Fishery Management Report No. 12-32

Fishery Management Report for Recreational Fisheries in the Tanana River Management Area, 2010

by

Audra L. J. Brase

and

Brandy Baker

August 2012

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)

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

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The Fishery Management Reports series was established in 1989 by the Division of Sport Fish for the publication of an overview of management activities and goals in a specific geographic area, and became a joint divisional series in 2004 with the Division of Commercial Fisheries. 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.adfg.alaska.gov/sf/publications/. This publication has undergone regional peer review.

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ABSTRACT

Historic, current, and future performance and management of the recreational fisheries of the ADF&G Region III Tanana River Management Area (TRMA) is presented in this report. Particular emphasis is placed on the performance and management of TRMA fisheries for 2010 with preliminary information for 2011.

The Tanana River drainage is the second largest tributary system of the Yukon River. The mainstem Tanana River is a large glacial system formed by the confluence of the Chisana and Nabesna rivers near Tok and the Alaska–Canada border which flows in a generally northwest direction for some 570 river miles to the Yukon River.

Much of the human population in Region III is located within the Tanana River drainage along the Alaska, Richardson, and Parks highways, and along the road system around Fairbanks. These highways and their secondary roads provide much of the access to TRMA sport fisheries.

The majority of fishing effort in the TRMA occurs on the Chena, Salcha, Chatanika and Delta Clearwater rivers; Minto Flats; Harding, Fielding, and Tangle Lakes, and various stocked waters. Sport anglers target many species in the TRMA; however, the most commonly targeted species are: king salmon *Oncorhynchus tshawytscha*, coho salmon *O. kisutch*, Arctic grayling *Thymallus arcticus*, burbot *Lota lota*, northern pike *Esox lucius*, lake trout *Salvelinus namaycush*, and stocked rainbow trout *O. mykiss.*

Key Words: *Arctic grayling, burbot, Chatanika River, Chena River, chum, king, coho, Delta Clearwater River, Fielding Lake, Harding Lake, lake trout, TRMA, management, Minto Flats, Nenana River, northern pike, personal use, rainbow trout, recreational, Salcha River, salmon, sport, stocked waters, Tanana River, Tangle Lakes, whitefish, Yukon River.*

EXECUTIVE SUMMARY

This document provides a wide array of information specific to the recreational angling opportunities and personal use and subsistence fisheries that exist within the Tanana River Management Area. Information specific to the recreation, personal use, and subsistence fisheries within the Tanana River during 2010 and preliminary data from 2011 are presented along with a brief history of these fisheries and past Alaska Board of Fisheries (BOF) decisions that have affected them.

INTRODUCTION

This area management report provides information regarding the Tanana Management Area (TRMA) and is one in a series of reports annually updating fisheries management information within Region III. The report is provided for the Alaska Board of Fisheries (BOF), Fish and Game Advisory Committees (ACs), the general public, and other interested parties. It presents fisheries assessment information and the management strategies that are developed from that information. In addition, this report includes a description of the fisheries regulatory process, the geographic, administrative, and regulatory boundaries, funding sources, and other information concerning Division of Sport Fish management programs within the area.

The goals of the Division of Sport Fish of the Alaska Department of Fish and Game (ADF&G) are to protect and improve the state's recreational fisheries resources by managing for sustainable yield of wild stocks of sport fish, providing diverse recreational fishing opportunities, and providing information to assist the BOF in optimizing social and economic benefits from

recreational fisheries. In order to implement these goals the division has in place a fisheries management process.

A regional review is conducted annually during which the status of important area fisheries is considered and research needs are identified. Fisheries stock assessment projects are developed, scheduled, and implemented to meet information needs identified by fisheries managers. Projects are planned within a formal operational planning process. Biological information gathered from these research projects is combined with effort information and input from user groups to assess the need for and development of fisheries management plans, and to propose regulatory strategies.

Division of Sport Fish (SF) management and research activities are funded by ADF&G and Federal Aid in Fisheries Restoration funds. ADF&G funds are derived from the sale of state fishing licenses. Federal aid funds are derived from federal taxes on fishing tackle and equipment established by the Federal Aid in Sport Fish Restoration Act (also referred to the Dingell–Johnson Act or D–J Act). The D–J funds are provided to states at a match of up to 3–to–1 with the ADF&G funds. Additional funding specified for providing, protecting, and managing access to fish and game is provided through a tax on boat gas and equipment established by the Wallop–Breaux (W–B) Act. Other peripheral funding sources may include contracts with various government agencies and the private sector.

This area management report provides information regarding the TRMA and its fisheries for 2009, with preliminary information from the 2010 season. This report is organized into 2 primary sections: a management area overview including a description of the TRMA and a summary of effort, harvest, and catch for the area, and a section on the significant area fisheries including specific harvest and catch by species and drainage.

The BOF divides the state into 18 regulatory areas to organize the sport fishing regulatory system by drainage and fishery. These areas (different from regional management areas) are described in Title 5 of the Alaska Administrative Code Chapters 47–74. The Division of Sport Fish of ADF&G divides the state into 3 administrative regions with boundaries roughly corresponding to groups of the BOF regulatory areas. Region I covers Southeast Alaska (the Southeast Alaska regulatory area). Region II covers portions of Southcentral and Southwest Alaska (including the Prince William Sound, Kenai Peninsula, Kenai River Drainage, Cook Inlet–Resurrection Bay Saltwater, Anchorage Bowl Drainages, Knik Arm Drainages, Susitna River Drainage, West Cook Inlet, Kodiak, Bristol Bay, and the Alaska Peninsula and Aleutian Islands regulatory areas). Region III includes Upper Copper River and Upper Susitna River area and the Arctic–Yukon–Kuskokwim Region (including the North Slope, Northwestern, Yukon River, Tanana River, and Kuskokwim–Goodnews regulatory areas).

Region III is the largest geographic region, encompassing the majority of the landmass of the state of Alaska (Figure 1). The region contains over 442,500 mi^2(1,146,000 km^2) of land, some of the state's largest river systems (Yukon, Kuskokwim, Colville, Noatak, Upper Copper and Upper Susitna River drainages), thousands of lakes, thousands of miles of coastline, and streams. Regional coastline boundaries extend from Cape Newenham in the southwest, around all of western, northwestern, and northern Alaska to the Canadian border on the Arctic Ocean. Region III as a whole is very sparsely populated, with the most densely populated center located in the Tanana River Valley. Fairbanks (population about 35,000, Fairbanks North Star Borough population of about 99,000) is the largest community.

For administrative purposes the Division of Sport Fish has divided Region III into 5 fisheries management areas (Figure 1). They are:

- Northwestern/North Slope Management Area (Norton Sound, Seward Peninsula, Kotzebue Sound, and North Slope drainages);
- Yukon Management Area (the Yukon River drainage except for the Tanana River drainage);
- Upper Copper/Upper Susitna Management Area (the Copper River drainage upstream of Canyon Creek and Haley Creek, and the Susitna River drainage above the Oshetna River);
- Tanana River Management Area (the entire Tanana River drainage);
- Kuskokwim Management Area (the entire Kuskokwim River drainage and Kuskokwim Bay drainages).

Area management biologists for the 5 areas are located in Nome/Fairbanks, Fairbanks, Glennallen, Fairbanks, and Bethel/Fairbanks, respectively.

ALASKA BOARD OF FISHERIES

The BOF is a 7-member board that sets fishery regulations and harvest levels, allocates fishery resources, and approves or mandates fishery conservation plans for the State of Alaska. BOF members are appointed by the governor for 3-year terms and must be confirmed by the legislature.

Under the current operating schedule, the BOF considers fishery issues for regulatory areas or groups of regulatory areas on a 3-year cycle. Proposals to create new or modify existing regulations and management plans are submitted by ADF&G and the public (any individual can submit a proposal to the BOF) for evaluation by the BOF. During its deliberations the BOF receives input and testimony through oral and written reports from ADF&G staff, members of the general public, representatives of local AC (Advisory Committees), and special interest groups such as fishermen's associations and clubs. The public provides their input concerning regulation changes and allocation through submission of written proposals and testifying directly to the BOF, by participating in local AC meetings, or by becoming members of local ACs.

ADVISORY COMMITTEES

Local ACs have been established throughout the state to assist the Boards of Fisheries and Game in assessing fisheries and wildlife issues and proposed regulation changes. AC members are nominated from the local public and voted on by all present during an AC meeting. Most active committees in urban areas meet in the fall and winter on a monthly basis. Rural committees generally have only one fall and one spring meeting due to funding constraints. AC meetings allow opportunity for direct public interaction with ADF&G staff attending the meetings that answer questions and provide clarification concerning proposed regulatory changes regarding resource issues of local and statewide concerns. The Board Support Section within ADF&G's Division of Administrative Services provides administrative and logistical support for the BOF and ACs. During 2009, ADF&G had direct support responsibilities for 81 ACs in the state.

Within the TRMA there are 6 ACs: Delta Junction, Fairbanks, Minto/Nenana, Middle Nenana River, Lake Minchumina and Upper Tanana/Forty Mile. In addition, the Paxson AC occasionally comments on proposals concerning TRMA fisheries.

RECENT BOARD OF FISHERIES ACTIONS

The BOF meets annually, but deliberates on each individual regulatory area on a 3-year cycle, most recently for the TRMA in January 2010. At that meeting major changes to the TRMA included:

1) Removed the spawning closure and extended the open season year round for Arctic grayling in the Chatanika River, Richardson Clearwater River, and Salcha River drainages.
2) Changed the bag and possession limit from 5 Arctic grayling, 12 inches or greater in length; to 5 Arctic grayling, no size limit in the Chatanika River, Richardson Clearwater River, Salcha River, and Shaw Creek River drainages.
3) In the Chatanika River drainage, the unbaited, single-hook, artificial lure provision was changed to allow only unbaited, artificial lures. In addition, bait is now allowed in the Chatanika River drainage only on hooks with a gap size larger than ¾ of an inch.
4) In the Delta Clearwater River and Tok River drainages, Five-Mile Clearwater Creek, Shaw Creek, and Piledriver Slough the unbaited, single-hook, artificial lure regulations were clarified to indicate that only one unbaited, single-hook, artificial lure may be used when fishing for any species in these systems.
5) To simplify the Chena River regulations, the methods and means were applied drainagewide.
6) In the Chatanika River, the regulatory boundary for the sport fishing salmon closure was moved one mile downstream from a regulatory marker to the Elliot Highway Bridge.
7) Repealed the 5 fish bag and possession limit, open season, and area restrictions for whitefish in the Chatanika River drainage which resulted in the regulations reverting back to the area background regulation of 15 whitefish with no size limit and no closed season.
8) Increased the bag and possession limit for northern pike in Volkmar Lake from 1 fish to 2 fish, of which only one may be 30 inches or greater.
9) Extended the open season for northern pike by 20 days in Volkmar and George lakes. This change aligned the open season for northern pike in all lakes in the Tanana River drainage to June 1–April 20.
10) Established a daily (10) and possession (20) limit for northern pike in the winter subsistence fishery that occurs in that portion of the Chatanika River upstream from the confluence of the Chatanika River and Goldstream Creek.
11) Closed the Tok River drainage to sport fishing for salmon.

Further details of the 2010 regulation changes may be found in the individual fisheries sections of this report and in Brase and Baker (2011).

At the 2007 BOF meeting several changes were made to the sport fish regulations in the TRMA. These included gear restrictions in the Chena River (to promote catch-and-release of Arctic

grayling, yet still allow anglers to target salmon, burbot *Lota lota*, and northern pike); minimum length requirements for lake trout *Salvelinus namaycush* and gear restrictions (to reduce lake trout harvest and hooking mortality) in Harding Lake; adding spears as a legal gear in the Chatanika River personal use whitefish fishery; adding a no bait restriction for Fielding Lake; expanding the harvest dates for Arctic grayling on the Delta Clearwater River; removing the minimum size limit for lake trout in the Tangle Lake system; allowing catch-and-release (C and R) fishing for king salmon in the Goodpaster River; and modifying the bag limit for all finfish species in Koole Lake (stocked lake). In addition, a Lake Trout Management Plan was adopted for the all of the AYK Region (5 AAC 74.040).

For additional BOF actions from 1986 through 2004, see: Arvey (1991; 1992; 1993); Arvey and Parker (1991); Arvey et al. (1990,1991,1995); Brase (2006); Burr et al. (1998); Clark et al. (1992); Doxey (2000; 2001; 2007); Parker (2000; 2001a; 2007a-b); and Parker and Viavant (2000).

ADF&G EMERGENCY ORDER AUTHORITY

ADF&G has emergency order (EO) authority (5 AAC 75.003, 2010) to modify time, area, and bag/possession limit regulations. EOs are implemented to deal with conservation issues not adequately controlled by existing regulations. Once implemented, an EO is in effect until the situation is resolved or the BOF can formally take up the issue. EOs are also used as a tool for inseason management of fisheries. Inseason management is usually in accordance with a fisheries management plan approved by the BOF. EOs issued under this authority for the TRMA from 2006 to 2011 are summarized in Appendix A.

FEDERAL SUBSISTENCE

The Alaska National Interest Lands Conservation Act (ANILCA) established a priority subsistence use of fish and game for federally qualified rural residents on lands and waters for which the federal government asserts jurisdiction. The state of Alaska has also established a priority for subsistence use of fish and game by Alaskan residents (AS 16.05.258) on all lands and waters, but cannot discriminate between rural and urban residents (Alaska State Constitution Article VIII, sections 3 and 15). Because of this difference, the federal government asserted authority to ensure a priority subsistence use of fish and game for rural residents on federal lands and certain adjacent waters. On October 1, 1999 the federal government asserted regulatory authority for assuring the rural priority for subsistence fisheries on federal public lands, which includes non-navigable waters on public lands. Following the "Katie John" decision by the Ninth Circuit Court in 1995, the federal government expanded the definition of public land to include waters for which the federal agencies assert federal reserved water rights. Under current practice, the federal land management agencies adopt regulations to provide for the priority subsistence use by qualified rural residents in non-navigable waters within federal public lands (including Bureau of Land Management (BLM) lands) and in navigable waters adjacent to or within federal conservation system units (generally does not include BLM lands). The state retains all other fish and wildlife management authorities, including management on federal land.

