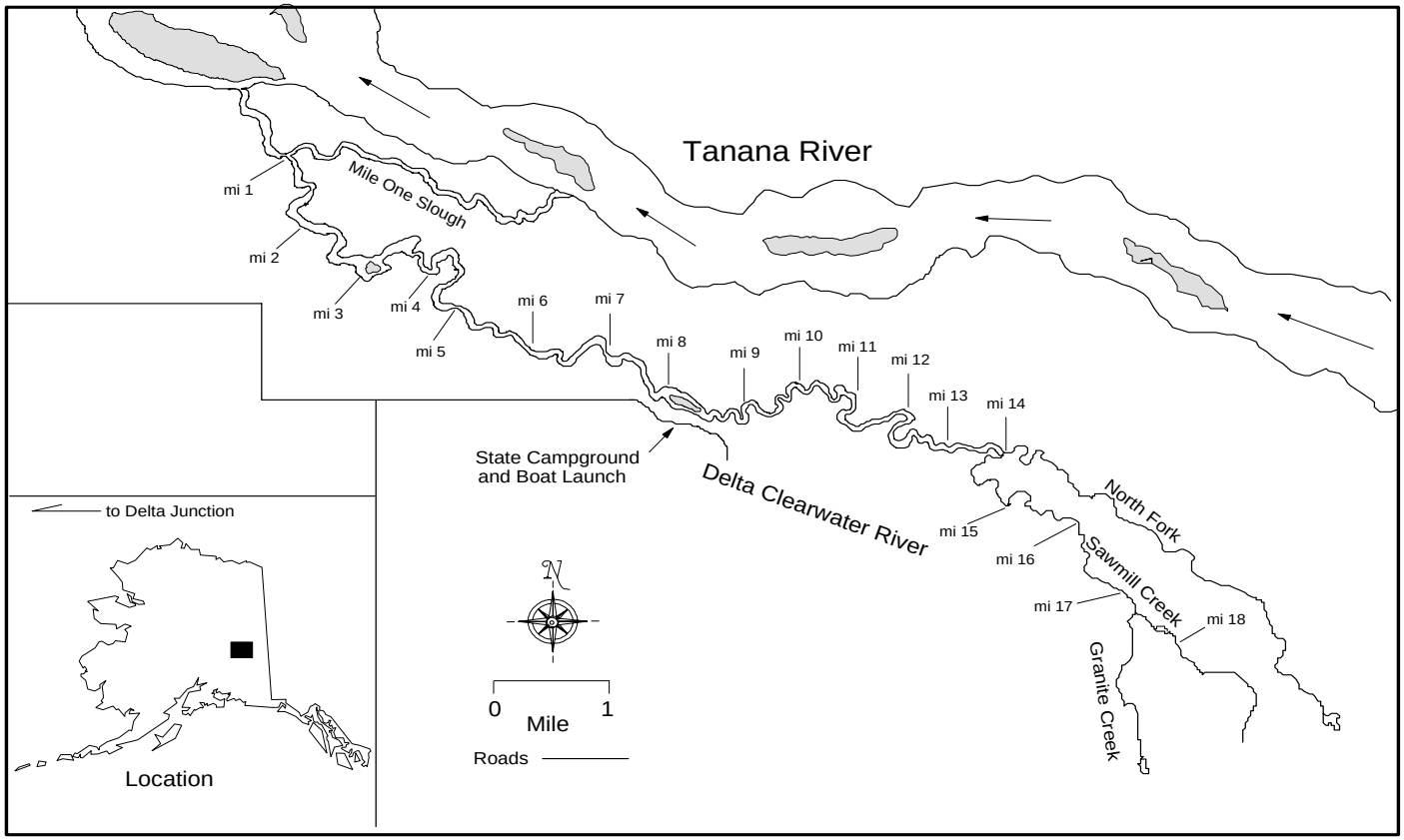

Figure 5.–Map of the Delta Clearwater River.

Table 12.–Delta Clearwater River coho salmon escapement effort, harvest, and catches from the Statewide Harvest Survey, 1977-2003[b].

Year	Coho Salmon Escapement[a]	Angler-days[b]	Harvest and Exploitation	Coho Salmon 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	2,161	794 (6.9%)	4,174
2002	38,625	4,580	517 (1.4%)	5,311
2003	102,800	..	..	..
Average 1998-2003	41,700	4,255	430 (0.01%)	3,337

[a] Estimates of escapement from river boat surveys only.

[b] Mills 1980-1994, Howe et al. 1995, 1996, 2000a-d; Walker et al. 2003; Jennings et al. 2004, 2006.

Table 13.–Boat count surveys and aerial surveys of the non-navigable portion of the Delta Clearwater River for 1994-1998 and expanded counts including 1999-2003.

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[a]	13,942[b]	21.3%[c]
2000	9,225	2,494[a]	11,719[b]	21.3%[c]
2001	46,875	12,013[a]	58,888[b]	21.3%[c]
2002	38,625	10,441[a]	49,066[b]	21.3%[c]
2003	102,800	27,791[a]	130,591[b]	21.3%[c]
Average 1994-2003	25,013	6,762	31,776	21.3%

[a] Total Delta Clearwater River escapement total using a expansion factor of 21.3%.

[b] Expansion factor (21.3%) to applied to average boat survey counts.

[c] 1994-1998 average.

Table 14.–Commercial, subsistence, personal use, and sport fish coho salmon harvests for the Tanana and Yukon rivers for 2002.

Year	Commercial Fish		Subsistence/ Personal Use		Tanana Sport Harvests	Tanana Total Harvests	Yukon Total Harvests	DCR Coho Escapement
	Yukon	Tanana	Yukon	Tanana				
2002	0	0	15,261	10,079	560	10,639	15,821	49,066[a]
Average 1977-2002	31,788	4,831	29,984	13,422	821	18,558	62,593	19,688[a]

[a] Total Delta Clearwater River escapement total using a expansion factor of 21.3%.

Escapement counts are completed on 17.5 miles of navigable water from an elevated platform on a riverboat. Aerial surveys have also been used to estimate escapement into non-boatable portions of the river from 1995 to 1998 (Stuby 1999). Preliminary 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 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 1.4% of the total escapement was harvested in 2002 (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. The increasing coho salmon effort has occurred at the same time as a decline in the Arctic grayling fishery. Initially 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 5,311 in 2002 is the largest ever recorded (Table 12). This demonstrates that anglers remain interested in participation but less in keeping their catch. The salmon flesh is not of the same quality as fish caught at the mouth of the Tanana River or lower Yukon River, and therefore the proportion of coho salmon harvested remains low.

The biological escapement goal (BEG) for the DCR is 9,000 coho salmon (ADF&G 1993). The boat-count escapement index in 2003 was 102,800 with an expanded count of 130,589 (includes tributaries not counted by boat; Table 12). Chum salmon escapements in lower Yukon/Tanana River fisheries were better than in previous years and commercial and subsistence fisheries were allowed. However, since these fisheries were curtailed for several years it appears that participation in these fisheries was weak. This may have been, in part, because buyers of commercially caught fish were not available. Given low numbers of harvested fish the coho salmon escapement to the spawning grounds was high. The 2003 boat count of coho salmon (102,800, Table 12) into the DCR was the largest since counts were initiated in 1972. It is possible that over-escapements could affect the production capacity of this relatively small system. The boat count was conducted on October 21 under favorable viewing conditions. About 5% of fish observed were carcasses. The timing of the run appeared to be normal.

Arctic grayling apparently change their migratory behavior to respond to large runs of coho salmon. About 6,600 Arctic grayling were estimated from mile 14 down to the mouth of the DCR. In 2000, only 1,000 grayling were estimated visually, the numbers increased to 5,000 in 2001 and 2002 and even greater in 2003.

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, 1996; Evenson and Stuby 1997; Stuby and Evenson 1998; and Stuby 1999). Estimated coho salmon escapement (including aerial survey of spring areas) for the DCR in 2002 was 49,066 and in 2003 was 130,589 (Table 13). The average proportion of 21.3% (Table 13) is applied to future boat counts for an expanded total escapement count.

Average total escapement (expanded count) since 1994 has been 31,776 (Table 13) far above the average total escapement since 1977, which is 19,688 (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). In the Yukon River drainage, no commercial catch occurred during 2002, whereas average commercial catch was 31,788 from 1977-2002 (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). These boat counts are conducted on the navigable portion of the river from the confluence of the Tanana River to approximately 17.5 river miles upstream. The average expanded count from 1977 to 2002 in the DCR is 19,688 fish (Table 14).

The department monitors the escapement between mid-September and early October to determine if any in-season management action is necessary. A management objective of 1/3 of the escapement goal (3,000 salmon) counted in the lower eight miles of river would be required for no action to occur (Figure 5). If achieving the escapement goal in the DCR is unlikely based upon counts below the in-season objective in conjunction with low numbers in the lower Yukon sonar and the Nenana test fish wheels, the department will close the fishery to the retention of coho salmon.

In 2003, larger than average fish wheel catches on the lower Tanana River and angler reports of coho salmon in the DCR earlier than normal indicated the potential of a large run. These were confirmed by the largest coho salmon escapement ever documented for the DCR in 2003

FISHERY MANAGEMENT

Unless there are lower-river fisheries that target coho salmon in the future, additional sport harvests could be sustained in the DCR coho salmon sport fishery. Harvest rates are low and more anglers are practicing catch-and-release. An increase in the bag limit is potentially warranted but few anglers are likely to take advantage of it. In 2003, record numbers of anglers were on the river in late September and October, many using boats to fish the river. The increase was likely due to unseasonably warm weather and the strong coho salmon run. No management action occurred in the sport fishery in 2003.

FISHERY OUTLOOK

In 2003, a record number of coho salmon returned to the DCR based upon an average parent year escapement of 12,000. Next years the run will be based upon a parent escapement of nearly 60,000 fish. If the 2004 lower river fisheries are similar to 2003, it is possible to have an even larger escapement to the DCR in 2004. Successive runs with large parent years may continue producing large number of coho salmon. General observations by the area biologist as well as public members indicated large numbers of juvenile coho salmon in 2003.

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. 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. Coho salmon numbers from the Yukon River sonar, test fishing indices, and subsistence reports indicate that there is the opportunity for some coho salmon fishing in the Tanana River.

Some local residents are concerned over calling more attention to the Delta-Clearwater River by increasing bag limits. Increased boat traffic on this small river could potentially cause riparian damage and disturb spawning fish.

ONGOING AND RECOMMENDED RESEARCH AND MANAGEMENT ACTIVITIES

Preliminary lower DCR survey (mid September) and 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 believed that exploitation of the DCR stock is substantial. The Tanana River coho salmon harvests in all fisheries (sport, commercial, subsistence, and personal-use) averaged 18,558 from 1977-2002 and 62,592 for the entire Yukon River fisheries (Table 15). In 2002, the entire Yukon River coho salmon fishery harvest was 15,802 and the DCR coho escapement was 38,625 (Table 15). Annual harvests of DCR coho salmon are found in Appendix C2.

Table 15.–Tanana and Yukon rivers coho salmon fishery averages as percent of DCR coho salmon escapement, 1977-2002.

Years	DCR	All Harvests[b]	
	Coho Escapement[a]	Tanana River	Yukon River
1977-1981	7,894	6,953	38,055
1982-1986	11,093	18,196	83,165
1987-1991	22,543	34,387	114,802
1992-1996	28,569	20,782	57,867
1997-2001	17,940	10,782	28,430
2002	38,625	10,060	15,802
1977-2002	15,518	18,558	62,592

[a] Delta Clearwater River boat escapements only.

[b] Includes commercial, subsistence, personal use and sport caught fish.

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 clear springs maintain cool water temperatures 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 spring systems is strong. The abundance of grayling populations within donor streams will determine how many fish migrate to spring 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 from 1984 to 1996. Abundance of grayling (age-5 and greater) averaged 8,600 from 1977-1989. Abundance declined to a low of 2,750 fish in 1996 (Ridder 1998a) (Figure 6). The population has increased to 6,891 fish in 2000, likely a result of restrictive regulations (Figure 6; Gryska 2001). A summary of Arctic grayling abundance estimates in the DCR are found in Appendix C1.

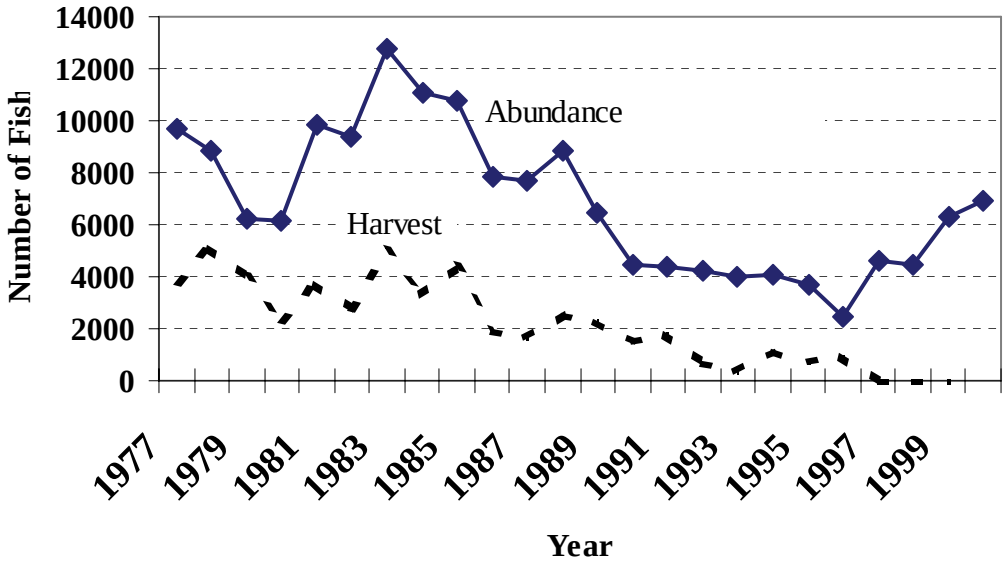

Figure 6.–Abundance of age-5 Arctic grayling in the Delta Clearwater River from 1977-2000. Data from Mills (1980-1994), Howe et al. (1995, 1996, 2001a-d), and Walker et al. (2003).