The development of regulations for subsistence fisheries under the federal subsistence program occurs within the established Federal Subsistence Board (FSB) process. The public provides its input concerning regulation changes by testifying in Federal Subsistence Regional Advisory Council (RAC) meetings or by becoming council members. Ten RACs have been established

throughout Alaska to assist the FSB in determining local subsistence issues and providing recommendations on proposed fishing and hunting regulations on the fish and game populations under consideration. Each RAC meets twice a year, and subsistence users and other members of the public can comment on subsistence issues at these meetings.

Within the TRMA the subsistence fisheries under federal regulation includes those in the: 1) Tetlin National Wildlife Refuge (683,000 acres) which includes much of the Nabesna and Chisana rivers; 2) Delta River Wild and Scenic River Corridor (150,000 acres, 160 miles of rivers and streams); 3) the Tangle Lakes Archaeological District (227,000 acres); 4) the headwaters of the Chisana and Nabesna rivers within the Wrangell-St. Elias National Preserve and adjacent to the Tetlin National Wildlife Refuge; and, 5) within the boundaries of Denali National Park and Preserve (9,500 square miles). The TRMA fisheries fall under the purview of the Eastern Interior RAC. The most recent meeting was held in October 2011 in Fairbanks.

REGION III SPORT FISH DIVISION RESEARCH AND MANAGEMENT STAFFING

The Region III Division of Sport Fish 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 biologist for each of the 5 management areas, one or more assistant area management biologists (an assistant area management biologist for the TRMA is located in Delta Junction), and 2 stocked water biologists. Area biologists evaluate fisheries and propose and implement management strategies through plans and regulation in order to meet divisional goals. A critical part of these positions is interaction with the BOF, ACs, and the general public. Stocked waters biologists plan and implement the regional stocking program for recreational fisheries. The regional management biologist assigned to the Region III office in Fairbanks also administers the regional fishing and boating access program.

The research group consists of a research supervisor, a salmon research supervisor, a resident species supervisor, research biologists, and various field technicians. 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 augment one another.

STATEWIDE HARVEST SURVEY

Sport fishing effort and harvest of sport fish species in Alaska have been estimated and reported annually since 1977 using a mail survey (Howe et al. 1995, 1996, 2001a-d; Jennings et al. 2004, 2006a-b, 2007, 2009a-b, 2010a-b, 2011a-b; (Mills 1979-1980, 1981a-b, 1982-1994); Walker et al. 2003). The Statewide Harvest Survey (SWHS) is designed to provide estimates of effort, harvest, and catch on a site–by–site basis. It is not designed to provide estimates of effort directed towards a single species. Species–specific catch per unit effort (CPUE) information can seldom be derived from the report. Two types of questionnaires were mailed to a stratified random sample of households containing at least one individual with a valid fishing license (resident or non-resident). Information gathered from the survey includes participation (number of anglers and days fished), number of fish caught and number harvested by species and site. These surveys estimate the number of angler-days of fishing effort expended by sport anglers fishing Alaskan waters as well as the sport harvest. Beginning in 1990, the survey was modified to include estimation of catch (release plus harvest) on a site-by-site basis. Survey results for

each year are not available until the following year; hence, the results for 2009 were not available until fall 2010. Additionally, creel surveys have been selectively used to verify the mail survey for fisheries of interest or for fisheries that require more detailed information or inseason management.

The utility of SWHS estimates depends on the number of responses received for a given site (Mills and Howe 1992; Clark 2009). In general, estimates from smaller fisheries with low participation are less precise than those of larger fisheries with high participation. Therefore, the following guidelines were implemented for evaluating survey data:

1. Estimates based on fewer than 12 responses should not be used other than to document that sport fishing occurred;
2. Estimates based on 12 to 29 responses can be useful in indicating relative orders of magnitude and for assessing long-term trends; and,
3. Estimates based on 30 or more responses are generally representative of levels of fishing effort, catch, and harvest.

For purposes of reporting and organizing statistics in the SWHS, the TRMA is designated as survey area U.

SPORT FISH GUIDE LICENSING AND LOGBOOK PROGRAM

Since 1998, the Division of Sport Fish has operated a program to register and/or license both sport fishing guides and sport fishing guide businesses and to collect information on sport fishing participation, effort, and harvest by saltwater and freshwater guided clients (Sigurdsson and Powers 2009). In 1998, the BOF adopted statewide sport fishing guide regulations (5 AAC 75.075) which required all sport fishing guides and businesses to register annually with ADF&G. At this time the BOF also adopted statewide regulations that required logbooks for saltwater charter vessels. The logbooks collected information on charter activity (location, effort, and harvest) that was necessary for the BOF for allocation and management decisions specific to king salmon (*Oncorhynchus tshawytscha*), rockfish (*Sebastes* spp.), and lingcod (*Ophiodon elongatus*) and for the North Pacific Fishery Management Council (NPFMC) for allocation of Pacific halibut (*Hippoglossus stenolepis*).

In 2004, the Alaska Legislature adopted House Bill 452 that established licensing requirements for sport fishing guide business owners and sport fishing guides on a statewide basis (effective 2005). This legislation also required logbook reporting for all freshwater guiding businesses, in addition to the existing saltwater reporting requirements. The logbook data provides location of fishing effort, level of participation, and number of species kept and released by clients. This information is used for the regulation, development, and management of fisheries and has been published annually since 2008 in a Fishery Data Series report (Sigurdsson and Powers 2009-2012).

SECTION I: MANAGEMENT AREA OVERVIEW

TRMA DESCRIPTION

After the Porcupine River drainage, the Tanana River drainage is the second largest tributary of the Yukon River (Brabets et al. 1999). The Tanana River basin (Figures 2 and 3) drains an area of approximately 45,918 square miles (73,898 km^2). The mainstem Tanana River is a large glacial-fed drainage formed by the confluence of the Chisana and Nabesna rivers near Tok and the Alaska–Canada border, which flows in a generally northwest direction for some 570 river miles to the Yukon River.

Much of the human population in Region III is located within the Tanana River drainage along the Alaska, Richardson, and Parks highways, and along the road system around Fairbanks. These highways and their secondary roads provide much of the access to sport fisheries. The Fairbanks North Star Borough and part of the Denali Borough lie within the TRMA. Approximately 99,000 people live in this area which encompasses the city of Fairbanks; Fort Wainwright; Eielson Air Force Base; and the communities of Nenana, North Pole, and Salcha.[1] Other communities and municipalities located within the TRMA include Anderson, Big Delta, Cantwell, Chatanika, Delta Junction, Dot Lake, Ester, Fort Greely, Fox, Healy, Livengood, Manley, Mansfield, Minto, Northway, Nabesna, Tanacross, Tetlin, Tok and Two Rivers.

The TRMA affords highly varied fishing opportunities ranging from lake trout and Dolly Varden *S. malma* in the high elevation lakes along the Denali Highway to some of the highest quality Arctic grayling and coho salmon *O. kisutch* fisheries in Interior Alaska.

FISHERY RESOURCES

Throughout the TRMA both indigenous (wild stocks) and introduced (produced in hatcheries and stocked) fish are available to anglers. There are 18 fish species indigenous to the Tanana River drainage, 6 of these are commonly targeted by sport anglers. They include: king and coho salmon, Arctic grayling, burbot, lake trout, and northern pike.

Chum salmon *O. keta*, Dolly Varden, sheefish (inconnu) *Stenodus leucichthys*, least cisco *Coregonus sardinella*, humpback whitefish *C. pidschian*, broad whitefish *C. nasus*, and round whitefish *Prosopium cylindraceum* are taken occasionally by sport anglers.

Longnose suckers *Catostomus catostomus*, Alaska blackfish *Dallia pectoralis*, lake chub *Couesius plumbeus*, slimy sculpin *Cottus cognatus*, and Arctic lamprey *Lampetra japonica* are present but not targeted by sport anglers.

Rainbow trout *O. mykiss* are not native to the drainage, but have been stocked in many lakes. Arctic char *S. alpinus*, coho salmon, king salmon, and Arctic grayling are also stocked in selected lakes of the Tanana River drainage.

[1] U.S. Census Data. 2010. http://www.census.gov (accessed February 23, 2011).

ESTABLISHED MANAGEMENT PLANS AND POLICIES

The regulations governing fisheries in the TRMA in 2010 are found in 5 AAC 74.001 through 5 AAC 74.030 (sport fishing), in 5 AAC 77.171 through 5 AAC 77.190 (personal use), and in 5 AAC 01.200 through 5 AAC 01.249 (subsistence fishing). The specific management plans that affect the TRMA sport fisheries are the: *Minto Flats Northern Pike Management Plans* (5 AAC 74.044 for the sport fishery and 5 AAC 01.244 for the subsistence fishery), *Tanana River Wild Arctic Grayling Management Plan* (5 AAC 74.055), *Chena and Salcha River King Salmon Sport Harvest Management Plan* (5 AAC 74.060), *Tanana River Area Stocked Waters Management Plan* (5 AAC 74.065), *Tanana River Area Wild Lake Trout Management Plan* (5 AAC 74.040), *Yukon River Drainage Fall Chum Management Plan* (5 AAC 01.249), *Yukon River King Salmon Management Plan* (5 AAC 05.360), and *Yukon River Summer Chum Salmon Management Plan* (5 AAC 05.362).

MAJOR ISSUES

Salmon fisheries are often the most controversial fisheries in Alaska and the TRMA is no exception. In terms of allocation of fish, subsistence fisheries have a priority over commercial, personal use, and/or sport fisheries during times when salmon runs are low. This priority can lead to regional and user group conflicts when commercial fisheries occur in the Lower Yukon River before the subsistence users in the upper portion of the drainage have even seen any salmon in their fish wheels and nets. In recent years Division of Commercial Fisheries has implemented emergency regulations to reduce the harvest of salmon (particularly king salmon) in the Yukon River drainage commercial and subsistence fisheries (JTC 2009, 2010).

Subsistence vs. Sport Fisheries

Although hook-and-line is a recognized gear type used by subsistence salmon fishers in some parts of Alaska, subsistence users often perceive the catch-and-release practices of sport anglers as "playing with food". This often creates conflict between subsistence users who are fishing for food and sport anglers who may be fishing for an experience and do not necessarily want to keep the fish they catch.

Conversely, the practice of subsistence users harvesting large numbers of fish is often objectionable to sport fishermen. Such a conflict has arisen in recent years between subsistence and sport users who fish for northern pike in Minto Flats. Some sport fishermen felt that relatively few subsistence fishermen were locally depleting the northern pike population and this would have an adverse affect on the summer spawning population and sport fishery.

Sport Fish Hatchery Production

The decline in the number and size of "catchable" (currently approximately 5 inches (~130 mm), down from the historic 8–12 inch size range (~200-305 mm)) stocked fish provided by state hatcheries has been an issue as the aging Division of Sport Fish hatcheries in Anchorage cannot meet production needs. Until the Ruth Burnett Sport Fish Hatchery (RBSFH), a new ADF&G-Division of Sport Fish hatchery being built in Fairbanks, opens for operation and is able to start outstocking catchable fish (scheduled date 2012) the TRMA will continue to receive fewer and sub–optimal fish and this may contribute to the continued decline in angler effort.

Habitat Degradation

In 1999, the National Resource Conservation Service (NRCS) implemented a watershed project designed to prevent sediment-bearing waters from the Granite Mountains from entering the Delta Clearwater River[2]. In the summer of 2000, the first phase of construction was completed. During 2002 to 2003, construction modifications continued on the project. In 2007, NRCS determined that the Watershed Project was a failure and began looking into future alternatives. In 2009, NRCS decided to make plans for a remedial project to restore the site to as close to pre-project conditions as possible. NRCS has applied for federal stimulus dollars to fund the remediation. Unfortunately, once restored it offers the watershed no protection from future flooding events affecting the DCR. If there is no restoration (remedial project), NRCS is adamant that the DCR will be subject to conditions much worse than if the project had not be done in the first place.

Public Access through Military Lands

There are many stocked lakes located on military lands in the TRMA. In order to access these areas the public may have to acquire a Recreation Access Permit (RAP) for getting on to the military base (Ft Wainwright, Ft Greely or Eielson Air Force Base), or they may have to phone in before entering an area to ensure training exercises are not occurring (Meadows Rd, Donnelly Training Area). These inconveniences may discourage casual anglers from fishing the lakes in these areas.

Alaska Railroad

The Alaska Railroad (ARRC) seeks to extend its mainline track from the crossing at Moose Creek/Richardson Hwy, near Eielson Air Force Base, 80 miles southeast to Fort Greely near Delta Junction. ARRC finalized its environmental impact statement (EIS) in 2010 and construction on the Tanana Bridge began in the fall of 2011. ADF&G has worked closely with the railroad to minimize the impacts to fall chum and coho salmon spawning areas near the proposed Tanana River crossing near the Salcha River.

The Department of Defense is currently drafting a plan for a military road which will extend from the proposed railway line to the Blair Lakes training area.

Invasive Species

In late fall 2010, large mats of an invasive aquatic plant (*Elodea canadensis*) were identified in Badger Slough (Amy Larsen, National Park Service [NPS] Biologist, personal communication). Prior to this discovery *Elodea* had not been documented in Interior Alaska; although when archival video footage was examined, it was determined that the plant had been in the slough for at least three years. This plant has the potential to spread throughout the Chena River drainage and possibly further into the Tanana River drainage, possibly degrading fish habitat. In 2011, the USFWS, NPS, and the Tanana River Watershed Association began surveying and collecting samples of aquatic plants to determine the spread of *Elodea* throughout the area.