Average exploitation on the DCR grayling population from 1977 through 1990 was 37.6%. As indicated by the steady decline in the DCR population the high harvest likely exceeded sustainability due to fluctuations in abundance of grayling in populations that summer in the DCR from up to eight nearby rivers. 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 1998.

Despite the decline in population numbers, DCR Arctic grayling appeared healthy to anglers because of the large average size of fish. The recent increase in the population and increasing average size have created a trophy fishery. Recent catch rates have been as high as 16,135 in 1998 (Howe et al. 2001a). However, while the DCR has been transformed into a trophy catch-and-release Arctic grayling fishery, there are anglers who still desire to harvest grayling. This was evident by the fact 17 proposals were submitted to the BOF in 2000 to allow some level of harvest. As a result, in 2001 a regulation was adopted with a restrictive bag limit of one grayling (open season from July 10 – August 9) with a maximum length of 12 inches. These changes have allowed some opportunity for harvest on the DCR Arctic grayling population.

RECENT FISHERY PERFORMANCE

Angler effort declined in the DCR as the grayling population declined. Angler effort from 1977-1986, averaged approximately 6,500 angler days, a majority of which is believed to target Arctic grayling (Ridder 1999). From 1997-2001 effort declined to an average of 3,720 angler days (Table 16).

Under the current bag and possession limit of one fish (<12 inches) and an open season from July 10 - Aug 9 for the DCR a small harvest of 51 (<12 inches) fish was reported in 2002 (Jennings et al. 2004, 2006; Table 16). Grayling catch rates averaged 7,211 grayling from 1992-1996 and 10,767 from 1997-2001 (Table 16). In 2002, 12,913 grayling were caught (Table 16). Annual harvest of DCR Arctic grayling are found in Appendix C2.

Table 16.–Number of Arctic grayling harvested and caught by recreational anglers fishing the Delta Clearwater River from 1977-2002.[a]

Years	Average DCR effort	Average grayling harvest	Average grayling catch
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
1977-2002	5,285	2,840	9,479

[a] Mills 1980-1994; Howe et al. 1995, 1996, 2001a-d; Walker et al. 2003; Jennings et al. 2004, 2006.

MANAGEMENT OBJECTIVES

Objectives have been updated from those made in 1993 (Parker 2003a) and will be used by ADF&G to manage 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 greater. In 2000, 54% of the measured population was 14 inches or greater. 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 of fish less than 12 inches not exceeding 900 fish.

In addition to maintaining large fish in the DCR new BOF 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. 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. The number of fish harvested can be estimated from the SWHS. In 2001, new BOF regulations allow for a harvest of 1 fish per day, less than 12 inches TL in size, from July 10 to August 9th. The timing of the open season avoids potentially high harvests during the 4th of July weekend. In 2001, 91 Arctic grayling were harvested (Jennings et al. 2004, 2006) and of these 44 were greater than 12 inches. In 2002, 51 Arctic grayling were caught less than 12 inches (Table 16). The low harvest of small fish can be explained by the evident preference to release fish. In 2002,

anglers caught nearly 3,500 small fish (<12") and the harvest of fish caught was not significant (<2%). If this trend continues, the season could be lengthened to provide more opportunity to catch small fish.

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 Statewide Harvest Survey (SWHS). Approximately 72% of the DCR angler-days were directed on Arctic grayling in 1995 (Howe and Fleischman 2001). Angler-days on Arctic grayling increased from 1,642 in 1997 to as high as 4,336 in 1999. With current management objectives, angler-days will likely continue to increase despite aberrations such as in 2000 when effort declined to 2,012 days. In 1998, effort was 2,600 angler days with a catch rate of 6.2 per day and declined to 2.7 in 1999 when days nearly doubled to 4,300. The lowest catch rate on Arctic grayling in the DCR was 1.26 fish per angler day in 1995. The lowest number of angler days directed on Arctic grayling was 1,642 in 1997. If 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 effort in the DCR initially experienced a decline (Parker and Viavant 2000). In 2002, the number of angler-days was above the recent 5-year average (1997-2001) which is likely a result of the regulation change in 2001. Since harvest was very small it is more likely that more anglers are attracted to the catch-and-release quality of the fishery. The catch in 2002 was higher than the recent 5-year average (Table 16).

It is assumed that the Arctic grayling regulations in the DCR will not need to be changed if all three objectives mentioned above are being met. To determine if objective 1 is met length and age composition of the measurable population will be estimated every 3 years through stock assessment. Whether objectives 2 and 3 are met will be assessed through estimates of harvest, catch, and effort obtained from the Statewide Harvest Survey. When any one of the objectives are not met, the department will evaluate whether additional assessment is necessary and determine if there is a need to propose a change in regulation during the next regulatory cycle.

FISHERY OUTLOOK

An increase in the 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 (approximately 12 inches) in fork length, 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).

Based on recent stock assessment, larger fish appeared across several age classes increasing the population of large size fish that inhabit choice habitat areas. If large size fish continue to occupy the DCR, and continue to increase 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 adopted a proposal at the December 1997 meeting for the DCR fishery. This proposal changed Arctic grayling regulations in the DCR to catch-and-release only and allow only unbaited, single-hook artificial lures from January 1 through August 31. Unbaited, artificial lures are permitted the remainder of the year to allow the use of this gear during the coho salmon fishery. This regulation includes the Delta Clearwater River and the Clearwater Lake drainage to avoid enforcement issues (Figure 7).

The BOF adopted a proposal during the January 2001 meeting to allow a one fish daily bag and possession limit. The open season for Arctic grayling is 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. Gear restrictions remained the same. This proposal was adopted due to large public support to allow some harvest opportunity for Arctic grayling in the Delta Clearwater River. A complete chronological review of regulation changes on the DCR can be found in Appendix B1.

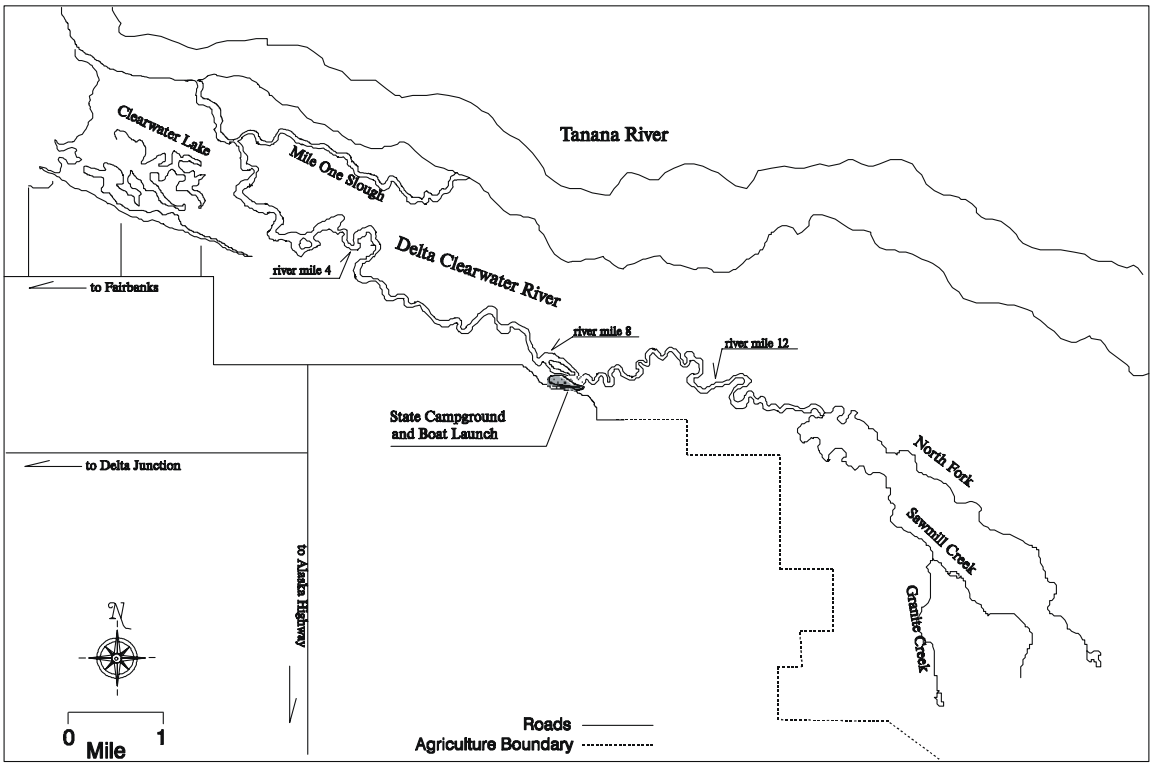

Figure 7.–Map of Delta Clearwater River and Clearwater Lake.

CURRENT ISSUES

Concerns have been raised that illegal harvest will increase with restrictive bag, size, and season limits.

Catch rates are very high in the DCR averaging nearly 15,000 over the past 5 years (Table 16). The catch rate is nearly double the population size indicating many fish are being caught multiple times given the relative small amount of access to the river. 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.

Due to the high catch rates the Delta Fish and Game Advisory committee submitted a proposal to the BOF in 2001 to allow only barbless hooks. The committee believed that less physical injury occurs from barbless hooks. Personal testimony from the public indicates ease of hook removal if barbless. One study (Taylor and White 1992) indicated fish caught on barbed hooks had a higher mortality rate than fish caught on barbless hooks; however, Schill and Scarpella (1997) synthesized numerous studies, and found no significant differences in mortality of fish caught with barbed and barbless hooks. The advisory committee concerns were likely less to do with mortality rate rather the condition the fish is in. Due to inconclusive data supporting the proposal, it was not adopted.

ONGOING AND RECOMMENDED RESEARCH AND MANAGEMENT ACTIVITIES

Continued assessment to evaluate the management objectives is recommended.

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 modifications to the project were done in 2001. Ongoing plans for the watershed are pending new engineer surveys of the watershed.

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: GOODPASTER RIVER ARCTIC GRAYLING

BACKGROUND AND HISTORICAL PERSPECTIVE

Arctic grayling is the primary sport fishery on the Goodpaster River. To a lesser extent northern pike, whitefish, and burbot are also caught and harvested. The Goodpaster River supports small anadromous runs of Chinook and chum salmon, but fishing for salmon is closed. Maintaining healthy stocks of Arctic grayling in the Goodpaster River is essential to maintaining the Goodpaster River fishery, and this stock also contributes to large grayling fisheries that take place in the Delta and Richardson Clearwater rivers. 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, many owning cabins located on the 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^2, and flows southwest for 140 miles to its confluence with the Tanana River 10 miles north of Delta Junction (Figure 8). This river has 13 named tributaries,

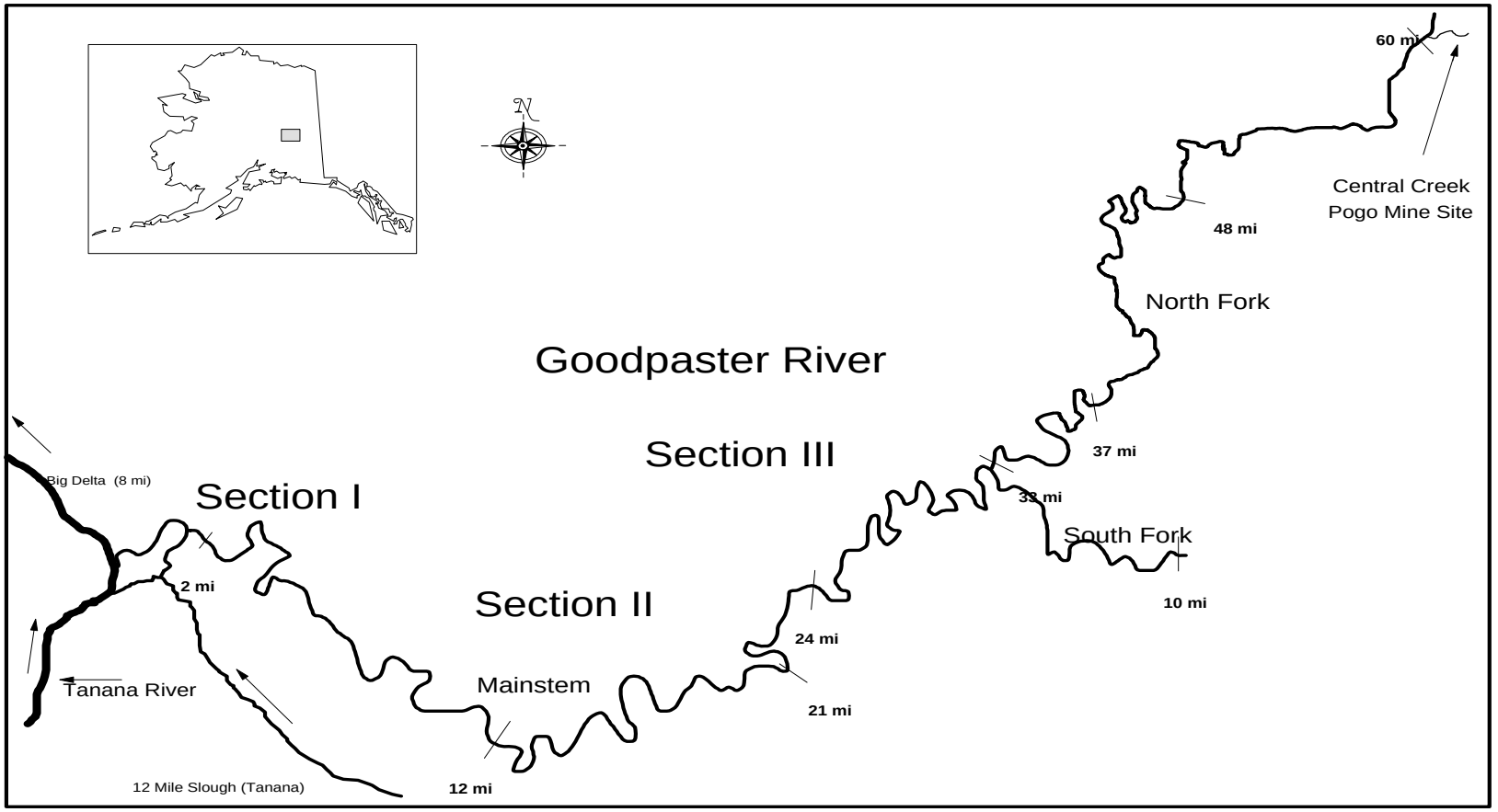

Figure 8.–The Goodpaster River**.**

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 (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. Access to the Goodpaster River during the winter is via snow machine 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 has not been used since however, Tech-Pogo plans to reopen the road in winter of 2003 to haul equipment to the mine in preparation for road construction in 2004. 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) has the potential to impact the habitat of the Goodpaster River. With the potential of mining in the upper watershed, monitoring of the Arctic grayling adult population with funds supplied by Teck-Pogo Incorporated began in 1998.