ACCESS PROGRAMS

The Wallop-Breaux amendment to the Federal Aid in Sport Fish Restoration Act (D–J) mandates that at least 15% of the federal funds collected from taxes on boat gas and sport fishing

[2] Salcha/Big Delta Soil and Water Conservation District,. 1987. Granite Mountain/Clearwater Creek water quality planning project, final report and recommendations. P.O. Box 547, Delta Junction, Alaska.

equipment be used by the states for the development and maintenance of motorized boating access facilities. A broad range of access facilities can be approved for funding if they are constructed to achieve a state fishery management objective. These facilities can include boat ramps and lifts, docking and marina facilities, breakwaters, fish cleaning stations, rest rooms, and parking areas.

In 2011, construction of a new public use cabin was begun at Coal Mine Lake #5, an outhouse was completed near the Manley boat launch and a new boat launch was completed within the right-of-way of the newly constructed Tanana River Bridge east of Tok. No other major access projects were constructed in the TRMA. Planning continues on development of the Tanana Lakes Recreation Area in which stocked lakes, river access, and campgrounds are planned adjacent to the Tanana River south of Fairbanks. This project is modeled after the existing Chena Lakes project that was developed when the Moose Creek Dam was built. Access funds were also used to construct public use ice houses for Chena and Birch lakes. Pending DNR approval a new public use cabin may be built at Glacier Lake, off the Denali Highway.

INFORMATION AND EDUCATION

Information regarding regulations, publications, stocking and fishing reports, news releases and EOs for the TRMA can be found at the ADF&G, Division of Sport Fish website (www.adfg.alaska.gov). From the Sport Fishing and TRMA link on this website, anglers interested in fishing the TRMA can read the area descriptions and download several Division of Sport Fish publications, including: *Stocked Lakes of the Tanana Valley*, *Fishing the Stocked Lakes of Donnelly Training Area*, *Fishing Quartz Lake*, *Coal Mine Road Lakes*, and *Roadside Salmon Fishing in Interior Alaska*.

There are three regional information and education (I&E) staff located in the Fairbanks office. An Information Officer II and a seasonal Fisheries Technician III respond to questions from the public at the office and via phone and e-mail. In addition, I&E staff distribute and update fishery brochures, fishing regulations, the regional webpage, coordinate the Fairbanks Outdoor Show booth, Kid's Fish & Game Fun Day, and the Becoming an Outdoors Woman (BOW) program. An Education Associate II coordinates the sport fishing component of the Alaska Conservation Camp and works with schools in various communities throughout the region to provide a curriculum in sport fishing and aquatic education.

A unique I&E feature of the TRMA is that Delta Clearwater River coho salmon provide eggs for schools from Fairbanks to Tok that participate in the statewide "Salmon in the Classroom" aquatic education program. School children rear the eggs in classroom incubators throughout the winter to learn about the life cycle of salmon.

SPORT FISHING EFFORT, HARVEST, AND CATCH

Angling within the TRMA occurs at numerous rivers, lakes, ponds, and streams. Some of these water bodies are accessible directly from the road system and have some type of boat launch accommodating watercraft appropriate to the size and characteristics of the water body. Access to off–road waters may be made by foot (or skis), overland use of ATVs, snowmachines, and/or dog teams. Access to the most remote sites may require light aircraft equipped with tundra tires, floats, or skis.

Opportunities for sport angling are available year–round in the TRMA. During the open water seasons sport fishing may occur wherever game fish are present, subject to time and/or area closures. Winter effort focuses on stocked lakes, with some effort directed toward lake and river populations of burbot, lake trout and northern pike. From 2005–2009, the TRMA has averaged approximately 47% of the Region III total sport fishing effort (number of angler-days, Table 1). The majority of fishing effort in the TRMA occurs in the Chena River (Appendix B).

In terms of fish harvested, the TRMA has averaged 35% of the Region III sport harvest over the past five years (Table 1), and has been in a downward trend since 2002. The majority of species caught and harvested in the TRMA are Arctic grayling, northern pike, burbot, and stocked species (Table 2).

Fishing guides, outfitters, and transporters take anglers to areas of higher quality fishing. Most transport is by aircraft or boat. Some commercial operators provide cabins or some sort of shelter, and/or boats for angler use. In the TRMA guides are known to operate in Minto Flats, Chena Lakes Recreation Area, George Lake, and the Nenana, Salcha, Chena, and Delta Clearwater rivers.

All sport fishing guides must be licensed annually with ADF&G and fill out a logbook recording their clients' fishing location, license number, residency, and their daily catch and harvest by species. In the TRMA these data may provide the area management biologist with previously unavailable information that may be useful for identifying areas that guides are using. This information may be used for making decisions regarding future research and/or management needs. In recent years these logbooks have provided an additional measure of fishing effort, catch and harvest by guided anglers (Appendix C). The number of fish reported as harvested and released by guides provides a check on results from the SWHS in areas where sport fishery guides are operating businesses; however the results reported in Appendix C have been summed for the entire Tanana River drainage as there are too few guides to separate out the catch and harvest numbers by individual fishery (ADF&G confidentiality policy). Note that the SWHS reports catch (fish harvested and released) and harvest while the guide log book reports list fish released and fish “kept”.

SECTION II: FISHERIES

Recreational angling occurs throughout the TRMA in diverse habitats, where anglers may target a large variety of fish species. This report will focus on the major fisheries that consistently get the highest amount of fishing effort and have had recent changes to the regulations which affect angling opportunity.

KING AND CHUM SALMON

Chena River

Background and historic perspective

The Chena River is a rapid runoff, tannic-stained river that flows slowly through the city of Fairbanks near its mouth with the Tanana River (Figures 3 and 5). It is approximately 160 miles long and in the summer of 1967, caused severe flooding in downtown Fairbanks. The flood was the impetus to begin construction in 1973 on the Moose Creek Dam at river mile 45 (~72 km; near the city of North Pole) to divert any future high water events away from populated areas. The dam was completed in 1979 and is operated and maintained by the U.S. Army Corps of Engineers.

The Chena River supports one of the largest king salmon populations in the Alaskan portion of the Yukon River drainage, with average annual returns of over 3,400 fish from 2006 to 2010 (Table 3). Adult king salmon enter the Yukon River during or shortly after breakup and migrate into the Tanana River to appear in the Lower Chena River (920 miles from the Bering Sea) between late June and the second week of July. They move up the Chena River to spawning areas which are primarily upriver from the where the fishery occurs (fishing for king salmon is closed above the dam). The run ends in late July or early August.

Chum salmon are primarily available in July and August during and just after the king salmon fisheries, and are targeted or caught incidentally while fishing for king salmon. While chum salmon are generally more abundant than king salmon, and are subject to a more liberal bag and possession limit (3 fish/day), the average harvest and catch is lower than that for king salmon (Table 4). The poor quality of chum salmon flesh for human consumption by the time the fish reach the Chena River is likely a contributing factor. Coho salmon are not present in the Chena River drainage.

Chena River king and chum salmon escapements have been annually assessed since 1986 using either mark-recapture experiments or a counting tower located at the Moose Creek dam (Table 3; Barton 1987, 1988; Barton and Conrad 1989; Brase 2012; Brase and Doxey 2006; Burkholder 1991; Doxey 2004; Doxey et al. 2005; Evenson 1991b; 1992 1992-1993; 1995-1996; Evenson and Stuby 1997; Savereide 2012a-b; Skaugstad 1990a, 1994; Stuby and Evenson 1998; Stuby 1999-2001). The average escapement from 2005–2009 was 3,472 king salmon (Table 3). Counting conditions at the dam can be highly variable depending on water height and river turbidity. In 2005 and 2011, the Chena River was extremely high and turbid for most of the king

salmon run; therefore, escapement was not estimated. In contrast, 2006 through 2010 had good counting conditions throughout the majority of the run and satisfactory estimates of escapement were produced.

Historically, the Chena River king salmon sport fishery was managed under a management plan with an escapement goal and a guideline harvest allocation for the sport fishery. An aerial survey escapement index of 1,700 fish was set by Division of Commercial Fisheries in 1992 (Bergstrom et al. 1995). In 1993, Division of Sport Fish staff expanded this aerial survey escapement index into an actual escapement abundance goal of 6,300 fish, as measured by the counting tower. This point objective was calculated based on averages of escapement data available at the time. A guideline sport harvest objective of 300–600 king salmon in the Chena River was set by the BOF in 1990. Inseason management for the guideline harvest objectives was impractical because there was no mechanism for day-to-day enumeration of the harvest and the harvest objectives were repealed in 2001.

In 2000, ADF&G formed an escapement goal (EG) committee to evaluate and calculate EGs for Chena and Salcha River king salmon and for some Yukon River drainage chum salmon stocks. The EG process was designed to set escapement ranges which maximize potential yield. The EG committee recommended a biological escapement goal (BEG) range of 2,800–5,700 king salmon, measured by the counting tower, for the Chena River based on an analysis of run reconstruction data related to brood year returns. There is no escapement goal set for chum salmon in the Chena River.

The annual escapements of king salmon into the Chena and Salcha rivers mirror each other sufficiently so that inferences regarding attainment of BEGs for both rivers can be made even if good data are available from only one of the rivers (Table 3). If high water disrupts the counts in one of the rivers, but not the other, the escapement projections and estimates for the river in which an accurate estimate can still be made are considered an index of the king escapement in the other river, and are to be used as a measure of run strength rather than the BEG.

A king salmon sport fishery has occurred at the Chena River since before statehood and the bag and possession limit for king salmon in the Tanana River drainage has remained unchanged since the early 1960s, at one fish ≥ 20 inches (~510 mm). The fishery is very easily accessible in the lower portion of the Chena River with multiple boat launch and walk-in sites located throughout Fairbanks and North Pole. The fishery is closed above the Moose Creek Dam.

The Chena River king salmon sport fishery continues to be relatively small, especially when compared with fisheries in Southcentral and Southeast Alaska; however, it remains very popular as it is one of the few opportunities to catch large fish near Fairbanks. Most sport anglers release their catch as the salmon flesh is quite deteriorated by the time the fish have traveled the 1000+ miles from the Bering Sea (Tables 4 and 5).

Recent Fishery Performance

Estimated harvests of king salmon between 1983 and 1992 ranged from 0 to 375 fish, and then increased in the mid-1990s (Brase 2009b). The 2010 king salmon harvest was 32 fish which was well below the 5-year average (2005–2009) harvest of 193 fish (Table 4). The 2010 catch of 515 fish was also below the 5-year average catch of 914 fish (Table 5). The 2010 harvest and catch numbers were likely below average due to low escapement and the king salmon sport fishing closure that occurred on July 28.

The 5-year (2005–2009) average total chum salmon harvest and catch in the TRMA was 126 and 857 fish, respectively (Tables 4 and 5). The Chena River chum salmon harvest and catch has represented less than half of the area total harvests during this period.

The Chena River experienced very high and turbid water conditions during the majority of the 2011 king salmon run. Due to these conditions the counting tower was unable to produce a useable estimate of escapement (Savereide 2012b). Based on the number of carcasses observed during the carcass survey and various angler reports, it is likely that the lower end of the escapement goal range was met (2,800 fish) although there is no way to confirm that presumption.

Fishery Objectives and Management

In 2001, the BOF adopted policy directing ADF&G to manage salmon harvests so that escapements fall within the BEG ranges set by ADF&G and adopted by the BOF. The BEGs are evaluated and modified as needed on a 3-year cycle in synchrony with the BOF meeting cycle for the Yukon River drainage.

Commercial and subsistence salmon harvests occur along almost the entire length of the mainstem Yukon and Tanana Rivers (Tables 6 and 7; JTC 2010). In 2001, the BOF adopted the *Chena and Salcha River King Salmon Sport Harvest Management Plan* (5 AAC 74.060) which mandated that all the Tanana River fisheries (commercial, subsistence, personal use, and sport) be managed in a manner such that the Chena River king salmon BEG range of 2,800–5,700 fish is achieved at the counting tower. In order to get that number of fish past the counting tower, restrictions may be placed on any or all of the Tanana River fisheries.

In 2009, an in-house *Sport Fish Management Plan for Chinook Salmon in the Chena and Salcha Rivers* (Brase 2009c) was developed to guide the sport fish manager and provide the basis for management actions in this popular king salmon sport fishery. The plan provides a prescription for fishery management actions based on projections of final escapement from counting tower data on or after Day 20 of the run relative to the BEG range for each river. The first day king salmon are seen at the counting tower is considered Day 1 of the run and the run typically lasts around 40 days with the midpoint on Day 20. Historical run-time data suggest that by Day 20 projections accurately predict escapements relative to meeting or not meeting the lower end of the BEG and allows a sufficient number of days in the run to provide additional harvest opportunity or reduce the harvest. Potential management actions include: closing the fishery if the lower end of the BEG range will not be met; restricting the fishery to catch-and-release only if there is a small chance of not achieving the lower end of the BEG range; maintaining the status quo regulations if projections indicate escapements will fall within the BEG range; liberalizing the regulations to allow a daily bag limit of two large king salmon if it is likely escapement will exceed the upper end of the BEG range; and, liberalizing the regulations to allow a daily bag limit of three large king salmon if it is likely escapement will exceed the upper end of the BEG range by 30% of the upper end BEG or greater.

In 2010, the plan suggested that the Chena River king salmon sport fishery be closed because the run was not projected to meet minimum escapement. An EO and news release were issued on July 26 and the fishery was closed on July 28. This proved to be the appropriate management action as the run did not meet minimum escapement.

In 2011, the Chena River king salmon fishery was restricted to catch and release only by EO on July 23 (Appendix A). This action was taken because the Chena River counting tower was inoperable due to high and turbid water conditions, and lower river indicators suggested that the king salmon run was weak. Restrictions had been placed on subsistence, commercial, and sport users in the Yukon River and closing the Chena (and all other Tanana River tributaries) to retention of king salmon seemed prudent based on recent years' production and the lack of data from the current year.

The closure in 2010 was the first EO issued to restrict the Chena River king salmon fishery since 2000 (Brase 2008; Appendix A). Prior to 2010, management actions on the mainstem Yukon and Tanana river subsistence, commercial, and personal use fisheries have in part enabled the Chena River king salmon BEG goal to be met or exceeded every year since 1990 (Brase 2009a; Table 3). In 2008, 2009, and 2011 the mainstem Yukon River commercial and subsistence fisheries were restricted in order to meet Canadian border passage obligations.

In 2010, downriver salmon assessment projects indicated that the chum salmon run was very weak. Therefore, on August 20, in accordance with the *Yukon River Drainage Fall Chum Salmon Management Plan* (5 AAC 01.249), the chum salmon sport fisheries were closed throughout the Yukon River drainage, including the Chena River and remainder of the Tanana River drainage (Appendix B).

Current Issues and Fishery Outlook

While run strength and river conditions can override fishing effort in affecting harvest and catch, the harvest potential of this fishery may be increasing due to a combination of increased public awareness of its availability and improvements in the gear and fishing techniques used to target king salmon; however, most recent estimates suggest that harvests have declined from the 1990s and exploitation rates remain low (Brase 2009a, Table 4).

Recent Board of Fisheries Actions

There have been no actions taken by the BOF with regards to the Chena River salmon fisheries since 2001 when the *Chena and Salcha River King Salmon Sport Harvest Management Plan* was adopted.

Current or Recommended Research and Management Activities

There has been some concern raised about the effect Moose Creek Dam may have on Chena River salmon passage. The dam is designed to allow water to pass freely through three floodgates at normal river stages. Fish passage is unimpeded until the river rises, placing property downstream at risk of flooding. When flow exceeds 8,000 cfs, the floodgates are partially closed to maintain that flow rate downstream from the dam. Water is diverted along the floodway to the Tanana River. The floodgates have seldom been lowered while adult king salmon were passing through the structure, and then only for short periods of time. A fishway built into the side of the structure is designed to allow fish passage if a large volume of water is backed up behind the dam. Because the water rarely gets high enough to flow down the fishway, its potential to pass migrating salmon is essentially untested.

Since 2007 DIDSON sonar has been deployed downstream of the dam to test the feasibility of estimating the number of migrating salmon during periods of high-water (> 2 consecutive days) when tower counts could not be completed. In 2007, a DIDSON was deployed at this site and a mixture model based on length was used to allocate the total count of salmon passing the sonar into numbers of Chinook and chum salmon (Huang 2012). Results were compared to actual

tower counts and suggested this methodology is an appropriate means to estimate passage when conditions prohibit tower counts. The project objective is to position two sonars so they can record images from each half of the river, 24 hours a day, 7 days a week. Research staff shall continue to refine the DIDSON operations so the sonar is a viable option during periods of high water.

Salcha River

Background and historic perspective

The Salcha River is located approximately 40 miles east of Fairbanks via the Richardson Highway. It is a tannic stained rapid-runoff system, approximately 120 miles long originating in the Tanana Hills to the north (Figure 3). Numerous recreational cabins are located along the lower 70 miles of the river.

The Salcha River supports the largest king salmon escapement in the Tanana River drainage, with average annual returns of over 8,000 fish from 2006 to 2010 (Table 3). Adult king salmon enter the Yukon River during or shortly after breakup, and migrate into the Tanana River to appear at the mouth of the Salcha River (965 miles from the Bering Sea) between late June and the second week of July, and continue up the Salcha River to spawning areas. The run ends in late July or early August.

Similar to the Chena River salmon sport fishery, chum salmon are caught incidental to king salmon in the Salcha River. Coho salmon are not present in the Salcha River drainage.

The Salcha River king and chum salmon runs have been annually assessed since 1987 using mark-recapture experiments or by a counting tower located near the Richardson Highway Bridge (Table 3; Barton 1988; Barton and Conrad 1989; Brase 2012; Brase and Doxey 2006; Burkholder 1991; Doxey 2004; Doxey et al. 2005; Evenson 1991b; 1992-1993, 1995-1996; Evenson and Stuby 1997; Savereide 2012a-b*;* Skaugstad 1988-1990a, 1992-1994; Stuby and Evenson 1998; Stuby 1999-2001). The operation of the Salcha River counting tower is currently contracted to Bering Sea Fishermen's Association (BSFA) with funding from the US/Canada Yukon River Pacific Salmon Treaty. BSFA closely follows the project design and methodology established by Division of Sport Fish (which operated the tower from 1993 to 1998) for this project. Contractor staff report king salmon passage counts to the Division of Commercial Fisheries at the end of each day so that ADF&G can calculate and track cumulative passage. Counting conditions on the Salcha River can be highly variable depending on water height and river turbidity.

There has been a king salmon sport fishery at the Salcha River since before statehood. The salmon fishery is accessible from either a vehicle trail just west of the Richardson Highway Bridge or the nearby Salcha River State Recreation Site (campground). Boaters launch at the campground and travel downstream to fish near the confluence of the Tanana and Salcha rivers. The salmon fishery on the Salcha River is closed above a marker located about 2 1/2 miles upriver from the Richardson Highway Bridge (about 5 miles upstream from the confluence of the Salcha and Tanana rivers). Most of the spawning occurs upstream of this area.

Until 1989, the Salcha River king salmon sport fishery had more angler effort and greater king salmon harvests than were seen on the Chena River. Estimated harvests between 1983 and 1992 ranged from 47 to 871 fish (Brase 2009b). Subsequently, harvest and catch did not increase as dramatically in the Salcha River as in the Chena River, but the average harvest continues to be

higher on the Salcha River (Table 4), even with a much smaller portion of the river open to salmon fishing.

The daily bag and possession limits for king salmon in the Tanana River drainage have remained unchanged since the early 1960s, at one fish ≥ 20 inches (~510 mm) per day.

Recent Fishery Performance

The 2010 king salmon harvest was 143 fish with a catch of 1,108 fish; this was below the 5-year average harvest (2005–2009) of 332 fish and above the average catch of 837 fish (Tables 4 and 5). It is difficult to determine if effort is increasing in the salmon fishery using the SWHS data because the Salcha River supports a multi-species sport fishery.

Similar to the Chena River, in 2011 the Salcha River had poor counting conditions throughout the king salmon run which limited counts to 16 of the 45 historic day's passage period. The count of 7,200 king salmon should be considered a minimum estimate of escapement (Table 3; C. Stark, Fisheries Biologist, BSFA, Fairbanks; personal communication). Salcha River contract staff performed an aerial survey on July 21 and 3,664 king salmon were observed from the mouth to above "The Splits" (approximately river mile 125 (~200 km). This suggests that the Salcha River met its escapement goal.

Fishery Objectives and Management

Similar to the process described under the Chena River king salmon section of this report, the EG committee recommended and the BOF adopted, a Salcha River king salmon BEG of 3,300-6,500 fish in 2001. Like the Chena River, the Salcha River king salmon BEG range has been met or exceeded every year since 1990 (Table 3).

The Salcha River is also managed under the *Chena and Salcha River King Salmon Sport Harvest Management Plan* (5 AAC 74.060), and an in-house management plan developed in 2009 to guide the sport fish manager and provide the basis for management actions in the Chena and Salcha rivers king salmon fisheries (Brase 2009c).

In 2011, the Salcha River king salmon fishery was restricted to catch and release only by EO on July 23 (Appendix A). This action was taken because the Salcha River counting tower was inoperable due to high and turbid water conditions, and Yukon River indicators were suggesting that the king salmon run was weak. Restrictions had been placed on subsistence, commercial and sport users in the Yukon River and closing the Salcha (and all other Tanana River tributaries) to retention of king salmon seemed prudent based on recent years' production and the lack of data from the current year.

In 2010, downriver salmon assessment projects indicated that the chum salmon run was very weak. Therefore, on August 20, in accordance with the *Yukon River Drainage Fall Chum Salmon Management Plan* (5 AAC 01.249), the chum salmon sport fisheries were closed throughout the Yukon River drainage, including the Salcha River and remainder of the Tanana River drainage (Appendix B).

Current Issues and Fishery Outlook

Typically, more sport anglers target king salmon on the Salcha River than on the Chena River; possibly due to better water clarity, larger run size, and the ease of access to good fishing locations.

Recent Board of Fisheries Actions

There have been no actions taken by the BOF with regards to the Salcha River king salmon fisheries since 2001 when the *Chena and Salcha River King Salmon Sport Harvest Management Plan* was adopted.

Current or Recommended Research and Management Activities

It is recommended that the department continue to work with BSFA contractors, who operate the Salcha River escapement monitoring project, in order to receive daily updates of the number of salmon passing the counting tower and river conditions.

COHO SALMON

Delta Clearwater River

Background and Historical Perspective

Coho salmon migrate to spawn in small spring-fed tributaries on the south side of the Tanana River drainage. These tributaries near Delta Junction provide critical habitat for the largest known coho salmon spawning concentrations in the Yukon River drainage. Because spring-fed systems do not freeze and coho salmon spawn into the late fall, these fish provide the latest open-water fishing opportunities in the region. Several such spring-fed systems exist throughout the upper portion of the Tanana River drainage, the largest of which is the Delta Clearwater River (DCR; Figure 4).

The DCR supports the largest documented spawning stock of coho salmon in the Yukon River, with escapements averaging over 12,000 fish/year from 2006–2010 (Table 8). The DCR is about 20 miles in length, is road accessible and supports the largest recreational fishery for coho salmon in the Tanana River drainage (Tables 4 and 5). From 2005 to 2009, an average of 266 coho salmon were harvested of the 3,100 fish caught annually in the DCR (Table 5). In 2010, the harvest of 209 fish was below the 5-year average (Table 4).

Annual escapement index counts of coho salmon have been conducted by boat survey since 1972 (Brase 2012; Brase and Doxey 2006; Doxey 2004; Doxey et al. 2005; Evenson 1991b; 1992-1993, 1995-1996; Evenson and Stuby 1997; Savereide 2012a-b*;* Skaugstad 1988-1989, 1990b, 1992-1994; Stuby and Evenson 1998; Stuby 1999-2001). Escapement counts are conducted from an elevated platform on a riverboat during the peak of the coho salmon spawning period (generally mid-October) in that portion of the Delta Clearwater River from its confluence with the Tanana River, upriver to mile 18 (~29km), or to the uppermost navigable point.

Coho salmon are the last of the salmon species to enter the Yukon River and may be seen in the DCR starting in mid-September. The peak of the run is in mid-October. Property owners living near the river have reported coho salmon spawning as late as January. The springs provide favorable overwintering habitat for juvenile coho salmon that rear in the river. Carcass sampling from 1984 to 1990 indicated that on average 14% of the returning coho salmon were 3-years old (1.1), 79% were 4-years old (2.1), and the remaining 7% were 5-years old (3.1) (Parker 1991). Therefore the majority of the coho salmon fingerlings in the DCR rear for 3 winters (including one winter rearing in river gravel), then outmigrate and spend 1 winter in the ocean before returning (Parker 1991).

Recent Fishery Performance

Coho salmon in the DCR provide the last open-water fishery of the year, attracting both local and non-local anglers who want the opportunity to catch a salmon. Anglers can fish from shore or by boat, which can be launched at the State Park campground or at a boat launch at river mile 8.5 (~13.5 km) off Jack Warren Rd. Coho salmon are caught from mid-September through October using various spoons, large spinners, or flies.

The coho salmon fishery on the DCR has steadily grown in popularity since 1984 (Parker 2009 b). The majority of coho salmon are released (Tables 4 and 5); the quality of the salmon flesh in the DCR is not as desirable as fish caught closer to the confluence of the Yukon and Tanana rivers. In 2010, the catch of 3,214 coho salmon was just above of the 5-year average of 3,100 fish (Table 5).

Fisheries Objectives and Management

Coho salmon assessment in the Yukon River drainage is quite limited and relies heavily on information from commercial and subsistence harvests; icy, winter conditions make sampling difficult and expensive. The only coho salmon escapement goal that is presently in place for the Yukon River drainage is the Delta Clearwater River. The current coho salmon escapement goal (5,200–17,000 fish; sustainable escapement goal (SEG)), was adopted by the BOF in 2004, and replaced the previous minimum threshold of 9,000 fish. The goal continues to be based on a boat survey during peak spawning. These boat counts are conducted on the navigable portion of the river from the confluence with the Tanana River upstream approximately 18 river miles. The average count from 2006 to 2010 in the DCR was 12,163 fish (Table 8).

The department monitors the DCR coho salmon escapement between mid-September and early October to determine if any inseason management action is necessary. An in-house management plan states that if 2,500 fish are found in the lower eight miles of river between September 15 and October 1, it is likely that the escapement goal will be met and no management actions to restrict harvest will occur. However, if less than 1,500 fish are found in the lower eight miles of river during the same time period, the sport fishery may be closed by EO. The present bag and possession limit is 3 coho salmon per day/3 in possession. Yukon River sonar counts and catch rates from a test fish wheel on the Tanana River near Nenana may be used as a preliminary index of DCR coho salmon run strength. With these data and a preliminary escapement estimate, the department has reasonable tools to predict if the coho salmon sport fishery needs to be restricted.

In 2011, approximately 500 coho salmon were counted on September 30 from the state campground (mile 8 or ~13km) downriver to mile 3 (~4.8 km), the lower 3 miles (4.8 km) of the river were not sampled because of poor viewing conditions (wind). Although this count was below the 1,500 fish trigger no actions were taken to restrict the fishery because Yukon and Tanana sampling projects were indicating that the run was late, and fishermen in the DCR were reporting large numbers of coho salmon holding at the mouth of the river. The final escapement estimate for 2011 was 6,180 coho salmon; surpassing the lower bound of the SEG.