RECENT FISHERY PERFORMANCE

The Goodpaster River Arctic grayling sport fishery occurs primarily in the lower 33 miles of the river. From 1998-2002, sport harvest of Arctic grayling from the Goodpaster River averaged 537 fish of which 299 were less than 12 inches in length and 238 were greater than 12 inches. The average catch of Arctic grayling during the same 5-year period was 2,608, of which 1,798 fish were less than 12 inches and 809 were greater than 12 inches (Table 17). 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 1,489 angler-days from 1983-2002 (Table 17). Catch data first estimated in 1990 shows an increasing 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 based upon use patterns on the river. The typical angler owns a cabin on the Goodpaster River and will fish near their place of residence. Anglers mostly use spinning rods with spinners or casting lures, keeping what grayling they catch for immediate consumption. 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.

Table 17.–Estimates of effort, harvest, and catch for Arctic grayling and other species in the Goodpaster River, from the Statewide Harvest Survey, 1983-2002[a].

		Harvest Grayling		Total Grayling	Harvest			Catch Grayling		Total Catch	Catch		
Year	Anglers Days	<12"	>12"	Harvest	Pike	Burbot	Whitefish	<12"	> 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	919	41	188	229	0	0	0	693	653	1,346	0	0	0
Averages													
1983-2002	1,489	292	306	1,068	20	61	37	1,699	953	2,652	99	32	38
1998-2002	974	299	238	537	4	33	0	1,798	809	2,608	33	51	0

[a] Mills 1984-1994, Howe et al. 1995, 1996, 2001a-d; Walker et al. 2003; Jennings et al. 2004, 2006

FISHERY MANAGEMENT

Seasonal migrations and stratified summer populations demonstrated in the Goodpaster River Arctic grayling population must be considered in management planning. Extensive migrations occur 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. These migrations can result in mixed-stock populations in waters supporting popular summer fisheries, for example, the Delta Clearwater River and Richardson Clearwater River. Designing management programs and setting regulations for such fisheries without quantifiable knowledge of migrations, the number of stocks involved, and their respective recruitment, may result in a loss of opportunity for anglers or over-exploitation of the stocks.

The Goodpaster River Arctic grayling harvests consists primarily of juvenile and sub adults (fish less than 270 mm FL) in the lower 33 mi (50 km) of the river during June through August. Adults comprise a majority of the population (75%) present in the lower 33 miles of the Goodpaster River in May (Ridder 1998b). When Arctic grayling have completed spawning by the third week in May, about a quarter of Goodpaster stock migrates to the DCR while most the remaining fish move upstream (Ridder 1998b). In summary, these adult Arctic grayling are subjected to fishing effort and harvest in other rivers besides the Goodpaster River and perhaps to a lesser extent in the Goodpaster River during the summer (Tack 1974).

Fluctuation in populations of Arctic grayling in rivers is not unusual. Variability in recruitment, due to spring floods has produced a "boom and bust" situation for many grayling stocks in the Tanana River drainage. Typically when water levels are normal or flood events are minor, recruitment is good, conversely when events associated with high discharge such as occurred in the late seventies and early eighties declines in Arctic grayling abundance occurred throughout the Tanana River drainage.

MANAGEMENT OBJECTIVES

The objective for the Goodpaster River recreational fishery is:

To maintain the Arctic grayling population such that fish numbers do not fall below 9,000 fish (greater than or equal to 270 mm fork length) in the assessed portion of the river in May.

The abundance of adult (>12 inches) Arctic grayling in the Goodpaster River was 12,616 fish in 2002 (Table 18). Total harvests of Arctic grayling that exceed 15% of the average population size annually may indicate overexploitation. If the Goodpaster River Arctic grayling abundance falls below 9,000 fish then regulatory action may be needed to reduce harvest. 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 of grayling (60%) to the DCR was the Goodpaster River (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 a 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. Additional information concerning the Goodpaster River and fisheries management is found in the 2002 updated Arctic grayling Management Plan for the Goodpaster River (Parker 2003a).

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

Year	GPR Abundance[a]	GPR Harvest in DCR[b]	Harvest in GPR[c]	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[d]	474	474	0.056
1999	14,808	0[d]	176	176	0.010
2000	12,442	0[d]	42	42	0.004
2001	14,437	44[d]	325	369	0.023
2002	12,616	0[d]	188	188	0.015
Mean	12,502	127	303	429	0.039

[a] Spring abundance in the first 33 miles of the Goodpaster River for fish ≥270 mm FL (12 inches), using the Jolly-Seber and Peterson estimates (Parker 2003b).

[b] Assuming 60% of the Delta Clearwater River summer stock adults of Goodpaster River origin (Ridder 1998b).

[c] Total harvest of grayling >12 inches as reported in Howe et al. 1995, 1996, 2001a-d; Walker et al. 2003; Jennings et al. 2004, 2006.

[d] Catch-and-release only regulation for the Delta Clearwater River starting in 1997.

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

Without large harvests in the DCR it would stand to reason that Goodpaster River Arctic grayling population would increase, when in fact it appears to remain fairly stable (Table 18). It is suspected that either several years of low flows (because of below average precipitation) have reduced the population's productive potential 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.

FISHERY OUTLOOK

Outlook for the Goodpaster River is optimistic. Higher water levels over the past 2 years may provide better habitat for juvenile Arctic grayling and thus a higher level of production.

BOARD OF FISHERY ACTIONS

No recent BOF actions have affected the Arctic grayling fishery on the Goodpaster River. The regulations are the standard background regulations for Region III with no season or gear restrictions.

CURRENT ISSUES

Through a public process DNR made allowance in 1998-1999 to permit the use of an RS2477 winter trail that crosses the lower river 13 times to assess the Pogo mining site above Central Creek. This winter road will again be put to use in 2003-2004 and in 2004, plans are to construct an all-season overland road from the Shaw Creek area or Quartz Lake to the Pogo site.

Historically, very little fishing occurs in the upper Goodpaster River above Central Creek. The establishment of the mining camp on the river at the Pogo site may increase harvest and effort. A policy for Pogo-Teck employees at the site prohibits fishing by workers while on site. 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 use.

ONGOING AND RECOMMENDED RESEARCH AND MANAGEMENT ACTIVITIES

The Arctic grayling population in the Goodpaster River will be deemed healthy if the current management objective is met. Management data that are needed include: 1) an estimate of the spawning population of GPR pre-migrating stock; 2) estimate of harvest of Arctic grayling in the Goodpaster River and other rivers where fisheries exist on the Goodpaster River stock; 3) the estimated level of exploitation that can be allocated to satellite fisheries; and, 4) the estimated 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. Harvests of the Goodpaster River stock in other rivers are difficult to obtain and some assumptions are required.

The following evaluation tools are needed.

1. Baseline monitoring of the Arctic grayling population with development of the Pogo mine in the upper watershed.

ADF&G will discontinue multi-year Jolly-Seber estimates of abundance of the adult Arctic grayling population. ADF&G plans to add to the baseline information by estimating abundance in 2003 above and below the mine site. The objective is obtaining density information to evaluate the effects of mining operations in the upper watershed. Objectives for this study are to estimate the abundance and age and length composition of fish >269mm FL.

2. Establish a research plan to learn about distribution and estimate Arctic grayling abundance in the entire Goodpaster River drainage.

Extensive mining exploration is occurring in the remote upper watershed. Over 500 square miles to date have 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 graying 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 the Arctic grayling population in the rest of the drainage, a drainage-wide study of abundance and distribution is required. Data collection needed includes: 1) distribution of grayling in the upper watershed to Eisenmenger Creek during the summer; 2) estimate of the 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); and, 4) juvenile salmon habitat studies (currently funded by Teck-Pogo). These projects, although not a complete list, will help track changes should issues effecting 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, and the Tangle lakes. In addition, lake trout have been transplanted in several Upper Tanana area lakes: Crystal Lake #1, Kenna, Ghost, Nickel, and North Twin lakes along the Meadows Road (Fort Greely); Paul's Pond along Coal Mine Road; Kenna Lake in the Jarvis Creek drainage; and, Four Mile Lake on the Taylor Highway. The last lake trout egg-take for the interior stocking program was 1999 at Sevenmile Lake. Lake trout take over a year to rear in the hatchery because of the late egg-take timing. ADF&G has abandoned using lake trout in their stocking program until adequate room in the state hatchery exists.

RECENT FISHERY PERFORMANCE

Tanana River drainage lake trout harvest in 2002 was 9% of the statewide harvest (Jennings et al. 2004, 2006). In 2002, 88% of the Tanana drainage lake trout harvest and 80% of the catch occurred in the Upper Tanana area (Table 5). The Tanana River drainage harvest in 2002 (709) is about the same as the last 5-year average but nearly half of the 1977-2002 average (1,407; Table 19). The 2002 catch (4,816) is comparable to the average catch (4,239) since 1990 and is close to the last 5-year average (1998-2002) of 3,670 (Table 19). An average of 44% of the lake trout harvested since 1977 came from the Tangle Lakes and Delta River, the most popular lake trout fishing sites in the Tanana River drainage (Table 19).

Table 19.–Summary of sport harvest and catch[a] of lake trout in several lakes within the Tanana River drainage, from 1977-2002[b].

Year	Harding Lake	Fielding Lake	Tangle Lake[c]	Delta River	Stocked Lakes/Ponds	Other[c]	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
1977-1981	na[d]	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
1977-2002	90	158	584	29	259	386	1,407
				Catch[a]			
1998	311	302	1,222	25	77	799	2,736
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
1998-2002	482	209	1,587	53	218	1,121	3,670
1990-2002	412	358	1,657	40	576	1,186	4,239

[a] Information available from 1990-2002 only. Anglers may have harvested or released fish tallied as “catch."

[b] Mills 1980-1994, Howe et al. 1995, 1996, 2001a-d; Walker et al. 2003; Jennings et al. 2004, 2006.

[c] Includes Tangle River and other streams which occasionally show up in the SWHS.

[d] No reported harvest.

MANAGEMENT OBJECTIVES

The only lake trout fishery with management objectives in the UTMA are for Fielding Lake. The objectives are based upon a harvest guideline to prevent excessive harvest and allow recovery of heavily fished populations. A conservative approach is needed in Fielding Lake to maintain a viable spawning population, and possibly, improve the quality of lake trout fishing in Fielding Lake.

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) only allows one or two years (Figure 9) of production before females are eligible for harvest. Age of maturity of 95% of the population occurs at age 10 or 23 inches.

   In 1999, the estimated abundance of spawning lake trout was 386 fish, assuming a 1:1 ratio of males and females (Parker et al. 2001). 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). 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.

2. **To allow the lake trout population in Fielding Lake to grow towards its maximum size to allow improved catch rates.**

   A declining catch after 1995 also suggests fewer fish available to anglers (Table 18). Prior to 1993, catch rates were high; over 900 fish in 1993 (Mills 1994), until 1995 at which point catch rates have remained below 350 (Table 19).

FISHERY MANAGEMENT

Management actions using a guideline of 0.5 kg/ha/yr have been successful in regulating harvest to an acceptable level, though there are questions whether this guideline is applicable in Alaska lake trout populations as this was developed in Canada (Burr 1993). In 1987, 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. Harvest levels fell after that, most likely a result of the more restrictive regulations. From 1994 to 2000 harvest dropped to an average harvest of 39 lake trout annually. In 2000 and 2001, 18 and 12 lake trout (Table 19) were harvested in Fielding Lake, respectively.

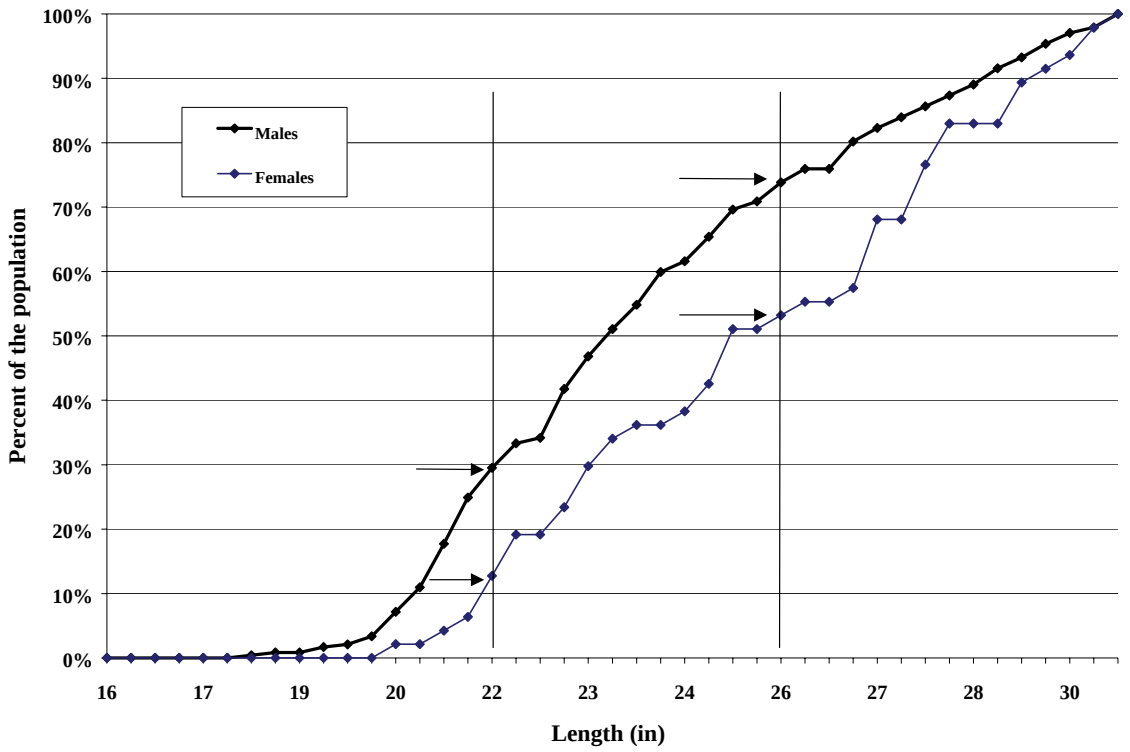

Figure 9.–The cumulative length distribution of male and female lake trout sampled from 1998 to 2000 in Fielding Lake.

The number of mature lake trout in Fielding Lake is low. The declines in the harvest and catch could be attributed to the increasingly restrictive regulations, and possibly from low numbers of legal-sized lake trout present. Based on recent population work on Fielding Lake, a combination of both causes is likely. 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. 2001). Given the length/weight relationship, the average sized fish caught in the sport fishery is 1.5 kg, or a biomass of 66 kg for the 43 lake trout harvested in 1999, which is within the recommended guideline (Parker et al. 2001). However, the exploitation rate is at least 11% (43 lake trout > 22 in, spawning abundance of 386 which includes some fish < 22 inches) is high given the low production characteristics of this species. This also suggests that the guideline is not 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).

Stocking of lake trout into small roadside lakes in the Tanana drainage has been successful in higher elevation lakes and has added diversity to the stocking program. Lakes stocked with lake trout in the UTMA have reportedly produced good catches of lake trout. Kenna Lake in 1999 is the last lake trout stocking in the interior, the cost and lack of room in the hatchery are reasons the program has been stopped for the near future.

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 spawning bed observed. 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 hook restriction appears to have restricted harvest (12 fish in 2001; Table 19) to a sustainable level.

BOARD OF FISHERY ACTIONS

The BOF has a history of approving restrictive bag limits throughout the Tanana River drainage (Appendix B2). 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 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 Lake in July 1993, when the minimum size limit was changed by emergency regulation from 18 to 22 inches on Fielding. 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 in January 2001 raised the minimum size limit to 26 inches and established a spawning closure for Fielding Lake during the month of September. In addition, a single-hook restriction when fishing for lake trout or burbot was established.

CURRENT ISSUES

Populations such as Fielding and the Tangle lakes in the Upper Tanana area need 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 should be directed at obtaining an estimate of the spawning population at Tangle Lakes. Tangle Lakes receives the largest harvest and catch of any lake trout populations in the Interior.

SECTION VII: TANANA RIVER BURBOT

BACKGROUND AND HISTORICAL PERSPECTIVE

People residing within the Upper Tanana area are the primary participants in this year-round fishery. Most fishing occurs during the spring and summer in the upper Tanana River drainage, unlike the winter fishery in the Fairbanks area. In past years, the most heavily fished lakes were Fielding, Harding, and Tangle 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 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 1997).

RECENT FISHERY PERFORMANCE

The 2002 estimated harvest of burbot in the Tanana River drainage by sport anglers was 4,009, about 7% below the 26-year average (Table 20). In 2002, 32% of the burbot harvest came from the Upper Tanana area portion of the Tanana River (Table 5). The Tanana River is split into three statistical areas; Lower, middle, and upper Tanana River. In 2002, only 26 burbot were harvested in the lower section, 2,397 harvested in the middle section and 268 harvested in the upper section (Jennings et al. 2004, 2006). The middle section is in both the Fairbanks and Upper Tanana areas. The middle section begins in Nenana and ends at Delta Junction. It 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 2002, the burbot harvest from the middle Tanana River section was 625 and 199 burbot in the Upper Tanana River section for a total of 824 burbot harvested (Table 20). In 2002, burbot comprised nearly 5% of all Tanana River sport fish harvested (Table 4). In 2002, anglers harvested 82.3% of the burbot caught for the entire Tanana River drainage (Table 6) a similar proportion (86.2%) occurred 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 resulting in a decline in the adult population. Due to low recruitment, a cycle of low abundance occurred thereafter (Parker 2001b). 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 harvest was reported in the SWHS. Anecdotal reports from anglers indicate some low level of harvest occurs at Fielding Lake. No reported harvest of burbot occurred in Fielding Lake in 2002. There was a reported harvest of 22 burbot in 2002 from Tangle Lakes in the Upper Tanana area (Table 20).

Table 20.–Sport harvest and catch of burbot in several waters of the Tanana River drainage[a], from 1977-2002.

	Upper Tanana area Portion of the Tanana River							
Year	Fielding Lake	Tangle Lake[c]	George Lake	Shaw Creek	Tanana River	Other	Fairbanks Waters[d]	Total
				Harvest				
1998	0	0	8	71	863	247	2,102	3,291
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
Average Harvest								
1977-2002[a]	72	54	51	195	1,859	676	1,436	4,342
1998-2002	0	128	2	199	739	197	1,949	3,097
				Catch[b]				
1998	25	0	8	79	1,292	316	2,860	4,579
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
Average Catch								
1990-2002	22	28	47	206	2,083	488	2,225	5,268
1998-2002	18	16	4	209	1,042	272	2,793	4,349

[a] Mills 1980-1994, Howe et al. 1995, 1996, 2001a-d; Walker et al. 2003; Jennings et al. 2004, 2006 data.

[b] Information available from 1990-2001 only. Anglers have harvested or released fish tallied as "catch".

[c] Includes Tangle River.

[d] Fairbanks waters include Harding Lake, Chatanika River, Chena River, Minto Lake and Tolovana River, Piledriver Slough, and Nenana River.

MANAGEMENT OBJECTIVES

The overlying 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 greater than 18 inches in size.**

   Simulations show an optimum population size of about 1,000 burbot over 18 inches in size and that 15% exploitation can be sustained. The population has grown to 750 fish in 2000. Indications are it will continue to grow until capacity is reached.

2. **In Fielding Lake maintain a harvest level on the adult burbot population not to exceed 15 percent.**

   Harvests of burbot greater than 50-100 fish per year are allowable. Burbot harvests are obtained from the SWHS; if this level is exceeded further restrictions are required.

FISHERY MANAGEMENT

Stock assessment of burbot occurred in Fielding Lake in 1999 and 2000 (Parker 2001b). Even though only 22 burbot were reported harvested in 2002 for other lakes in the Upper Tanana area, some level of harvest higher than 22 burbot occurs in the vicinity. 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 of burbot have been estimated 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 2001b). 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).

BOARD OF FISHERY ACTIONS

In January 2001 the BOF adopted a department proposal that opened the burbot fishery in Fielding Lake to a daily bag and possession limit of one burbot. In addition, a proposal was amended and adopted pertaining to lake trout but affecting burbot as well. This proposal was intending to eliminate the use of bait in Fielding Lake, and may have eliminated the opportunity to harvest burbot. This proposal closed fishing on Fielding Lake during the month of September and required that only a single hook with bait may be used for lake trout or burbot. 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 abundance 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 are believed to have been under-reported. Although

fisheries occur throughout the year, the major effort for burbot is in the spring prior to a rise in water levels caused by glacier melt. 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 2001b).

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 Creek and Deadman Lake near the Canadian Boarder, all are accessed by plane or boat, and are mostly open-water fisheries. 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 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 northern pike in the Tanana drainage is non-consumptive as only 17% of all pike caught from 1998-2000 were harvested. Pike harvests in 2002 represent 13.7% of the total pike catch in the Tanana drainage (Tables 6 and 21). Although effort is not estimated by species, it is believed 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 have prevented access to these lakes.

Table 21.–Sport harvest and catch of northern pike in lakes and rivers in the Tanana River drainage, 1996-2002.

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[a]						
1998	139	282	165	418	27	121	34	731	138	815	2,870	857
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
1998-2002	35	241	91	371	30	73	38	606	200	1,696	3,381	994
1977-2002	640	513	325	1,219	260	237	313	2,550	238	2,215	8,445	1,152
						Catch[a]						
1998	1,425	1,240	1,267	2,995	449	350	384	4,138	1,132	5,005	18,385	5,419
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
1998-2002	612	1,171	1,034	3,725	256	241	157	4,091	1,056	8,125	20,470	6,544
1990-2002	2,864	1,708	1,717	3,495	251	296	657	11,509	1,256	10,836	36,380	6,901

[a] Howe 2001a-b; Walker et al. 2003*;* Jennings et al. 2004, 2006.

Stock assessment of northern pike populations in the Tanana drainage has been done in various years 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.

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 wide (Bingham and Parker 1995).

RECENT FISHERY PERFORMANCE

Estimated harvests for northern pike fisheries in the Tanana drainage have been variable over time at most locations (Table 21). Catches in George Lake improved 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. Fewer fish were harvested over the past 5 years (371) than over the last 25 years (1,219; 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 3,381 in the Tanana River drainage, 29% or 994 northern pike of these were harvested in the Upper Tanana area portion of the Tanana River (Table 21). The 5 year average for catch of northern pike from the Upper Tanana area is 32% or 6,544 of the total Tanana River drainage harvest (Table 21). George Lake contributes the largest catch of pike in the Upper Tanana area, the recent 5-year average is 3,725 northern pike caught annually (Table 21). Volkmar Lake is a remote lake, accessible by floatplane during the open water months. The majority of the effort occurs during the winter when anglers access the lake by snowmachine from Quartz Lake to the Goodpaster River, or by crossing the Tanana River from Sawmill Creek Road, east of Delta Junction. The winter fishery is characterized as consumptive, fish caught by jigging or spearing are easily preserved by freezing. Anglers reported drastic declines in the pike population 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 harvest remains low.

MANAGEMENT OBJECTIVES

The department will attempt to limit harvest in northern pike lakes to 10-20% annually.

> The department spent 10 years conducting population surveys on Volkmar Lake from 1985 to 1994. According to sustained yield models, the Volkmar Lake maximum production level population is 3,000 fish (over 18 inches). The average abundance of catchable pike, or those 18 inches or greater, is 2,800. Based upon the average population size, an annual harvest between 10-20% (or 300-550 fish) is sustainable.

FISHERY MANAGEMENT

Estimates of catch and harvest from the SWHS for Volkmar Lake are periodic, with only six estimates in 21 years. 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 population was slightly above the maximum sustainable level, with harvest slightly over the optimal level (Pearse and Hansen 1995). However, the harvest of 1,084 in 1995 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 330-550 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 average size of the population is small and 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 the 1997 BOF meeting a proposal was adopted that 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 proposed by a local angler as a conservation measure. The department feels that the reduction of the bag limit is sufficient (average harvest of 38 over the past 5 years; Table 21) to reduce effort and harvest to acceptable levels.

Due to unsustainable harvests and population declines in some fisheries, regulations for pike were restricted during the late 1980s. In 1987, the bag limit was reduced from ten per day to five per day, with only one over 30 inches. The 30-inch size limit implemented in the mid-seventies was designed to make more large fish available to anglers. In 1992, the BOF passed a regulation that established a spring spawning closure (April 1 - May 31) in the Tanana drainage. The closure was intended to protect northern pike while they are concentrated for spawning and are most vulnerable to anglers (Arvey et al. 1995).

In 2000, the BOF adopted a proposal for the Chisana River drainage upstream from the Northway bridge in which northern pike daily bag and possession limit was reduced 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 would like ADF&G to increase the number of large fish in Volkmar Lake. Ten trophy-sized northern pike have been taken from Volkmar Lake since the inception of the ADF&G trophy program. Anglers on the average harvest 60% of the population over 30 inches. The average proportion of pike (> 30 inches) harvested since 1991 is 28%, and 97% of the pike > 30 inches caught are harvested. 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. Anglers must concede to harvesting fewer large fish.

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 44 lakes in the Upper Tanana Management Area (UTMA or Upper Tanana area). 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 major and small fisheries. Major fisheries have more than 5,000 angler-days of effort, annually. Quartz Lake is the only major fishery in the UTMA. All other lakes are collectively called small 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, 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.

The production and stocking of fish along with research projects and the management of the stocking program is funded primarily by two sources. One is the Sport Fish Account of the state Fish and Game fund, which includes revenues from sales of fishing licenses. The second, and larger funding component is the Federal Aid in Sport Fisheries Restoration program, comprised of the Dingell Johnson (D-J) Fund and the Wallop-Breaux Amendment (W-B).