Current Issues and Fishery Outlook

Between 2001 and 2005, large numbers of coho salmon returned to the DCR. However, since 2005 there has been a significant decrease in the run size signaling a change in return per spawner in the DCR (Table 8). In 2011, the escapement of 6,180 coho salmon was 51% below

the recent 5-year average (2006–2010) of 12,163 fish. During the past 10 years, the escapement goal for the DCR has been met or exceeded every year.

Recent Board of Fisheries Actions

The last BOF action affecting salmon sport fishing in the DCR was in 1998 when a 3 fish bag and possession limit for coho and chum salmon was established drainagewide.

Current or Recommended Research and Management Activities

The preliminary Lower DCR survey (mid-September) and peak DCR coho salmon survey should be conducted annually to assess the coho salmon run in relation to the 5,200–17,000 fish SEG.

KING, COHO, AND CHUM SALMON

Other TRMA Fisheries

Background and historic perspective

Several other river drainages in the TRMA support spawning populations of salmon; these include the Chatanika (king and chum salmon), Nenana (king, chum and coho salmon) and the Goodpaster rivers (king and chum salmon). The furthest upstream tributary of the Tanana River drainage in which substantial king salmon spawning occurs is the Goodpaster River.

The Tanana River from its confluence with the Gerstle River to the Little Delta River is crucial habitat for returning 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 chum and coho salmon.

Coho salmon migrate to spawn in small spring-fed tributaries in the south side of Tanana River drainage. Several such springs are known to exist throughout the TRMA, including the Richardson Clearwater River, Providence Creek, and Blue Creek.

The Chatanika River king salmon population was assessed sporadically by boat survey and then annually from a counting tower from 1998 to 2005 (Table 3; Brase and Doxey 2006; Doxey 2004; Doxey et al. 2005; Stuby 1999-2001). The counting tower project was discontinued in 2005 due to consistently annual high water conditions which resulted in poor viewing conditions and poor quality estimates in most years.

The Nenana River drainage is believed to support the second largest coho salmon spawning population in the Tanana River drainage and has been surveyed regularly by boat and aerial survey since 1993 (Chris Stark, Bering Sea Fishermen's Association [BSRA] biologist, personal communication). These surveys indicate that recent Nenana River drainage coho salmon escapements have been between 2,000 and 9,000 fish (Table 8).

Pogo Mine (J/V Teck/Cominco and Sumitomo LLC), a working mine within the Goodpaster River drainage, conducted aerial surveys for king salmon from 1998 to 2003 as part of environmental assessment studies (Table 3). In 2004, Teck-Pogo Inc. contracted BSFA to monitor the Goodpaster River king salmon escapement for 20 years. BSFA subcontracted Tanana Chiefs Conference (TCC) to operate a counting tower. Since 2004, TCC has operated the counting tower on the North Fork of the Goodpaster River. In 2011, an estimated 1,325 king

salmon passed the counting tower under moderately favorable counting conditions (Table 3; C. Stark, Fisheries Biologist, BSFA, Fairbanks; personal communication).

Fishery Objectives and Management

Due to a lack of a long time series of return data, there are no escapement goals associated with any of the "other" TRMA salmon populations.

When an EO is implemented restricting the fishing regulations for king salmon based on information from the Chena and Salcha rivers or downriver (Yukon and Tanana rivers) run indicators, it typically covers all of the king salmon fisheries in the Tanana drainage. However, EOs relaxing inseason restrictions or liberalizing standard regulations may not apply to the other Tanana River drainage stocks if the information is based only on tower count information from the Chena and Salcha rivers, and if there is not specific information as to run status in the other streams.

In 2011, all tributaries were restricted to king salmon catch and release only by EO on July 23 (Appendix A). This action was taken because the counting towers on the Chena and Salcha rivers were inoperable due to high and turbid water conditions, and lower river indicators were suggesting that the king salmon run was weak. Restrictions had been placed on subsistence, commercial, and sport users in the Yukon River and closing all Tanana River tributaries to retention of sport-caught king salmon seemed prudent and reasonable based on recent years' production and the lack of reliable inseason escapement data.

Current Issues and Fishery Outlook

Although effort and catch rates are currently sporadic and low in these minor salmon systems, this may change as more development occurs in the area.

Recent Board of Fisheries Actions

At the 2010 BOF meeting a proposal was adopted which relocated the regulatory boundary marker between the Upper and Lower Chatanika River, above which is closed to salmon fishing. The former regulatory boundary was located one mile (~1.6 km) upstream from the Elliott Highway Bridge and was originally put in place for the whitefish spear sport fishery that occurred in the area through 1993. Other regulations used this point as a reference in order to maintain consistency. The new boundary is the Elliott Highway Bridge itself. This new location provides a more permanent and recognizable boundary.

The BOF also adopted a proposal which closed the Tok River drainage to sport fishing for salmon to provide protection for a developing stock. In 2008, the department received a report of about 50 spawning coho salmon in the Tok Overflow #1 (30 miles upstream in the Tok River) (Parker 2009b). In October 2009, department staff again surveyed the same area on and counted 13 coho salmon. These were the first historical documentations of any coho salmon in these springs and given low numbers of fish the BOF supported providing protection to this small salmon stock.

In 2007, the BOF adopted a proposal to allow catch-and-release fishing for king salmon in the lower 25 miles of the Goodpaster River from July 1 through August 31 (Parker 2008).

Current or Recommended Research and Management Activities

The Chatanika River drainage was an important mining area from the 1920s through 1950s. In 1926 the Davidson Ditch Diversion Dam was built. It was used to support industrial activity in the area until it became inoperable in 1967 due to flood damage. In 2002, the dam was removed through a cooperative partnership among several state, federal, and private non-profit organizations. This project restored fish passage to more than 65 miles (105 km) of upstream habitat for king and chum salmon. Staff from BSFA annually monitors the watershed above the old dam site for recolonization by salmon adults and/or juveniles. Juvenile salmon have been observed from the former dam site to approximately 6.2 miles (10 km) upriver every year since the dam was removed except in 2009, when no juveniles were observed despite extensive trapping and survey efforts (C. Stark, Fisheries Biologist, BSFA, Fairbanks; personal communication).

Aerial surveys of other coho salmon producing streams in the area are conducted. For example, since 2000 aerial surveys have been performed consistently by the Division of Commercial Fisheries to count Richardson Clearwater River (RCR) coho salmon. In 2011, an estimated 575 coho salmon were counted on the RCR (M. Parker, Commercial Fish Biologist, ADF&G, Fairbanks; personal communication), the average escapement for 2006–2010 was 449 fish (Table 8).

A foot survey was conducted on Blue Creek for the first time in 2007 from the mouth to head of the springs (approximately 1.2 miles). Peak salmon counts in Blue Creek showed 2,200 chum and 102 coho salmon (Parker 2008). In 2011, 61 coho, and 2 chum salmon were counted in the same area.

ARCTIC GRAYLING

Chena River

Background and historic perspective

Due to its accessibility, the Chena River Arctic grayling stock offers high-quality angling opportunity to a broad socio-economic and age spectrum of anglers. There is road access from Eielson Air Force Base and the river flows through Fort Wainwright Army Base, giving military personnel direct access. The Chena River State Recreation Area is a popular boating, camping, and fishing destination for residents and non-resident visitors traveling along the road system.

From the late 1970s through the mid-1980s, the Arctic grayling fishery on the Chena River was the largest Arctic grayling fishery in Alaska. The average annual fishing effort (for all species) for the 10-year period (1977–1986) was about 30,500 angler-days (Brase 2008). Between 1986 and 1987, estimates of abundance declined (Table 9;Clark and Ridder 1986, 1988). Although there was no stock assessment performed on Chena River Arctic grayling prior to 1985, the decline in average harvest from 1977 to 1984 (28,440 fish; Brase 2008) compared to the 1985–1986 average harvest (7,051 fish; Brase 2008) was a reasonable indicator of the decline in the Arctic grayling population. Therefore, in 1988 the bag limit was reduced from 10 per day to 5 per day, fishing was restricted to catch-and-release during the spring spawning period (April 1 through the first Saturday in June), and the use of bait was eliminated.

Although harvest decreased for two years after the imposition of these restrictions and abundance estimates increased after 1989, both harvest and effort increased substantially in 1989

(Brase 2008), prompting the lowering of the bag limit from five per day to two per day. This additional restriction was not sufficient to reduce harvest to a sustainable level, and in 1991 the fishery was further restricted by EO to catch-and-release only (Brase 2008). The BOF made this a permanent regulatory change in 1994. After the change in fishing regulations, catches and effort dropped off; however, they have remained relatively stable in recent years averaging approximately 37,000 fish and 20,000 angler-days between 2000 and 2009 (Table 10, Appendix B).

In addition to eliminating sport harvest through regulation changes, the department initiated a program of Chena River stock enhancement by stocking hatchery and pond-reared Arctic grayling that were spawned from Chena River stock. In 1993 and 1994 approximately 61,000 fish/year were stocked into the Chena River. Survival of these fish was estimated as part of the ongoing stock assessment efforts during 1993–1995, and was determined to be too low to justify the cost of the enhancement effort. Stocking was discontinued after 1994 (Clark 1993-1996).

The Chena River Arctic grayling population continued to be assessed with mark-recapture experiments from 1991 to 1998 and then again in 2005 (Table 9; Clark et al. 1991; Clark 1994, 1995, 1996; Ridder 1998b, Ridder 1999a; Ridder and Fleming 1997; Wuttig and Stroka 2007). These surveys illustrate an Arctic grayling population that is stable with a large proportion of quality-sized fish, but likely cannot sustain a large annual harvest that would be similar to historic levels.

The Chena River Arctic grayling fishery has been popular since before statehood, and has increased in popularity as Fairbanks and the surrounding area has been developed and access has improved. The Arctic grayling fishery is almost entirely an open water fishery, occurring from April through October. Anglers target Arctic grayling throughout the road and boat accessible sections of the river and its tributaries, and some are transported to the headwaters by aircraft to begin float trips during which they fish for Arctic grayling. Chena (Badger) and Piledriver sloughs are important components of the Chena River Arctic grayling fishery as they provide rearing areas for lower river Arctic grayling and are easily accessible fishing locations.

Prior to 2007, the SWHS divided the Chena River into the "upper river" and "lower river" at the South Fork (river mile 77 (~124 km)). Since 2007, the Chena River was divided into the upper and lower sections at the Moose Creek Dam (river mile 45 or ~72 km) (Figure 5). The SWHS provides separate estimates of effort, catch, and harvest of all species for each section. Species distributions, regulations closing salmon fishing and prohibiting the use of bait above the dam suggests that almost all of the effort in the SWHS-designated upper river is directed toward Arctic grayling. The lower river supports a multi-species fishery, including a king salmon fishery which may be growing. While the majority of the effort in the Chena River is probably directed toward Arctic grayling, effort is not apportioned between species and the multi-species fishery confounds attempts to describe the total effort targeting Arctic grayling within the Chena River fisheries.

Recent Fishery Performance

From 2004 to 2006, the reported catches of Arctic grayling in the Chena River declined; in 2007 the catch increased and then declined in 2008 and 2009. The 2010 catch was 27,067 fish; this was below the 5-year average (2005–2009) catch of 31,649 fish (Table 10).

Fishery Objectives and Management

In 2004, the BOF adopted the *Tanana River Area Wild Arctic Grayling Management Plan* (5 AAC 74.055) that directed ADF&G to manage Arctic grayling fisheries for long-term sustained yield while providing and/or maintaining fishery qualities that angler's desire. The *Tanana River Area Wild Arctic Grayling Management Plan* has three management approaches: regional, conservative, and special. Each of these approaches has different means of achieving the goals of sustained yield (reduce bag and possession limits, reduce fishing season, catch-and-release only, and/or modify other methods and means). The Chena River is in the special management category.

In addition, ADF&G has drafted an in-house *Fishery Management Plan for the Chena River Arctic Grayling Sport Fishery* (Doxey and Brase *In prep*). After this plan has gone through a full review it will be used to manage the Chena River Arctic grayling population. The management objectives in the draft plan are:

- In the upper river (river-miles 45–90) maintain a minimum abundance of 8,500 Arctic grayling ≥ 12 inches (~305 mm) in total length.
- In the lower river (downriver from river mile 45 (~72 km) at the Moose Creek dam) maintain a minimum abundance of 2,200 Arctic grayling ≥ 12 inches (~305 mm) in total length.

Current Issues and Fishery Outlook

The 2005 Chena River Arctic grayling assessment showed that the numbers of large (~11 inch or ≥270mm) Arctic grayling in the upper portion of the drainage (5,203 fish, SE = 543) had dropped from the 1998 estimate of 12,519 fish, SE = 2,051 (Table 9). The number of large Arctic grayling in the lower river was estimated at 2,190 fish, SE = 268. Both of these estimates are below the draft management objective; however, estimates of total abundance (fish ~6 inches or ≥150 mm) for both years were nearly identical at approximately 27,500 fish (Table 9).

Recent Board of Fisheries Actions

At the 2010 meeting, the BOF clarified that Chena Slough (also known as Badger Slough) is part of the Chena River and therefore, falls under the same regulations. The BOF also modified the gear regulations on the Chena River so that the same gear (one unbaited single-hook artificial lure; or one unbaited treble hook with a gap between hook and shank of 1/2 inch or greater; or one baited single hook with a gap between hook and shank larger than 3/4 inch) may be used throughout the drainage (previously there were differences in hook size regulations between the upper and lower portions of the river).

At the 2007 meeting, the BOF deliberated over a proposal that sought to allow a limited harvest of Arctic grayling less than 12 inches (~305 mm) from June 1–July 15 below the Nordale Bridge on the Chena River. No action was taken on the harvest aspects of this proposal; rather, the BOF amended the existing regulations to allow only one unbaited single-hook, artificial lure when fishing for Arctic grayling in the lower portion of the Chena River drainage (previously unbaited single-hook, artificial lures were mandatory only above the dam), *note that the actions taken in 2010 supersede the 2007 actions.*

Current or Recommended Research and Management Activities

The Chena River Arctic grayling population should continue to be assessed on a regular basis to determine whether additional actions should be taken in order to meet management objectives.