RECENT FISHERY PERFORMANCE

From 1993 through 2002, the stocking program in the UTMA generated from 12,278 to 29,162 angler-days annually and averaged about 19,386 angler-days (Table 22). This represents about 38% to 53% 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 41,764 to 95,262 fish and annual harvest ranged from 16,518 to 35,032 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.

Table 22.–Effort, harvest, and catch statistics by species for stocked fisheries in the UTMA 1993-2002.

	Year									
	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Effort										
Number of anglers[a]	12,507	11,522	13,413	9,980	7,128	7,696	8,461	7,259	6,180	5,952
Number of days fished (effort)	29,162	24,380	26,711	21,482	12,278	13,613	23,126	17,243	12,642	15,800
Catch										
Rainbow trout	60,450	37,811	41,979	35,003	32,652	49,049	63,723	48,663	24,461	44,606
Coho/Chinook salmon	20,887	12,865	10,960	15,597	9,207	15,924	18,201	29,026	11,429	23,816
Arctic grayling	3,930	5,289	1,437	3,046	1,939	3,097	3,145	1,059	3,333	3,294
Arctic char	3,461	1,899	1,656	2,351	1,342	3,400	9,200	3,507	2,323	6,001
Lake trout	1,707	1,678	541	162	370	136	994	340	218	886
Total	90,434	59,540	56,572	56,158	45,509	71,606	95,262	82,595	41,764	78,603
Catch rate (catch / effort)	3.1	2.4	2.1	2.6	3.7	5.3	4.1	4.8	3.0	4.9
Harvest										
Rainbow trout	23,141	16,396	18,198	16,328	12,394	19,303	21,914	19,854	9,063	17,762
Coho/Chinook salmon	10,056	6,723	4,910	6,724	3,129	6,710	6,533	10,720	5,123	8,684
Arctic grayling	362	1,162	440	381	322	123	135	33	720	387
Arctic char	1,106	522	694	767	688	1,409	2,356	1,498	1,575	2,268
Lake trout	368	810	262	61	111	7	300	82	37	144
Total	35,032	25,612	24,503	24,260	16,644	27,552	31,237	32,186	16,518	29,245

[a] 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.

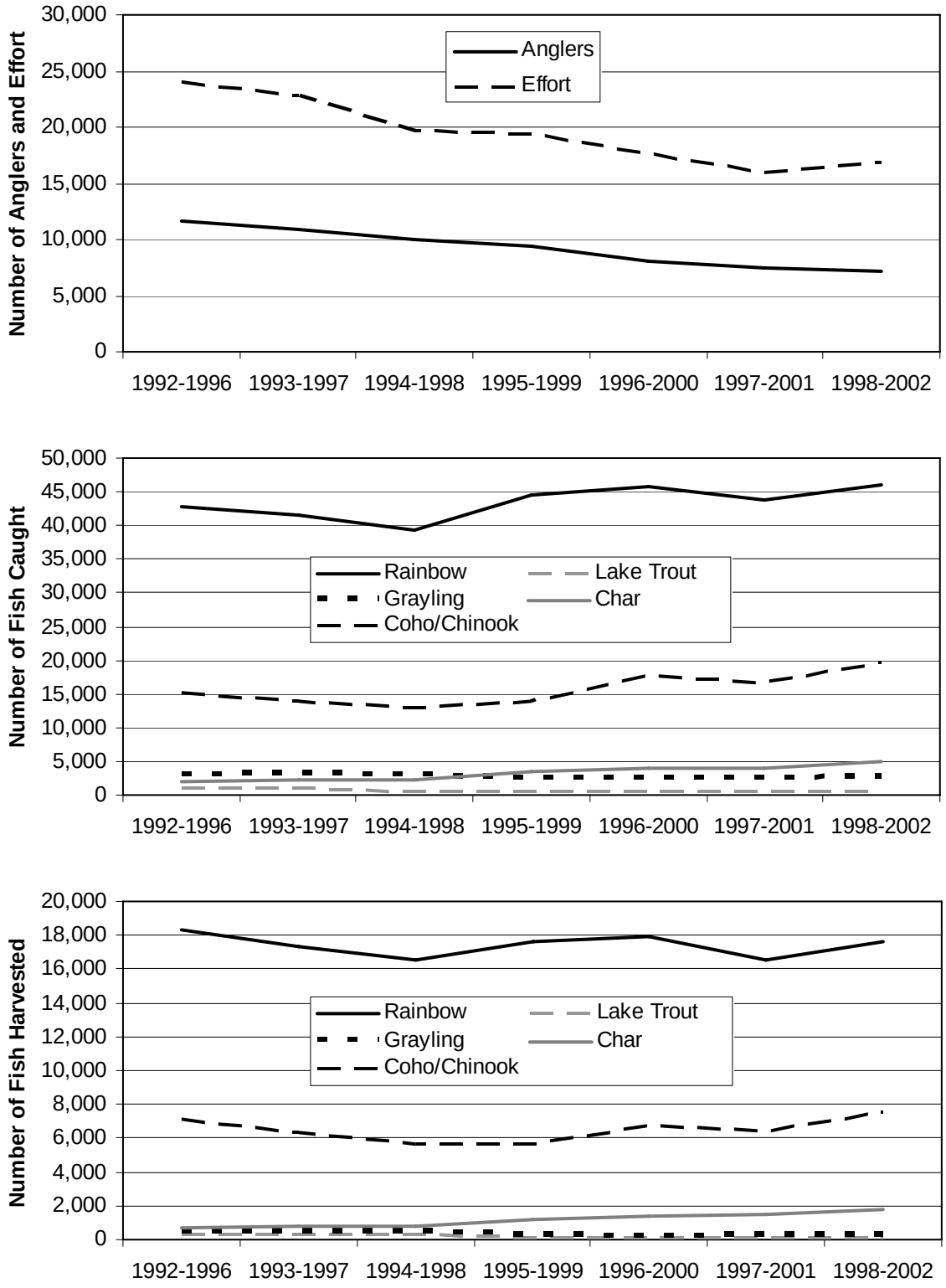

Figure 10.–Five-year averages for fishing effort (angler-days) and number of fish caught and harvested from UTMA fisheries, 1992-2002.

Over the last 10 years the average catch and harvest of stocked fish in the UTMA show that 65% of the catch and 66% 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 2002, the average catch rate per angler-day of effort for stocked fish in the UTMA was 4.9 fish and the recent 10-year average was 3.9 fish (Table 22). Fish stockings for 2001 through 2003 are summarized in Table 23 and projected fish stockings for 2004 and 2005 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. Stocking records for 2002 and 2003 are found in Appendix A1.

Management plans and stocking methods for existing fisheries will be reviewed and modified to reflect changes in public desire, how the fisheries are used, and changes in hatchery production. Research activities will be conducted to assess public desire and the use of stocked waters, evaluate progress toward achieving management objectives, and to address important fishery concerns such as the growth and survival of stocked fish. Objectives, actions, and evaluations for the stocking program are listed separately for each fishery management plan within the UTMA (Quartz Lake, Urban Small Lakes, Rural Small Lakes, and Remote Small Lakes).

MANAGEMENT OBJECTIVES

Quartz Lake Sport Fishery

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.

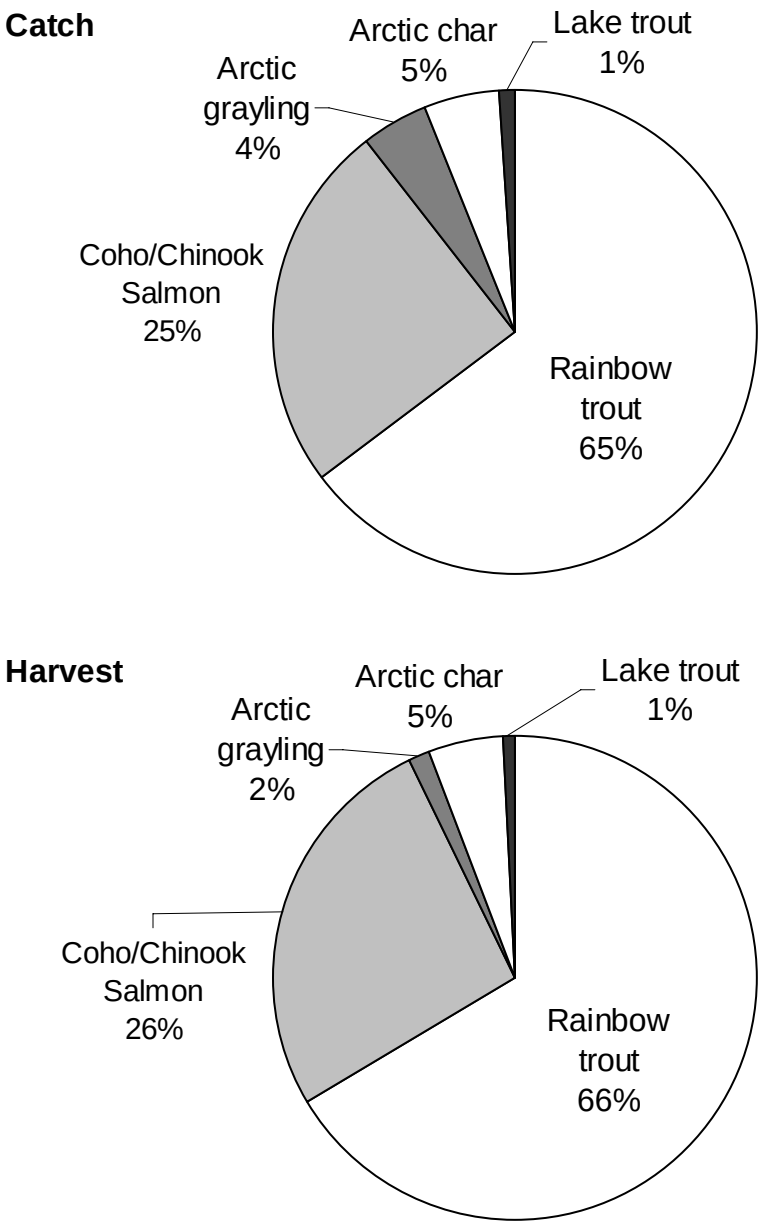

Figure 11.–Ten year average catch and harvest composition by species for all stocked lakes in the UTMA, 1993-2002.

Table 23.–Summary of stocking activities for the UTMA, 2001-2003.

Species	Broodstock	Catchable	Subcatchable	Fingerling	Total
2001					
Arctic char			11,065		11,065
Arctic grayling		1,815			1,815
Coho salmon				58,000	58,000
Lake trout		600			600
Rainbow trout	125	14,727		445,350	460,202
Total	125	17,142	11,065	503,350	531,682
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

Table 24.–Summary of projected game fish stockings for the UTMA, 2004-2005.

Species	Lifestage	Target Size (in)	2004 Projected Number of Lakes	2004 Projected Number of Fish	2005 Projected Number of Lakes	2005 Projected Number of Fish
Arctic char	Subcatchable	5-6	17	24,825	0	0
Chinook salmon	Catchable	6-8	2	5,000	2	5,000
Arctic grayling	Fingerling	2-4	7	9,000	7	9,000
Arctic grayling[a]	Catchable	6-8	0	0	0	0
Coho salmon[b]	Fingerling	2-4	2	33,000	3	42,600
Rainbow trout	Fed fry	1½	3	180,000	3	180,000
Rainbow trout	Fingerling	2	27	280,200	6	177,600
Rainbow trout	Catchable	5-6	7	21,100	7	21,100
Rainbow trout	Broodstock	12-16	1	40	2	75

[a] Catchable Arctic grayling will not be produced by the Ship Creek Hatchery Complex until suitable rearing conditions are available.

[b] The Ship Creek Hatchery Complex may not produce coho salmon for lake stockings if initial rearing space is limited.

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). The Quartz Lake fishery is managed as a consumptive fishery, allowing anglers to harvest up to the daily bag limit of any of the stocked species. Daily bag and possession limits are:

Species	Daily Bag and Possession Limit	Size Limit
Salmon (coho/Chinook)	10 in combination	no size limit
Arctic char	10	no size limit
Rainbow trout	10	no size limit

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 2000 through 2003 are summarized in Table 25 and projected fish stockings for 2004 and 2005 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.

Table 25.–Summary of stocking activities for Quartz Lake, 2001-2003.

Species	Broodstock	Catchable	Subcatchable	Fingerling	Total
2001					
Arctic char			9,065		9,065
Coho salmon				58,000	58,000
Rainbow trout	85	7,752		313,244	321,081
Total	85	7,752	9,065	371,244	388,146
2002					
Arctic char				6,285	6,285
Rainbow trout		16,570		329,167	345,737
Total		16,570		335,452	352,022
2003					
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

Table 26.–Summary of projected game fish stockings for Quartz Lake, 2004-2005.

Species	Lifestage	Target Size (in)	2004 Projected	2005 Projected
Arctic char	Subcatchable	5-6	9,500	0
Chinook salmon	Catchable	6-8	5,000	5,000
Coho salmon[a]	Fingerling	3-4	30,000	30,000
Rainbow trout[b]	Fingerling	2	150,000	150,000
Rainbow trout[c]	Subcatchable	4-6	20,000	20,000
Rainbow trout	Catchable	6-8	12,800	12,800

a The Ship Creek Hatchery Complex may not produce coho salmon for lake stockings if initial rearing space is limited.

b Additional rainbow trout fingerlings may be reared in ponds and then stocked into Quartz Lake.

c These fish will be reared during the summer in ponds on Fort Greely. In the fall the fish will be captured and moved to Quartz Lake.

Fishery Statistics

During the period 1993 through 2002, the annual effort on stocked species ranged from 6,956 to 17,820 angler-days and averaged about 13,018 angler-days (Table 27). Five-year moving averages from 1991 through 2002 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 1993, about 64% of the catch and 65% of the harvest was comprised of rainbow trout. Coho and Chinook salmon (landlocked silvers and kings) were next significant in numbers of fish caught and harvested followed by Arctic char (Figure 13). Average annual effort per surface acre was about 8.7 angler-days. In 2002, the catch rate for Quartz Lake was about 5.0 fish per angler-day of effort (Table 27) and exceeded the objective of two fish per angler-day.

Upper Tanana Valley 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, only Big "D" Pond is in the urban fishing program in the UTMA. The department stocks catchable size fish in urban lakes because these lakes typically can not produce sufficient numbers of catchable fish from stockings of fingerlings to meet angler demand. The current level of fishing effort at Big "D" Pond is not high enough to be reported in the Statewide Harvest Survey but the fishery is popular with local residents. In response to public requests, the department will continue to search for other lakes in the upper Tanana Valley to include in the urban fishing program.

Table 27.–Effort, catch, and harvest statistics by species for Quartz Lake 1993-2002.

	Year									
	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Effort										
Number of Anglers[a]	9,039	7,962	9,133	6,853	4,445	5,821	6,140	4,628	4,113	4,432
Number of Days Fished (effort)	17,613	14,031	17,569	14,163	6,956	10,175	17,820	11,047	8,325	12,477
Catch										
Rainbow Trout	43,654	23,675	28,684	23,051	19,729	36,416	54,463	32,358	14,821	34,849
Coho/Chinook Salmon	19,233	11,212	10,210	15,404	8,902	13,320	16,740	27,464	10,715	23,699
Arctic Char	0	0	413	706	497	2,726	8,859	2,502	1,847	4,393
Total	62,887	34,887	39,307	39,161	29,128	52,462	80,062	62,324	27,411	62,941
Catch Rate (catch / effort)	3.6	2.5	2.2	2.8	4.2	5.2	4.5	5.6	3.3	5.0
Harvest										
Rainbow Trout	18,699	11,556	12,585	11,687	8,496	14,335	19,066	14,358	6,060	13,207
Coho/Chinook Salmon	8,977	5,706	4,633	6,724	2,999	5,526	6,018	9,866	5,080	8,684
Arctic Char	0	0	174	330	313	1,201	2,321	1,066	1,509	1,700
Total	27,676	17,262	17,392	18,741	11,808	21,062	27,405	25,290	12,649	23,591

[a] 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.

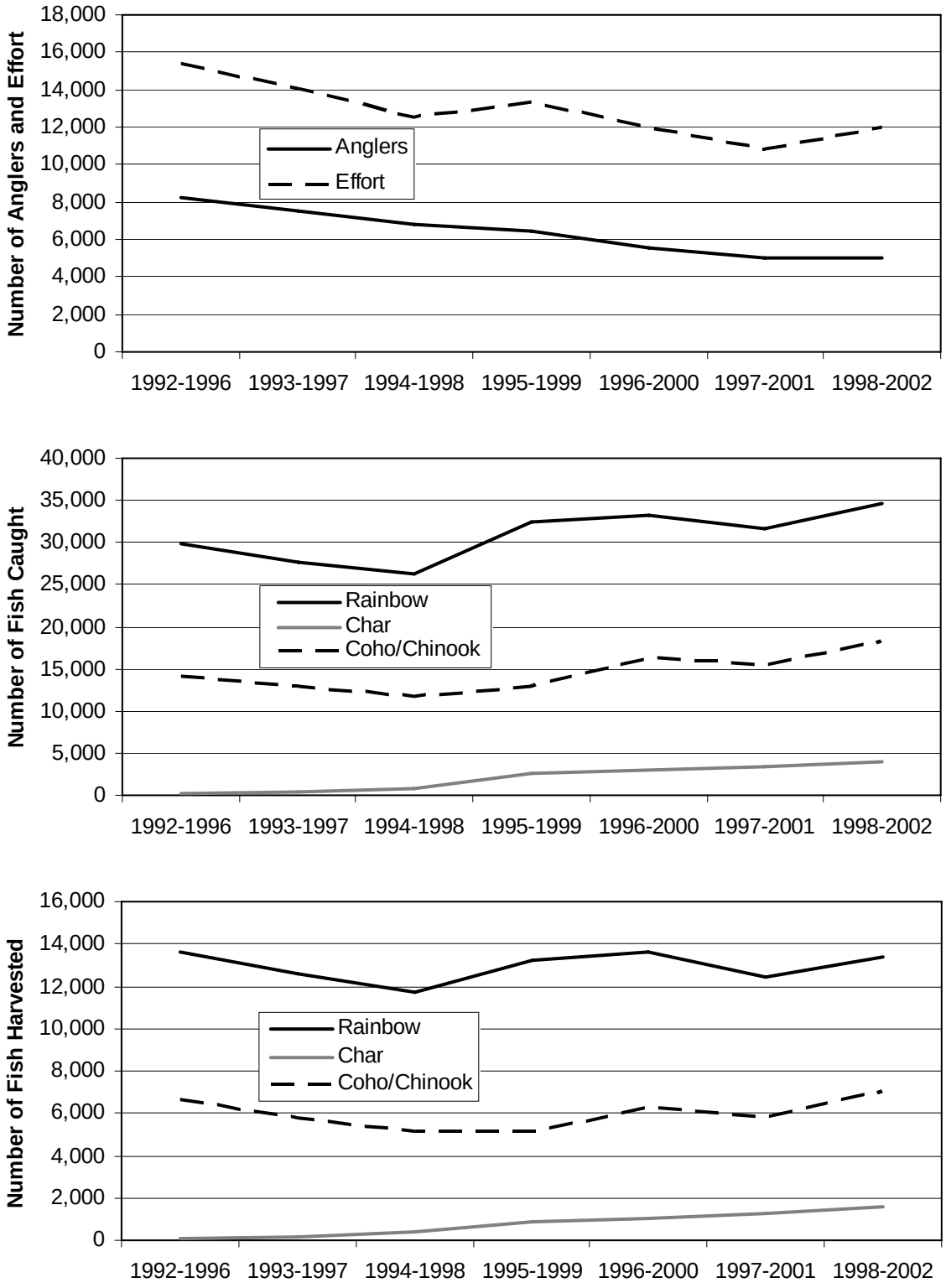

Figure 12.–Five-year moving averages for fishing effort (angler-days) and number of fish caught and harvested from Quartz Lake, 1992-2002.

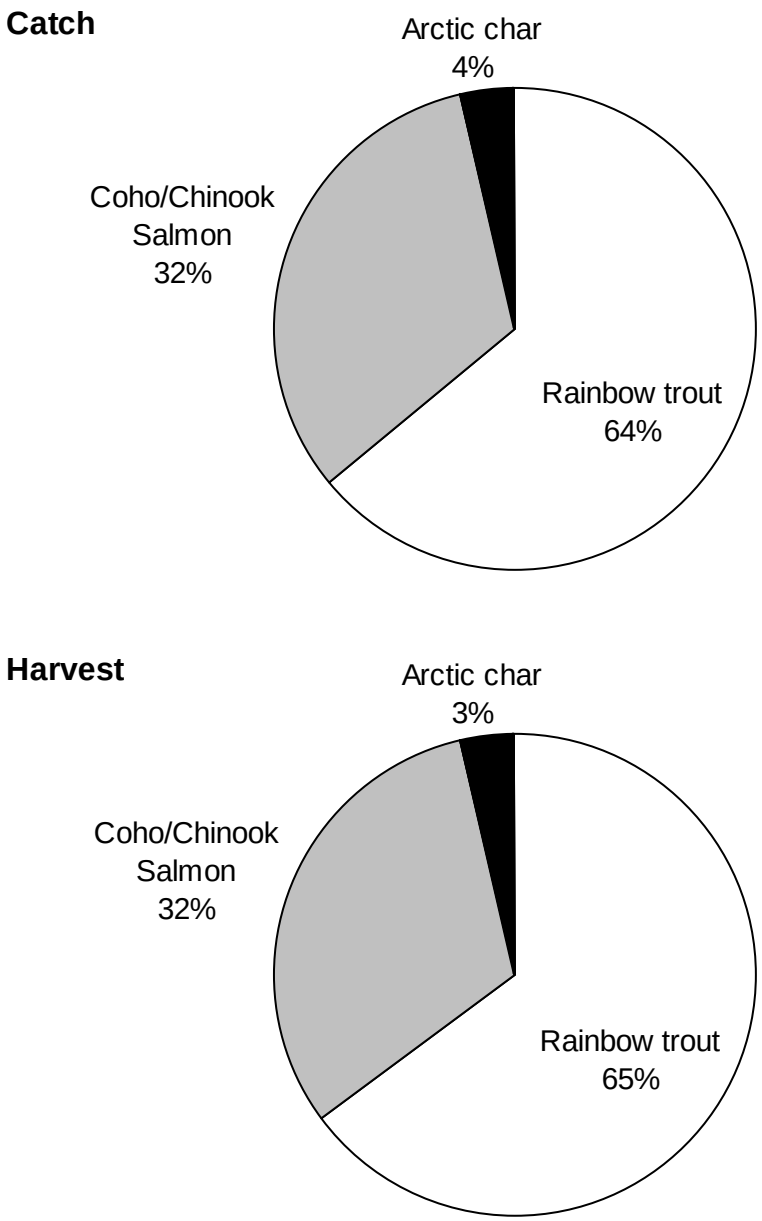

Figure 13.–Ten year average catch and harvest composition by species for Quartz Lake, 1993-2002.

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

Species	Daily Bag and Possession Limit	Size Limit
Salmon (king and silver)	10 in combination	No size limit
Rainbow trout	10	No size limit
Arctic grayling	5	No size limit
Arctic char	10	No size limit
Lake trout	2	No size limit

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 1,500 all-female (triploid) rainbow trout.

Fish stockings for specific lakes are listed in Table 28. Fish stockings for 2001 through 2003 are summarized in Table 29 and projected fish stockings for 2004 and 2005 are summarized in Table 30.

Evaluations

1. Sport fishing effort and harvest will be estimated through the Statewide Harvest Survey.
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 Statewide Harvest Survey questionnaire or fewer than 12 participants responded to the questionnaire.

Table 28.–Summary of stocking activities for small urban lakes in the UTMA 2001-2003.

Species	Broodstock	Catchable	Subcatchable	Fingerling	Total
2001					
Rainbow trout		1,544			1,544
2002					
Rainbow trout		2,414			2,414
2003					
Rainbow trout		1,691			1,691

Table 29.–Summary of projected game fish stockings for small urban lakes in the UTMA, 2004-2005.

			2004 Projected		2005 Projected	
Species	Lifestage	Target Size (in)	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 Valley Rural Lakes Sport Fishery

The ADF&G has been stocking small rural lakes in the upper Tanana Valley for more than 20 years. These rural lakes are along or near the road system and are most are easily accessed directly by road. Access to some of the lakes may require a short hike or the use of an ATV or snowmachine. The rural small lakes stocking program will serve a segment of the public who want to get away from population centers but must remain on or near the road system. 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.

Table 30.–Actions for rural stocked lakes in the UTMA.

Lake	Lake Size in Acres	Species	Stocking Year
Richardson Highway			
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 (at Quartz)	102	Rainbow	Annual
Rapids Lake	5	Rainbow	Even Years
Shaw Pond	3	Char; Rainbow	Even Years; Annual
Meadows Road			
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
Coal Mine Road			
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

-continued-

Table 30.–Page 2 of 2.

Lake	Lake Size in Acres	Species	Stocking Years
Coal Mine Road (cont'd)			
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
Alaska Highway			
Craig Lake	17	Rainbow	Odd Years
Donna Lake	58	Rainbow	Odd Years
Four Mile Lake	100	Char, Rainbow	Even Years, Even Years
Hidden Lake (*Tetlin R.*)	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

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

Species	Daily Bag and Possession Limit	Size Limit
Salmon (king and silver)	10 in combination	No size limit
Rainbow trout	10	No size limit
Arctic grayling	5	No size limit
Arctic char	10	No size limit
Lake trout	2	No size limit

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 2001 through 2003 are summarized in Table 31 and projected fish stockings for 2004 and 2005 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.

Fishery Statistics

From 1993 through 2002, annual effort on stocked species ranged from 1,233 to 10,158 angler-days and averaged about 5,218 angler-days (Table 33). Five-year moving averages from 1992 through 2002 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 1993, about 64% of the catch and 67% 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 annual effort per surface acre was about 6.3 angler-days. Average catch rate for stocked fish in rural lakes in the UTMA was about 3.0 fish per angler-day of effort (Table 33).

Table 31.–Summary of stocking activities for small rural lakes in the UTMA 2001-2003**.**

Species	Broodstock	Catchable	Subcatchable	Fingerling	Total
2001					
Arctic grayling		1,815			1,815
Rainbow trout	40	6,975		76,340	83,355
Total	40	8,790		76,340	85,170
2002					
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
2003					
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

Table 32.–Summary of projected game fish stockings for small rural lakes in the UTMA, 2004-2005.

			2004 Projected		2005 Projected	
Species	Lifestage	Target Size (in)	Number of Lakes	Number of Fish	Number of Lakes	Number of Fish
Arctic char	Subcatchable	5-6	15	13,825	0	0
Arctic grayling	Catchable[a]	7-8	0	0	0	0
Arctic grayling	Fingerling	3	0	0	0	0
Coho salmon	Fingerling[b]	2-4	1	3,000	2	12,600
Rainbow trout	Fingerling	2-4	15	59,000	3	18,000
Rainbow trout	Catchable	6-8	6	8,300	6	8,300
Rainbow trout	Broodstock	12-16	1	40	2	75

[a] Catchable Arctic grayling will not be produced by the Ship Creek Hatchery Complex until suitable rearing conditions are available.