Delta Clearwater River

Background and Historical Perspective

The Delta Clearwater River (DCR) is the largest of several spring-fed streams near Delta Junction (Figure 4). Arctic grayling spawn in the Goodpaster River, Shaw Creek, Upper Delta River, Healy River, and several other tributaries during the early spring. When spawning is complete, some adults leave for summer feeding waters such as the DCR or the Richardson Clearwater River (RCR). These clear springs maintain cool water temperatures in the summer and provide ideal feeding habitat for adult Arctic grayling. Grayling are not known to spawn or overwinter in the DCR or the RCR. It is unclear how Arctic grayling recruit to these summer feeding streams; however, fidelity to the DCR and other spring-fed streams is strong (Ridder 1998a). The abundance of Arctic grayling populations within the spawning streams in part determines how many fish migrate to these spring-fed streams.

Arctic grayling larger than 10 inches (240mm), were at a low of 3,000 fish in 1996 (Ridder 1998a). The population later increased to 7,991 fish in 2000 and to 14,799 in 2006, likely because of a series of changes to the bag and possession limits (Gryska 2001, Wuttig and Gryska 2010; Table 12). In the last ten years, estimates of total catch of Arctic grayling in the DCR have ranged from 8,690 fish in 2000 to 22,112 fish in 2007 (Table 10).

Recent Fishery Performance

Angler effort in the DCR over the last five years (2005 to 2009) averaged 4,354 angler-days. Species-specific effort estimates are not available from the SWHS; however, data from a mail-out survey conducted in 1994 and 1995 indicated that 72% of the effort for the Delta Clearwater River was directed at Arctic grayling in 1995 (Howe and Fleischman. 2001). In 2010, the angler effort on the DCR was 4,193 days, very similar to the five-year average (Appendix B).

Harvest in the DCR averaged 122 Arctic grayling from 2005 to 2009 (Table 11). Catches of Arctic grayling from 2005 to 2009 averaged 16,840 fish (Table 10). Population models have suggested that a harvest of 900 Arctic grayling $\leq$ 12 inches (~305 mm) would be sustainable on the DCR (Clark and Ridder 1994), but harvests of this magnitude have not occurred.

Fisheries Objectives and Management

In 2004, the BOF adopted the *Tanana River Area Wild Arctic Grayling Management Plan* (5 AAC 74.055) that stated that ADF&G would manage Arctic grayling fisheries for long-term sustained yield while providing and/or maintaining fishery qualities that anglers desire. The *Tanana River Area Wild Arctic Grayling Management Plan* has three management approaches: regional, conservative, and special. Each of these approaches has different means of achieving the goals of sustained yield (reduce bag and possession limits, reduce fishing season, only allow catch-and-release, modify other methods and means). DCR Arctic grayling are managed under the special management approach.

Current management objectives for the Delta Clearwater River Arctic grayling recreational fishery were updated in 2003 (Parker 2003a). The three objectives of that plan are as follows:

1. Maintain a fishery in which at least 40% of the measurable population of Arctic grayling exceeds 14 inches in length (~355 mm).
2. Maintain an annual harvest of 900 fish ≤ 12 inches (~305 mm) or less.
3. Prosecute the fishery in such a way as to provide for a minimum catch rate of one Arctic grayling per angler-day.

Current Issues and Fishery Outlook

Catch levels are very high in the DCR averaging over 16,000 fish annually over the past five years (Table 10). The catch is more than the 2006 estimated population size, suggesting that many fish are caught multiple times. The apparent repeated handling of DCR Arctic grayling is likely responsible for some level of mortality, although catch-and-release mortality is probably low (5%, McKinley 1993). However, even a low hooking mortality rate of 5% could be significant with such high catch levels.

In 2006, the abundance of Arctic grayling over 12 inches (~305 mm) in the DCR was estimated at 14,799 fish (Table 12; Wuttig and Gryska 2010), which is significantly larger than the 2000 estimate, even when the 95% confidence intervals are compared, rather than just the point estimates. Therefore current catch rates and the associated hooking mortality appear to be sustainable.

Recent Board of Fisheries Actions

At the 2010 meeting, the BOF adopted a proposal which clarified method and means in waters which had either catch-and-release regulations or exceptions to the general bag and possession limits for Arctic grayling. This affected the DCR which is managed under the special management approach. Sport anglers in the DCR are now restricted to one single-hook, artificial lure, rather than allowed two single hooks or artificial flies per line.

In 2007, the BOF expanded the retention dates for Arctic grayling in the DCR ≤ 12 inches (~305 mm) in length to June 1 through December 31, recognizing that the previous narrow harvest window resulted in low harvests and that a higher level of harvest would be sustainable.

Current or Recommended Research and Management Activities

Management activities should ensure protection of aquatic habitat for healthy fish production. Under the "Major Issues", section of this report, there is a summary of the status of the DCR Watershed Project.

Tangle Lakes System

Background and historic perspective

The Tangles Lakes system is located in the upper portion of the Tanana River drainage near the Denali Highway and is made up of several high elevation lakes including Lower, Shallow, Round, and Upper Tangle lakes which are connected by the Tangle River that flows into the Delta River. The Delta River drains north through the Alaska Range, eventually joining the Tanana River and emptying into the Yukon River. The watershed includes 150,000 acres of land, 160 miles of streams and 21 lakes.

The Delta River Corridor is managed by the BLM as a Wild and Scenic Waterway and is a popular area in the summer and fall. There is a BLM campground located on Round Tangle Lake and it is relatively easy to canoe from the Tangle Lakes to the Delta River and then to a takeout on the Richardson Highway near Phelan Creek.

Recent Fishery Performance

In 2010, the Tangle Lakes system accounted for the largest number of Arctic grayling caught and harvested in any water body within the TRMA. The Tangle Lakes Arctic grayling catch was 27,682 fish (24% of TRMA total) and the harvest was 2,656 fish or 36% of the total TRMA Arctic grayling harvest (Tables 10 and 11).

Fishery Objectives and Management

The Arctic grayling fisheries in the Tangle Lakes system fall under the *Tanana River Area Wild Arctic Grayling Management Plan* regional management approach and the background bag and possession limit that was instituted in 1975 for Arctic grayling in the Tanana River drainage (5 fish/day with no size limit and no closed seasons).

Current Issues and Fishery Outlook

In 2003, the BLM conveyed to the State of Alaska a 235,000 acre block (Denali Block 1) in the Tangle Lakes region, an area north of the Denali Highway between miles 12 and 41. There has been a great deal of mineral exploration in this area in recent years. This exploration has shown the potential for a significant deposit of rare minerals of the platinum group. This area includes the Tangle Lake system, which annually averages 5,000 angler-days of use. The portion of the Delta River that is federally designated as a National Wild and Scenic River Corridor was excluded from the state's conveyance and will continue to be managed by BLM.

In 2008 and 2009, BLM and ADF&G coordinated and conducted a cooperative research project collecting baseline data on Arctic grayling abundance and distribution in the Upper Delta River. The abundance of Arctic grayling in the 17 km (10.5 mile) section of the Delta River that is designated as Wild and Scenic was estimated at 44,212 fish (SE = 9,108) ≥240 mm FL (~9.5 inches) and 23,152 fish (SE = 3,189) ≥270 mm FL (~10.5 inches). These densities are the greatest ever observed among published estimates for Alaskan Arctic grayling populations (Gryska 2011b).

Recent Board of Fisheries Actions

There have been no actions taken by the BOF with regards to the Tangle Lakes area Arctic grayling fishery since 2004 when the *Wild Arctic Grayling Management Plan* was adopted.

Other TRMA Arctic grayling Fisheries

Background and historic perspective

Arctic grayling are popular with recreational anglers, are generally abundant, and occur in many TRMA rivers and streams besides the major fisheries previously detailed:

The **Chatanika River** is located approximately 30 miles north of Fairbanks and is accessible via both the Elliot and Steese Highways (Figure 3). The Chatanika River is a clear or lightly tannic stained rapid-runoff stream, and flows through valleys between summits and uplands for about 80% of its length before it enters Minto Flats. At that point the character of the river changes from one typical of rapid-runoff upland streams with pools, riffles, cutbanks and gravel bars, and

a substrate consisting largely of gravel or broken rock; to a slower stream with an incised channel with high, fairly stable banks and a bottom substrate consisting primarily of sand and organic material. Mining activity dominated the Upper Chatanika River drainage during the first half of the 20th century. Today recreational cabins are scattered along the river's length with a few small mining claims still in operation.

In the upper river, anglers focus almost entirely on Arctic grayling; while in the lower river Arctic grayling, northern pike, burbot, sheefish, salmon, and whitefish are all targeted by anglers. Prior to 1992, the Chatanika River Arctic grayling bag and possession limit fell under the background regulations of 5 fish/day with no size limit. From 1992 to 2009 regulations allowed for a daily bag and possession limit of 5 fish, all $\geq$ 12 inches in total (~305 mm), and Arctic grayling could not be retained during the spawning closure from April 1 through May 31. In 2010, the regulations changed to allow retention year-round (no closed seasons) and no length limits on the 5 fish bag and possession limit.

Arctic grayling have been assessed intermittently in the Chatanika River since 1972 (Clark 1991; Fish 1996; Fleming et al. 1992; Holmes 1983, 1985; Holmes et al. 1986; Ridder et al. 1993; Roach 1994, 1995; Tack 1973; Wuttig 2004; and Wuttig and Gryska 2011). Because the Chatanika River is difficult to survey due to its length and shallow depth, abundance has often been reported as a density index, rather than a point estimate (Brase 2009b). In 1995 and 2002, researchers reported no immediate conservation problem for Chatanika River Arctic grayling, but stream productivity may be low (Fleming 1998; Wuttig 2004). Arctic grayling densities were lower in the upper river (between Perhaps and Sourdough creeks) and concerns were expressed about the potential for stock depletion in the upper river should fishing mortality increase. An extensive population assessment was performed in 2007, and it indicated a significant increase in the number of large Arctic grayling in the Chatanika River since the last assessment in 2002 (Table 13).

The **Nenana River** drainage is a turbid, glacier-fed tributary located approximately 45 miles south of Fairbanks. The lower portion of the drainage is accessible via the Parks Highway and the upper portion of the drainage is accessible via the Denali Highway (Figure 3). Most angling effort occurs in the clearwater tributaries of the Nenana River such as the Brushkana River as well as Julius and Clear creeks. There are recreational cabins scattered throughout this area and there is some sport fish guide activity in the area.

A radiotelemetry study performed in 2001–2002 demonstrated the importance of the Brushkana River as a spawning stream within the upper portion of the Nenana River drainage. Radiotagged Arctic grayling that spawned in the Brushkana River overwintered in the mainstem Nenana River or other large tributaries (Gryska 2006). As a result of this work, the Nenana River Arctic grayling stocks are considered one stock for management purposes.

The **Salcha River** (Figure 3) Arctic grayling fishery has supported increasing catch and consistent harvest over recent years and provides a substantial proportion of the harvest opportunity for Arctic grayling in the TRMA (Tables 10 and 11). The majority of the Arctic grayling fishing opportunity is accessible only by boat, and a high proportion of the effort is from property owners along the river and their visitors. Some sport fish guiding for Salcha River Arctic grayling also occurs.

Effort on this multi-species fishery may be impacted by many factors including: the strength of the king salmon run, high water events that can make Arctic grayling fishing very difficult, low

water events that can limit boat access to fishing areas, weather, and timing of breakup and freeze-up (Appendix B).

Prior to 1987, the Salcha River Arctic grayling bag and possession limit was 5 fish per day, 10 fish in possession, with no size limit and no seasonal closures. From 1987 through 2009 the Salcha River Arctic grayling regulations were a bag and possession limit of 5 fish ≥12 inches (~305 mm) per day and Arctic grayling could not be kept during the spawning period (April 1–May 31). In 2010, the regulations were amended to allow retention year-round (no spawning closure) and no length limit.

The Salcha River Arctic grayling population was annually assessed from 1988 to 1994 and appeared to be stable or possibly increasing (Table 14, Clark 1988, 1989; Clark and Ridder 1987, 1990, Clark et al. 1991; Ridder et al. 1993; Roach 1994, 1995). It is difficult to make direct population comparisons from year to year because different sizes of study areas were assessed, sampling occurred at different times of year, and different size classes were available. The Salcha River Arctic grayling population was most recently assessed in 2004. The summer index population of 2,042 fish (SE = 434) ≥ 270 mm (~10.5 in) in a 24 mile (39 km) reach of the river is similar to the 1994 index estimate of 2,767 fish ≥ 270 mm (~10.5 in; Table 14; Gryska 2011a).

Other waters which support Arctic grayling sport fisheries include Fielding Lake, the Goodpaster River, the Tok River drainage, Shaw Creek and the Richardson Clearwater River. Access ranges from roadside fisheries to those accessible only by boat along major rivers to the mouth of the tributary. As with almost all Arctic grayling fisheries in the Tanana River drainage, these fisheries primarily take place during the open-water season.

Recent Fishery Performance

In terms of harvest and catch, the Chatanika Arctic grayling fishery had remained relatively stable since 2003. In 2010, the harvest of 774 fish was above the 5-year average (2005–2009) of 582 fish (Table 11); but the catch of 4,659 was below the 5-year average of 9,165 fish (Table 10). The percentage of fish retained in 2010 was 17%, and this was the highest percentage retained in the past ten years. This increase in harvest may have been due to the 2010 change to the sport fish regulations which removed the spawning closures and length limit restrictions for Arctic grayling in the Chatanika River.