[b] The Ship Creek Hatchery Complex may not produce coho salmon for lake stockings if initial rearing space is limited.

Table 33.–Effort, catch, and harvest statistics by species for small rural lakes in the UTMA 1993-2002.

	Year									
	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
					Effort					
Number of Anglers[a]	2,903	2,600	3,466	2,418	1,998	1,243	1,634	2,037	1,640	3,183
Number of Days Fished (effort)	10,158	8,323	7,084	5,353	4,018	2,477	3,916	4,806	1,233	2,859
					Catch					
Rainbow Trout	15,464	10,250	10,018	8,760	9,512	7,102	5,528	10,434	5,836	7,408
Coho/Chinook Salmon	1,480	1,620	672	193	215	2,465	1,452	1,446	632	60
Arctic Grayling	3,559	4,860	1,185	2,081	1,448	2,563	2,761	838	1,459	1,941
Arctic Char	3,055	1,779	1,220	1,523	807	513	341	952	395	1,550
Lake Trout	1,682	1,610	520	148	297	131	748	285	142	448
Total	25,241	20,119	13,615	12,704	12,278	12,774	10,830	13,955	8,464	11,407
Catch Rate (catch / effort)	2.5	2.4	1.9	2.4	3.1	5.2	2.8	2.9	6.9	4.0
					Harvest					
Rainbow Trout	4,086	3,063	3,862	3,729	2,723	2,952	1,384	3,408	1,306	5,836
Coho/Chinook Salmon	1,029	984	277	0	120	1,180	515	778	16	632
Arctic Grayling	351	929	417	353	260	110	20	13	173	1,459
Arctic Char	933	511	516	403	337	206	35	379	13	395
Lake Trout	368	795	241	47	90	7	142	77	11	142
Total	6,767	6,281	5,313	4,532	3,529	4,455	2,097	4,654	1,519	8,464

[a] 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.

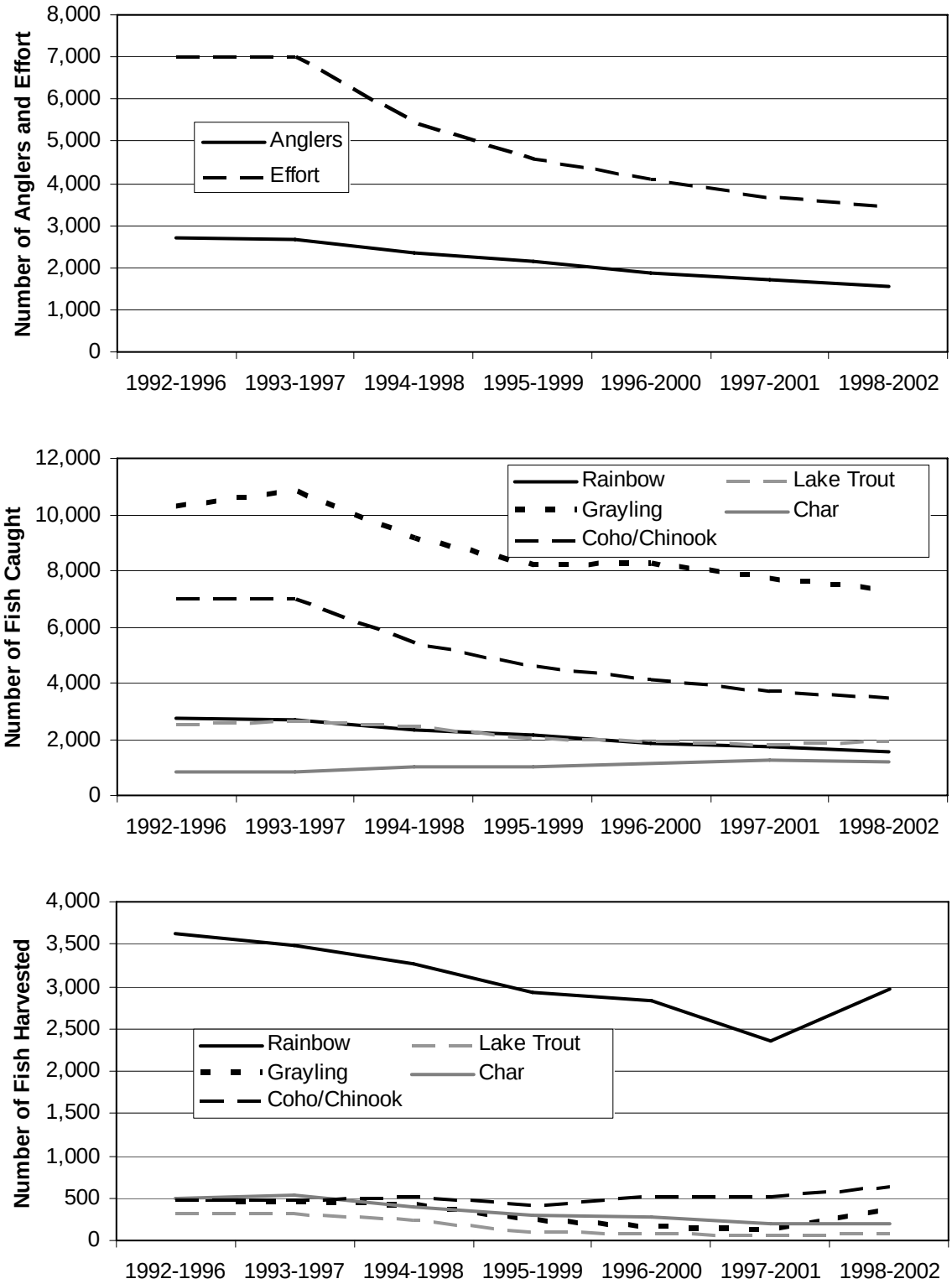

Figure 14.–Five-year moving averages for fishing effort (angler-days) and number of fish caught and harvested from small rural lakes in the UTMA 1992-2002.

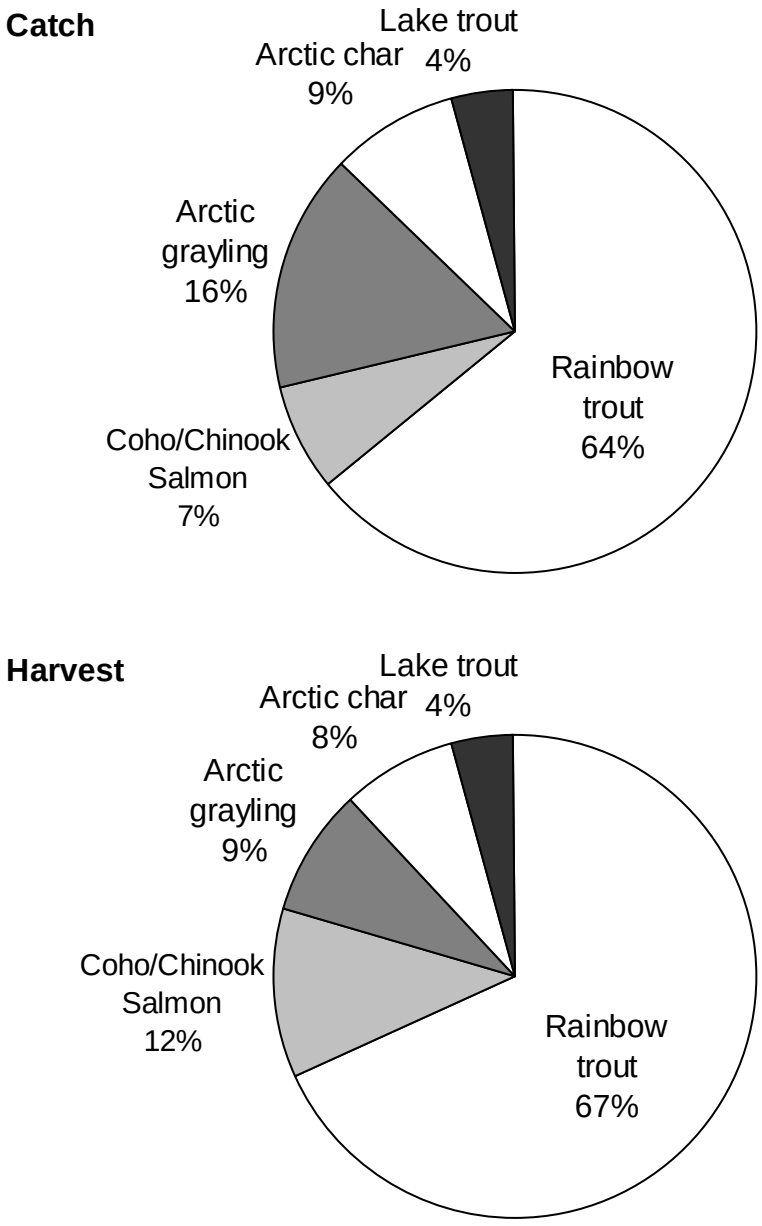

Figure 15.–Ten year average catch and harvest composition by species for small stocked rural lakes in the UTMA, 1993-2002.

Upper Tanana Valley 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 were fishing opportunities do not exist or are limited. The remote lakes stocking program will serve a segment of the public who is willing to travel away from the road system to access lakes that are visited by few anglers. 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 (Table 33). 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
Rainbow trout	10	No size limit
Arctic char	10	No size limit
Lake trout	2	No size limit

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.

Actions

Fish stockings for specific lakes are listed in Table 34. Fish stockings for 2001 through 2003 are summarized in Table 35 and projected fish stockings for 2004 and 2005 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 1993 through 2002, annual effort on stocked species ranged from 385 to 1,917 angler-days and averaged about 1,151 angler-days (Table 37). Five-year moving averages from 1992 through 2002 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 1993, 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 effort per surface acre for stocked species was about 1.6 angler-days. Average annual catch rate for stocked fish in remote lakes in the UTMA is about 3.4 fish per angler-day of effort (Table 37).

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 2001-2003.

Species	Broodstock	Catchable	Subcatchable	Fingerling	Total
2001					
Arctic Char			2,000		2,000
Lake Trout		600			600
Rainbow Trout				55,766	55,766
Total		600	2,000	55,766	58,366
2002					
	Fish were not stocked in remote lakes in 2002.				
2003					
	Fish were not stocked in remote lakes in 2003.				

Table 36.–Summary of projected game fish stockings for small remote lakes in the UTMA, 2004-2005.

			2004 Projected		2005 Projected	
Species	Lifestage	Target Size (in)	Number of Lakes	Number of Fish	Number of Lakes	Number of Fish
Rainbow Trout	Fingerling	2	5	58,100	0	0
Arctic Char	Subcatchable	5-6	1	1,500	0	0

Table 37.–Effort, catch, and harvest statistics by species for small remote lakes in the UTMA 1993-2002.

	Year									
	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Effort										
Number of Anglers [a]	476	899	735	577	583	543	593	507	307	239
Number of Days Fished (effort)	1,033	1,917	1,855	1,458	1,096	815	1,183	1,214	555	385
Catch										
Rainbow Trout	1,045	3,841	3,219	2,708	3,253	5,265	3,519	5,613	2,941	2,161
Arctic Char									33	37
Lake Trout	0	59	0	0	0	0	137	0	48	317
Total	1,045	3,900	3,219	2,708	3,253	5,265	3,656	5,613	3,022	2,515
Catch Rate (catch / effort)	1.0	2.0	1.7	1.9	3.0	6.5	3.1	4.6	5.4	6.5
Harvest										
Rainbow Trout	309	1,736	1,723	730	1,130	1,857	1,414	1,975	1,210	637
Arctic Char									33	0
Lake Trout	0	15	0	0	0	0	55	0	16	8
Total	309	1,751	1,723	730	1,130	1,857	1,469	1,975	1,259	645

[a] 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.