The Salcha River Arctic grayling fishery had a recent 5-year average (2005–2009) catch of 8,003 and harvest of 1,123 fish (Tables 10 and 11). In 2010, similar to the Chatanika River the number of fish harvested (1,556) was above average, while catches (5,670) were below average. In 2010, the percentage of fish retained went up to 27%; this was the highest retention rate on the Salcha River since 2006. This increase in retention may have been due to the 2010 change in sport fish regulations on the Salcha River which removed the spawning closures and length limit restrictions.

Reported catch and harvest rates vary considerably in the other Arctic grayling fisheries of the TRMA, in part because many of these small fisheries enter and drop out of the SWHS report from one year to the next, depending upon whether any of the small number of anglers utilizing them receive and return a SWHS. The effort, catch, and harvest rates for these small fisheries are not broken out separately in this report as they are based on few angler responses, and therefore, the precision of the estimates of catch, harvest, and effort are generally much lower than those for fisheries where there is a high SWHS response rate.

These small fisheries will continue to be monitored through the SWHS to watch for trends that may indicate a fishery is getting higher use and may warrant further research or management activities.

Fishery Objectives and Management

In 2004, the BOF adopted the *Tanana River Area Wild Arctic Grayling Management Plan* (5 AAC 74.055) that directed ADF&G to manage Arctic grayling fisheries for long-term sustained yield while providing and/or maintaining fishery qualities that anglers desire. The *Wild Arctic Grayling Management Plan* has three management approaches: regional, conservative, and special. Each of these approaches have different ways of meeting the goals of sustained yield (reduce bag and possession limits, reduce fishing season, only allow catch-and-release, and/or modify other methods and means).

With the exception of Five-Mile Clearwater (located on the south side of the Tanana River between Fairbanks and Delta Junction), Shaw Creek and its confluence with the Tanana River, the Tok River and Piledriver Slough; the Arctic grayling fisheries in these other waters fall under the *Tanana River Area Wild Arctic Grayling Management Plan* regional management approach and the background bag and possession limit that was instituted in 1975 for Arctic grayling in the Tanana River drainage (5 fish/day with no size limit and no spawning closure).

Five-Mile Clearwater Creek and the Tok River are both in the *Tanana River Area Wild Arctic Grayling Management Plan* conservative management approach, with a bag and possession limit of 2 fish, only one of which may be over 12 inches long (~305 mm; size limit in the Five-Mile Clearwater only). Piledriver Slough is managed under the conservative management approach and is open to catch-and-release fishing only.

The department has developed a *Fishery Management Plan for the Goodpaster River* (Parker 2003b). This plan has an abundance-based objective for the Goodpaster River Arctic grayling population. The management objective 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 (~10.5 in) fork length) in the assessed portion of the river in May.

Recent Board of Fisheries Actions

At the 2010 meeting, the BOF adopted several proposals specific to the Arctic grayling fisheries in the TRMA. A proposal was adopted that aligned the end dates for Arctic grayling spawning catch-and-release limitations in the *Tanana River Wild Arctic Grayling Management Plan* (May 30) with those dates in the specific area regulations (May 31). A second proposal was adopted which clarified the methods and means in the water bodies in which there are either catch-and-release regulations or exceptions to the general bag and possession limits for Arctic grayling, and are under the conservative or special management approach of the *Tanana River Area Wild Arctic Grayling Management Plan* (5 AAC 74.055). The Piledriver Slough Arctic grayling fishery is managed under the special management approach to maintain current population characteristics or levels, or rebuild the population to previous population characteristics or levels. The Five-Mile Clearwater Creek and Tok River are managed under the conservative management approach to maintain a high quality Arctic grayling fishing experience (a higher percentage of large fish) or to provide additional conservation measures. Under either the conservative or special management approach of the management plan it is appropriate to restrict gear to one single-hook, artificial lure rather than allowing two single hooks or artificial flies per line. Shaw Creek is under the regional

management approach, but this BOF action was applied to Shaw Creek because of its unique roadside situation and susceptibility to exploitation.

Finally, a proposal was adopted which brought several small Arctic grayling waters in the TRMA into compliance with the *Tanana River Area Wild Arctic Grayling Management Plan* (5 AAC 74.055) regional management approach by removing spawning closures, length, and gear restrictions. The action removed the Arctic grayling size restrictions on the Chatanika River, Salcha River, Richardson Clearwater River, Shaw Creek, and that portion of the Tanana River near the mouth of Shaw Creek. It also removed the Arctic grayling spawning restrictions on the Chatanika, Salcha and Richardson Clearwater rivers; but retained the Arctic grayling spawning restriction for Shaw Creek and that portion of the Tanana near Shaw Creek because this is a critical spawning area for Arctic grayling from several streams.

Current or Recommended Research and Management Activities

Arctic Grayling management plans may be developed that would set thresholds for: 1) regulatory action if/when stocks decline; and, 2) reinstating the prior regulatory regime if/when stocks recover.

NORTHERN PIKE

Minto Flats

Background and historic perspective

The Minto Flats wetlands complex is located about 35 miles west of Fairbanks between the communities of Nenana and Minto (Figure 6). It is an approximately 500,000 acre area of marsh and lakes interconnected by numerous sloughs and rivers. Most of the area is included in the Minto Flats State Game Refuge which was established by the Alaska Legislature in 1988 to ensure the protection and enhancement of habitat, the conservation of fish and wildlife, and to guarantee the continuation of public uses within the area. The Chatanika, Tolovana, and Tatalina rivers and Washington, Goldstream, and numerous smaller creeks flow into Minto Flats. These flowing waters come together as tributaries to the Tolovana River, itself a tributary to the Tanana River at its mouth at the southwestern end of the Flats. The waterways of the Flats are slow and meandering.

A group of large interconnected lakes in the eastern Flats is called the Minto Lakes. These lakes are generally shallow and heavily vegetated. The Minto Lakes are a popular northern pike fishing and waterfowl hunting area. In addition to those who use boats, there are both guiding services and private pilots that travel to the lakes in floatplanes. Guides and private individuals have cabins on some of the sparse areas of higher ground that are not regularly flooded. The Minto Lakes are thought to support the majority of the northern pike sport fishery within the Tolovana River drainage, although the SWHS does not separate the lakes' harvest and catch data from the rest of Minto Flats.

The Minto Lakes are a major northern pike spawning and summer feeding area. In winter, much of the flowing and standing water within the Flats becomes anoxic, forcing fish to move to waters of the Chatanika and Tolovana rivers or up tributary rivers to oxygenated areas. Winterkill is common and can be a confounding factor in attempts to predict fish population dynamics and assess angler impact. Northern pike are typically the only fish targeted by sport

anglers in the Minto Flats area. These large piscivores are located throughout the Flats and can be readily taken on many types of lures.

The northern pike fishery of the Lower Chatanika River is included in this section because northern pike move between Minto Lakes and Chatanika River, and the lower 35 miles of the Chatanika River is within Minto Flats. Similarly, because effort, catch, and harvest estimates for the Tolovana River appear occasionally in the SWHS data and because Minto Flats and all of its waters are within the Tolovana River drainage, general references in this section to the Minto Flats complex and/or Tolovana River drainage should be considered a summation of effort/harvest or catch of northern pike in the Tolovana River, Minto Flats, and the Lower Chatanika River drainage.

The Tolovana River drainage/Minto Flats complex northern pike population has supported a major proportion of the TRMA northern pike sport fishery for many years (Table 15). It was primarily a summer fishery until the mid-1980s, when an intensive sport fishery developed on concentrations of northern pike that were overwintering in the Chatanika River just upstream from the mouth of Goldstream Creek. A subsistence fishery for northern pike (and whitefish) occurs near the village of Minto and at historically used sites in the eastern portions of Minto Flats (Andrews 1986). Gillnets are used throughout the open-water period and northern pike are taken through the ice with hook and line.

From 1984 to 1986, the total harvest of northern pike from the Minto Flats complex doubled from 3,128 fish to 6,488 fish (Brase 2008). It was believed, and later demonstrated by radiotelemetry studies (Roach 1998b) that these fish were the spawning stock for the Minto Lakes. After 1987, regulations were implemented closing sport fishing for northern pike at Minto Flats between October 15 and May 31, and the bag limit was reduced from 10 to 5 fish per day, only 1 of which may be ≥ 30 inches long (~760 mm).

Estimated sport catch and harvest of northern pike in the Minto Flats complex peaked in 1994 with a harvest of 9,489 fish and a catch of 52,191 fish. Estimated sport harvest and catch continued to decline until 2001, when reported catches started to increase (Brase 2009a). A significant increase in the recent years' catch and harvest began in 2003 when harvest went from 650 fish in the Minto Flats complex, to 1,284 fish (Table 15). Harvests remained at that higher level through 2007 and then dropped in 2008 and 2009 (Brase 2009b).

Currently Minto Flats is closed to sport fishing for northern pike from October 15–May 31; the daily bag and possession limit is 5 fish, only 1 of which may be ≥ 30 inches long (~760 mm).

Northern pike population assessments have been performed in the Minto Lakes area every 3 to 5 years since 1987. As a surrogate for abundance estimates of northern pike in the entire Minto Flats (200,000 ha), ADF&G estimates the abundance of northern pike in the Minto Lakes Study Area, which contains an estimated 6,000 ha of summer habitat for northern pike (Roach 1998b). The 2008 estimate of 9,854 northern pike ≥ 400mm (~16 in) was significantly less than the estimates from either 2003 or 1997 (25,227 and 16,546 fish respectively) (Table 16). Similar results were also observed for pike ≥ 600mm (~24 in), with the 2008 estimate of 2,092 fish being significantly smaller than the 2000 and 1997 estimates (5,331 and 3,251 fish respectively; Joy 2009).

Recent Fishery Performance

The 2010 catch in the Minto Flats was 6,477 fish, which was lower than the recent 5-year average (2005–2009) of 8,604 fish (Table 15). In 2010, the fishing effort in Minto Flats was below average with an estimated 1,424 days fished compared to the 5-year average of 2,401 days (Appendix B). The majority of the effort at Minto Flats is probably directed toward northern pike, even though effort is not estimated by target species in the SWHS.

Although Minto Flats is closed to northern pike sport fishing from October 15 through May 31, there is a subsistence fishery that occurs throughout the winter. To participate in any subsistence fishery, one needs to be an Alaska resident. If a resident wishes to participate in the subsistence fishery in the Tolovana River drainage, they must acquire a Tolovana Subsistence Northern Pike Permit from the ADF&G Division of Commercial Fisheries in Fairbanks. Subsistence fishers commonly harvest northern pike near the confluence of the Chatanika River and Goldstream Creek (Figure 6) late in the winter/early in the spring. The winter subsistence northern pike harvest has averaged 980 fish over the past 5 years (2005–2009) from an average number of 55 permit holders (Table 17).

Fishery Objectives and Management

The Minto Flats northern pike population is managed under the sport and subsistence *Minto Flats Northern Pike Management Plans* (5 AAC 74.044 and 5 AAC 01.244), which stipulate that the maximum exploitation rate of northern pike by all users in the Lower Chatanika River and Minto Lakes/Goldstream Creek area may not exceed 20% of the northern pike population annually.

The sport plan establishes the open season for the sport fishery from June 1 to Oct 14 and the bag and possession limit at 5 fish, only 1 may be ≥ 30 inches (~750 mm). Additionally, if the subsistence harvest in the Chatanika River drainage upstream of the confluence of the Chatanika River and Goldstream Creek is ≥ 750 northern pike from January 1 to the ice free period, the sport bag and possession limit will be reduced by EO to 2 fish, of which only 1 ≥ 30 inches (~750 mm) in the lakes and all flowing waters of Minto Flats for the remainder of the calendar year.

The subsistence management plan is slightly different: 1) subsistence fishing for northern pike is open year-round; however, a permit is required (Alaska residents only); 2) prior to 2010 there were no daily and/or annual limits, however in 2010 the BOF established a 10 fish bag, 20 fish possession limit for the fishery that occurs in that portion of the Chatanika River upstream from its confluence with Goldstream Creek; 3) gillnets may be used only April 15–October 14; and, 4) a hook-and-line may be used only if fishing through the ice. If the subsistence harvest in the Chatanika River drainage upstream of the confluence of the Chatanika River and Goldstream Creek is greater than 1,500 northern pike from January 1 to the ice free period, these waters will be closed by EO to fishing for northern pike through the ice.

Finally, both the sport and subsistence management plans for northern pike require the use of single hooks in that portion of the Chatanika River drainage upstream of the confluence of the Chatanika River and Goldstream Creek to the Fairbanks Nonsubsistence Area boundary (approximately one mile (~1.6 km) below the boat launch).

In 2007, over 1,500 northern pike were harvested in the winter subsistence fishery; (Table 17); therefore, on February 16 Division of Commercial Fisheries closed the subsistence fishery by EO

for the remainder of the winter in that portion of the Chatanika River drainage upstream from the confluence of the Chatanika River and Goldstream Creek. On May 1 an EO was issued by Division of Sport Fish reducing the summer season sport daily bag and possession limits throughout the Minto Flats area to 2 fish per day, only 1 of which could be greater than or equal to 30 inches (~750 mm; Appendix A).

In 2008, over 1,200 northern pike were harvested in the winter subsistence fishery; therefore, on May 1 an EO was issued by Division of Sport Fish reducing the summer season sport daily bag and possession limits throughout the Minto Flats area, similar to the actions taken in 2007 (Appendix A).

Current Issues and Fishery Outlook

The harvest of northern pike in the lakes and flowing waters of the Minto Flats area may be approaching the maximum 20% exploitation rate specified in regulation. The 2000–2009 (10 year) average sport fish harvest of northern pike in the Minto Flats was 940 fish (Table 15) and the 2001–2009 (10 year) average subsistence harvest was 982 fish (Table 17); these two harvest estimates added together equal 1,922 northern pike. The 2008 abundance estimate in the Minto Flats index area was 9,854 northern pike larger than ~16 inches (400mm, Table 16); 20% of this abundance is 1,971 fish. Therefore, if the sport and subsistence harvests continue to maintain their current level and the population of pike in Minto Flats does not increase, there may have to be further restrictions to the sport fishery.