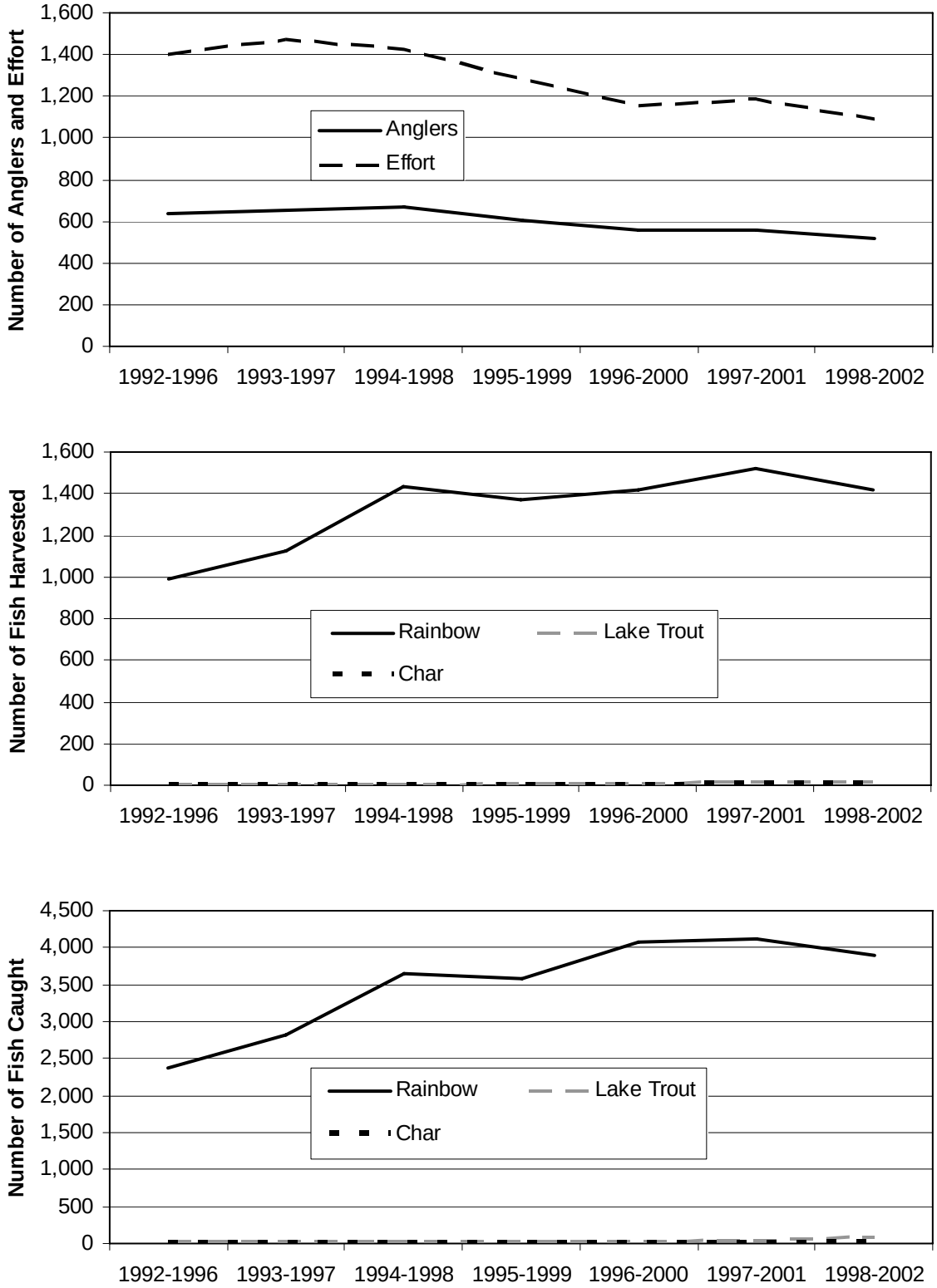

Figure 16.–Five-year moving averages for fishing effort (angler-days) and number of fish caught and harvested from small remote lakes in the UTMA 1992-2002.

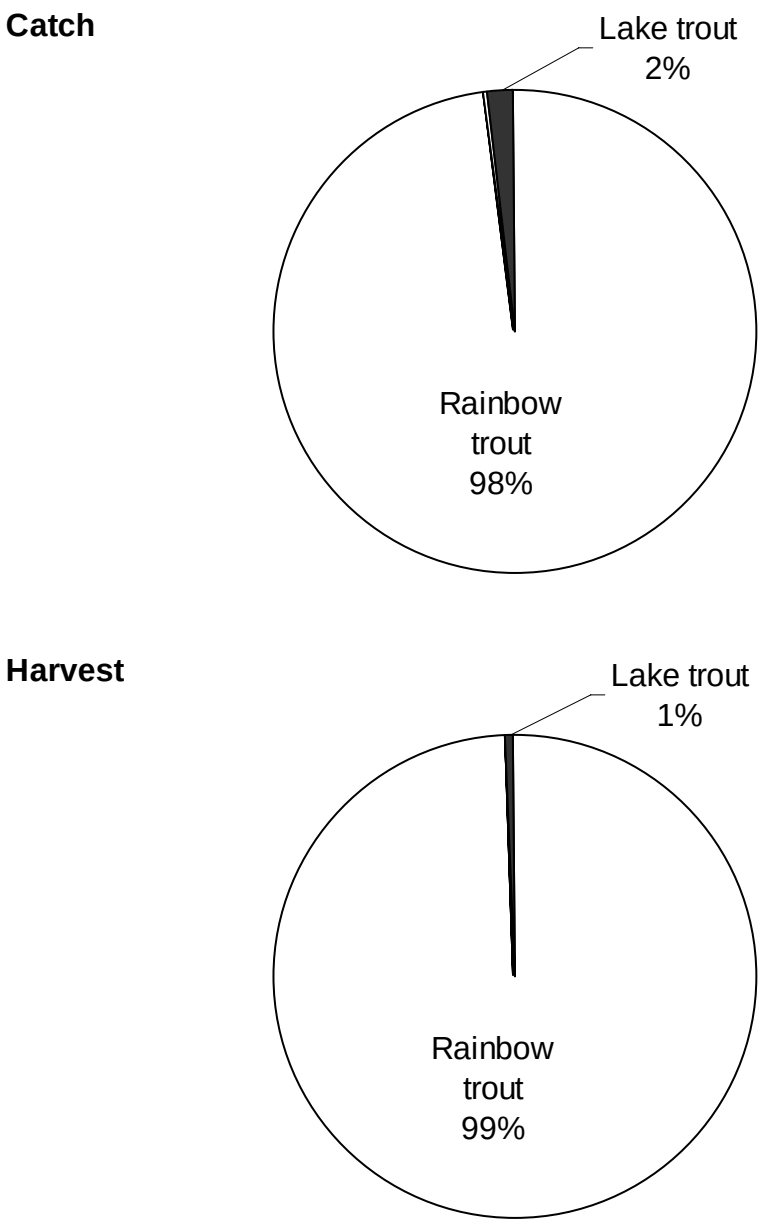

Figure 17.–Ten year average catch and harvest composition by species for small remote lakes in the UTMA, 1993-2002.

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.

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 expressed frustration with these fisheries because by spring there were 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 weigh 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 Meiers 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 char 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 general 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 1994 Region III initiated a program to create fisheries for trophy size rainbow trout in Little Harding Lake (22 ha), Craig Lake (7 ha) and Coal Mine #5 Lake (5 ha). Special regulations were adopted by the BOF in 1997 for these lakes to increase the likelihood of creating successful fisheries. These lakes are open to fishing from 15 May through 30 September. Only unbaited, single-hook, artificial lures can be used. The daily bag and possession limit for rainbow trout is one fish which must be 18 inches (457 mm) or larger. In 2001, the BOF adopted a proposal which repealed the special regulations on Coal Mine #5 and Craig lakes because the objectives of the program were not met. The regulations for these two stocked lakes reverted back to the background stocked waters regulations.

CURRENT ISSUES

Based on interest of the public, ADF&G staff continues to evaluate lakes as suitable candidates for a trophy rainbow trout program. A management plan for interior stocked waters has been submitted as a proposal for the 2004 BOF meeting, and three proposals have been submitted to the Board of Fish to change bag and possession limits for Quartz Lake.

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, 2002 and 2003.

Location	Species	Date	Number Stocked	Average Length (in)	Size
Backdown Lake	Arctic Char	4-Sep-2002	663	3.6	Fingerling
Backdown Lake	Rainbow Trout	14-Aug-2002	992	2	Fingerling
Big "D" Pond	Rainbow Trout	3-Jun-2002	1,510	8	Catchable
Big "D" Pond	Rainbow Trout	1-Jul-2002	904	8	Catchable
Bolio Lake	Rainbow Trout	3-Jun-2002	2,511	9.3	Catchable
Brodie Lake	Arctic Char	4-Sep-2002	588	3.6	Fingerling
Dicks Pond	Arctic Char	4-Sep-2002	588	3.6	Fingerling
Donnelly Lake	Rainbow Trout	14-Aug-2002	11,522	1.9	Fingerling
Ghost Lake	Arctic Char	4-Sep-2002	513	3.6	Fingerling
Jan Lake	Coho Salmon	30-Jul-2002	9,000	3	Fingerling
Kens Pond	Arctic Char	4-Sep-2002	588	3.6	Fingerling
Kens Pond	Rainbow Trout	14-Aug-2002	829	2	Fingerling
Last Lake	Arctic Char	4-Sep-2002	588	3.6	Fingerling
Last Lake	Rainbow Trout	14-Aug-2002	1,000	2	Fingerling
Little Lost Lake	Rainbow Trout	3-Jun-2002	1,061	9.3	Catchable
Mark Lake	Coho Salmon	30-Jul-2002	3,600	3	Fingerling
Quartz Lake	Arctic Char	4-Sep-2002	6,285	3.6	Fingerling
Quartz Lake	Rainbow Trout	3-Jun-2002	6,682	8	Catchable
Quartz Lake	Rainbow Trout	13-Jun-2002	2,883	7.8	Catchable
Quartz Lake	Rainbow Trout	27-Jun-2002	7,005	9.7	Catchable
Quartz Lake	Rainbow Trout	14-Aug-2002	85,726	1.9	Fingerling
Quartz Lake	Rainbow Trout	14-Aug-2002	167,767	2	Fingerling
Quartz Lake	Rainbow Trout	14-Aug-2002	75,674	1.9	Fingerling
Rangeview Lake	Arctic Char	4-Sep-2002	588	3.6	Fingerling
Shaw Pond	Rainbow Trout	19-Jun-2002	939	9.1	Catchable
Sheefish Lake	Arctic Char	4-Sep-2002	913	3.6	Fingerling
Weasel Lake	Rainbow Trout	14-Aug-2002	1,255	2	Fingerling
Big "D" Pond	Rainbow Trout	23-Jun-2003	1,691	8.3	Catchable
Bolio Lake	Grayling	20-Aug-2003	1,000	1.9	Fingerling
Bolio Lake	Rainbow Trout	23-Jun-2003	2,678	9.3	Catchable

-continued-

Appendix A1.–Page 2 of 2.

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

[a] 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 2002.

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**.

1988

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

Season

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.**

2002

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 10-August 9**
- **August 10 – July 9**, **Catch-and-release only** for Arctic Grayling.

Appendix B2.–Board of Fisheries regulation history including actions taken in January 2001 regarding lake trout and burbot in Fielding Lake.

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

2001

Seasons, bag, possession, and size limits, and methods and means

- 22-inch minimum size limit increased to 26-inch minimum size
- Open season from October 1 through August 31
- When fishing for burbot or lake trout, only one single hook with bait, may be used

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

Seasons, bag, possession, and size limits, and methods and means

- Bag limit is 1 per day, 1 in possession, no size limit
- Open season from October 1 through August 31
- When fishing for burbot or lake trout, only one single hook with bait, may be used

Appendix B3.–History of northern pike Sport Fish regulations in the Tanana River drainage from statehood to 2002.

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)

1988

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.

Season

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

Season

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.

1998

Season

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

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**.
- In Harding Lake sport fishing for northern pike is closed.

APPENDIX C

Appendix C1.–Summary of Arctic grayling estimates and standard errors within the Delta Clearwater River, 1977-2000[a].

Year	N[150]	SE[N150]	N[240]	SE[N240]	N[270]	SE[N270]	N[Age 5+][a]	SE[Age 5+]	Recruitment	
									N[Age 5][a]	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

[a] 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, 1977-2002[a].

Year	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	Catch WF
1977	6,881	...	...	6,118	31	19	28	...	...	...	...	...	...
1978	7,210	...	...	7,657	126	59	0	...	...	...	...	...	...
1979	8,398	...	...	6,492	0	0	53	...	...	...	...	...	...
1980	4,240	...	...	5,680	25	25	29	...	...	...	...	...	...
1981	4,673	...	...	7,362	45	0	203	...	...	...	...	...	...
1982	4,231	...	...	4,779	21	21	94	...	...	...	...	...	...
1983	5,867	...	...	6,546	63	63	262	...	...	...	...	...	...
1984	5,139	...	...	4,193	571	182	325	...	...	...	...	...	...
1985	8,722	...	...	5,809	722	174	1,015	...	...	...	...	...	...
1986	10,137	...	...	2,343	1,005	246	208	...	...	...	...	...	...
1987	5,397	...	...	2,005	1,068	42	66	...	...	...	...	...	...
1988	5,184	...	...	2,910	1,291	0	1,114	...	...	...	...	...	...
1989	5,368	...	...	3,016	1,049	29	34	...	...	...	...	...	...
1990	4,853	...	...	1,772	1,375	0	0	...	...	12,424	3,271	55	0
1991	5,594	0	2,165	2,165	1,721	98	91	3,033	4,965	7,998	4,382	98	376
1992	3,756	0	797	797	615	68	294	2,669	3,417	6,086	1,555	289	358
1993	4,909	0	437	437	48	0	0	3,074	2,638	5,712	1,695	101	50
1994	3,984	375	1,036	1,411	509	0	10	4,269	5,037	9,306	3,009	66	38
1995	6,261	0	926	926	463	72	0	1,620	4,354	5,974	5,195	441	9
1996	3,424	0	1,218	1,218	937	0	0	3,354	5,624	8,978	2,435	110	65
1997	2,161	0	0	0	794	0	0	2,980	1,685	4,665	4,174	57	85
1998	3,415	0	0	0	479	0	0	4,842	11,293	16,135	2,350	0	77
1999	5,705	0	0	0	75	0	14	2,444	9,328	11,772	1,634	203	145
2000	2,647	0	0	0	255	12	36	2,339	6,351	8,690	1,911	12	43
2001	4,670	0	47	0	816	0	44	3,554	9,020	12,575	5,393	65	160
2002	4,580	51	0	51	517	0	20	3,180	9,733	12,913	5,311	23	20
Mean 1998-2002	4,203	20	9	28	429	2	14	3,272	9,145	12,417	3,320	61	89

[a] Mills 1980-1994; Howe et al. 1995, 1996, 2001a-d; Walker et al. 2003; Jennings et al. 2004, 2006.

Appendix C3.–Reference information specific to 2004 Board of Fisheries proposals**.**

Proposal(s)	Topic	Page	Tables	Page	Figures	Page
101 & 114	Quartz Lake bag limits	64	25, 26, 27	65, 66, 67	12, 13	68, 69
113	Delta Clearwater Arctic grayling gear	34	16	35	6	34