Recent Board of Fisheries Actions

In 2010, the BOF adopted a housekeeping proposal which aligned the language in the subsistence and sport fish versions of the *Minto Flats Northern Pike Management Plan* (5 AAC 01.244 and 5 AAC 74.044). The description of the area used to estimate the exploitation rate of northern pike in the two versions of the plan was not the same, whereas, the intent of the plan was to include the same area and fish stocks. The new language aligns the description of the area for which the exploitation rate is calculated.

Current or Recommended Research and Management Activities

Performing a northern pike population estimate in the Minto Flats is a priority before the next BOF meeting to assess whether the population has rebounded from the low population estimated in 2008.

TRMA Lakes

Background and Historical Perspective

Northern pike sport fisheries occur in several lakes in the TRMA including: George, Volkmar, Deadman, Healy, and Mineral lakes. Of these lakes, George Lake has the largest amount of fishing effort and harvest. Hook-and-line is the predominant gear used to harvest northern pike, although spears are also used during the winter months. 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 northern pike anglers. Results showed that 84% of participation and 82% of the harvest occurred during the open water months (Bingham and Parker 1995). Fishing occurred slightly more often on rivers (51%) than on lakes (49%) during the open water period. Only 14% of the total participation occurred during the ice-covered season, of which 86% of effort was on lakes. Much of the effort directed towards pike in the TRMA is non-

consumptive fishing (catch-and-release). In 2010, only 13% of the total catch of northern pike in the Tanana River drainage was harvested (Table 15).

George Lake is a semi-remote lake located about 35 miles southeast of Delta Junction and about 5 miles northeast of the Alaska Highway (Figure 2). The lake is large (1,823 ha) but shallow, maximum depth is only 35 feet (~10 m); and the majority of the shoreline is privately owned. The lake has one major inlet and a navigable outlet, George Creek, which flows to the south into the Tanana River. Nearshore waters are shallow with large beds of aquatic vegetation.

George Lake is typically ice-free from late May to mid-October and is seasonally accessible by boat, snowmachine, and airplane (equipped with floats or skis). Fishing pressure at George Lake is heaviest from June 1 (when the season opens) through mid-July. Little ice fishing occurs before late December or early January because poor ice conditions on the Tanana River prevents snow machine access. Year to year total fishing effort at George Lake can be variable due to poor snowmachine conditions (low snowfall and open water on the Tanana), and difficult boat access (low creek levels). During the ice fishing season, northern pike and burbot are taken by hook-and-line as well as with spears. ADF&G has annually issued between 1 and 6 ice house permits for George Lake since the early 1980s.

Volkmar Lake is semi-remote and is relatively close to Delta Junction and Fort Greely (Figure 2); there are numerous private land parcels and cabins around the shoreline, relatively easy wintertime access, and good catch rates of northern pike. Volkmar Lake is situated north of the Tanana River and most of the fishing effort occurs though the ice during spring when temperatures are more moderate and the Tanana River can be crossed safely. During summer Volkmar Lake can only be accessed by float-equipped aircraft. Northern pike stock assessment studies are done periodically for both George and Volkmar lakes (Table 18;Pearse and Burkholder 1993; Pearse and Hansen 1993; Pearse 1994; Scanlon 2001; Wuttig and Reed 2010).

In 1995, a record 1,263 angler-days occurred on Volkmar Lake with a harvest of 1,084 pike (Howe et al. 1996). In 1996, effort and harvest fell to the lowest recorded level (191 angler-days and 9 fish harvested). In 1996, anglers reported that size and abundance of pike in Volkmar Lake had declined. At the 1997 BOF meeting, the board adopted a bag and possession limit of one fish, no size limit, as a conservation measure. Stock assessment in 2000 estimated a population of 612 northern pike ≥18 inches (~450 mm) in Volkmar Lake; it is thought that the large harvest in 1995 was likely responsible for the decline in population and harvests at that level were not sustainable (Parker 2009b).

Recent Fishery Performance

The five and ten year average catches and harvests of northern pike in both George and Volkmar lakes have remained very similar, although there is annual variability (Table 15). Both these lakes are almost exclusively northern pike fisheries therefore the estimates of effort may be applied to these lakes more readily than for other multi species fisheries.

Fishing effort in George Lake is highly variable, ranging from 601 to 1,939 angler-days in just the past five years (Appendix B). This variability may be due to the water levels in George Creek, which are not always high enough to allow anglers boat access into the lake; or ice conditions on the Tanana. When there is severe overflow it is difficult to cross the Tanana on snowmachine. In 2001 and 2003, the harvest of northern pike in George Lake increased dramatically as more anglers were able to access the lake via boat (due to high water), but

declined in 2002 and 2004 because the outlet was low. In 2007, harvest increased at George Lake because the outlet was boat accessible during the spring. In 2010, the harvest of 681 northern pike was higher than both the 5- and 10-year averages (Table 15).

Since 2000, fishing effort on Volkmar Lake has averaged 161 angler-days per year (Appendix B). Since 2000, harvests of pike at Volkmar Lake ranged from 0 fish in 2007 to 127 in 2002 (Table 15). From 2005 to 2009, average harvest and catch of northern pike was 29 and 187 fish, respectively (Table 15).

Fisheries Objectives and Management

George Lake

The management objective since 1993 has been to ensure that harvests and incidental mortality of northern pike by the recreational fishery are sustainable by limiting exploitation to 10%–20% annually. A draft management plan for George and Volkmar lakes was developed in 2007. The revised management objective for George Lake is to maintain a population size greater than 9,200 northern pike ≥18 inches (~450 mm) in size. An abundance of less than this is the threshold at which a management action to restrict harvest would be taken by the department.

The department conducted stock assessment for northern pike in George Lake during May 2006 and estimated the population size to be 16,178 fish ≥ 18 inches (~450 mm; Table 18) with an additional 4,268 fish between 12 and 18 inches (~305-450 mm; Wuttig and Reed 2010). The population estimate is well above the objective for George Lake at which a management action would need to occur.

Volkmar Lake

The management objective for Volkmar Lake is to maintain a population of northern pike ≥ 18 inches (~450 mm) of 2,000 fish or greater. Although no formal abundance or exploitation-based management objective exists for Volkmar Lake, 2,000 fish was selected as the population size at which any regulatory change would be considered to increase harvest. An increase in the bag limit is recommended to allow for additional harvest opportunity if the population rises above 2,000 fish.

In 2000, the estimated abundance of northern pike >450 mm (~18 in) in Volkmar Lake was 615 fish (Scanlon 2001). Angler effort and harvest were minimal after 1997 presumably due to a reduced bag and possession limit and angler perceptions of low northern pike abundance. In 2005, the population of northern pike >450 mm (~18 in) had increased to 1,630 fish (Wuttig and Reed 2010) and in 2009; the population had increased to 4,017 fish (Wuttig 2010).

Current Issues and Fishery Outlook

George Lake

Based on recent population estimates, the northern pike population in George Lake appears healthy and current harvests are sustainable. During the late 1980s and 1990s, George Lake supported a large population of relatively small northern pike (~20 in (510 mm) (Clark et al. 1988, Pearse and Hansen 1993). Recently, anglers and some members of the local Fish and Game Advisory Committee have expressed their satisfaction in the improved quality of their summer fishing experience at George Lake because of good catch rates, particularly of larger-sized fish (e.g., >24 inches (~610 mm)).

Stock assessments conducted during 2006 indicate a higher proportion of larger fish in the population compared to 1987. In 1987, 48% of the northern pike population was estimated to be over 18 inches (~450 mm; Clark et al. 1988). In 2006, 79% of the northern pike population was estimated to be ≥18 inches (~450 mm; Wuttig and Reed 2010). In 2006, it was estimated there were approximately 1,013 northern pike ≥30 inches (~750 mm) or about 6% of the estimated population. In 1987, only 3.4% of the population, or 300 fish were estimated at 30 inches (~750 mm) or more in length.

Volkmar Lake

The northern pike population in Volkmar Lake has exceeded the abundance threshold of 2,000 fish larger than ~18 inches (450mm). It is consistent with the management guidelines to increase the bag limit to allow additional harvest opportunity.

Recent Board of Fisheries Actions

In January 2010, the BOF adopted a proposal which increased the bag and possession limit in Volkmar Lake from one fish (no size limit) to two fish, of which only one can be over 30 inches (~750 mm) in length. The BOF also adopted a proposal which reduced the spring spawning closure for northern pike in Volkmar and George lakes by 20 days. This aligned the open season for all the lakes in the TRMA, with the exception of the Tolovana drainage and Harding Lake, to June 1–April 20.

Current or Recommended Research and Management Activities

Northern pike populations should continue to be monitored in George and Volkmar lakes to assess possible fisheries impacts from the recent regulation changes.

Other TRMA Northern Pike Fisheries

Harding Lake is located about 45 road miles southeast of Fairbanks along the Richardson Highway and is the largest roadside lake north of the Alaska Range (Figure 3). Northern pike were a high profile game fish in Harding Lake because they were readily caught and their preference for shallow water habitats made them highly vulnerable to anglers. In 2000, northern pike fishing at Harding Lake was closed due to low abundance; for details about the closure and habitat rehabilitation efforts see Brase (2009b).

Northern pike are common in many smaller lakes and in sloughs and tributaries of the Tanana River, and small harvests are reported annually from many locations throughout the TRMA. The Lower Chena, Zitziana, and Salcha rivers; Piledriver Slough; and gravel pits in south Fairbanks and on Eielson Air Force Base are examples of the types of areas that produce northern pike for anglers. Other fisheries occur in lakes in the Kantishna River drainage (such as East Twin and Mucha lakes) and in clear boat-accessible sloughs, backwaters, and small tributaries off of the Tanana River. Other lakes in the Upper Tanana River drainage with northern pike populations are Sand, "T", Mansfield, Dog, Island, Tetlin, Takomahto, Jatahmund, Island, and American Wellesley lakes.

The northern pike present in the Tanana River drainage provide the population reservoir which, through the movements of individual fish, ensures the continued viability of small stocks and availability of fishing opportunity wherever suitable habitat occurs, including the colonization of ponds. Northern pike colonize suitable gravel pits and other ponds when the river floods into

them and the pits become connected to the river; or when people illegally introduce northern pike into those waters. Many of these areas are road-accessible and rarely produce large numbers of fish or many large fish. It is not presently possible to develop a direct estimate of effort because of the mixed stock fisheries of which these northern pike fisheries are a part.

The wide range of accessibility for anglers and the diversity of types of angling opportunity add value to these fisheries. Angler interest in road-accessible northern pike fisheries is high. However, the nature of northern pike as a piscivore that takes the hook readily, but requires many years to grow to the larger sizes valued by anglers, makes it difficult to manage for high quality northern pike fisheries in roadside situations.

Abundance and age and sex composition studies were conducted in East Twin Lake in 1993 (Pearse 1994) and Deadman Lake in 1994 (Hansen and Pearse 1995). In both cases, the populations were judged to be healthy and capable of sustaining existing harvest levels. A radiotelemetry study done in 1993 and 1994 in the Chena River suggested that adult northern pike in that river move little during the year (Pearse 1994).

Management on a sustainable basis is an overriding obligation. However, in roadside ponds stocked with salmonids such as rainbow trout and where northern pike have been illegally introduced, maximum harvest rate (in excess of sustainability) is beneficial to the put-and-take fishery for stocked species.

The department will continue to monitor these small northern pike fisheries through the SWHS and assess trends which may indicate a fishery is getting higher use and may, therefore, warrant further research and/or management activities.

BURBOT

Tanana River

Background and historic perspective

The Tanana River is the second largest tributary of the Yukon River; it is approximately 570 miles long and is highly turbid in the summer due to glacial run-off. The largest Tanana River mainstem sport fishery is the winter burbot fishery. Burbot are the only freshwater members of the cod family (*Gadidae*), and are unique among freshwater fishes in the fact that they are active and spawn in the coldest part of winter when most other fish are generally inactive.

Burbot are commonly caught through the ice using set lines on which up to 15 hooks may be used. In flowing waters of the Tanana River drainage the bag and possession limit for burbot is 15 fish/day, with no size limit. Burbot stocks in the Tanana River are harvested most heavily near population centers such as Fairbanks, North Pole, and Nenana.

Population assessments were conducted annually from the late 1980s through 1998 in the Lower Chena River and the Tanana River near Fairbanks, and they showed a population that was stable and was possibly increasing (Table 19;Evenson 1988, 1994, 1996a, 1997; Stuby and Evenson 1999). Radiotelemetry studies on burbot have also been conducted. Extensive movements and exchange of burbot within the Tanana River drainage tends to minimize effects of concentrated local fishing effort, and overall, stocks in the Tanana River appear to be lightly exploited (Evenson 1997).

While most of the effort in the Tanana River fishery is probably directed toward burbot, it can be difficult to make inferences about burbot fisheries because the SWHS bases its estimates on calendar years, which divide the winter fishery into two segments and assigns the first portion to the end of one year and the second portion to the beginning of the next. Anglers fish for burbot all winter. Casual observations indicate that effort increases as the ice becomes safer for surface travel in November. Effort declines in late December, and then climbs again after mid-January. This decline coincides with the darkest, coldest time of the year, and with the general timing of burbot spawning in the rivers.

Prior to 1988 there was no bag and possession limit for burbot if taken by hook-and-line. There was a 10 fish/day limit if the fish were taken by spear or bow and arrow. In 1988, the current bag and possession limits of 15 fish in flowing waters, and 5 fish in lakes were adopted.

Recent Fishery Performance

The estimated catch and harvest of burbot in the TRMA varies from year to year within a range of about 2,000 to 5,000 fish. The recent 5-year average total harvest of 2,224 burbot is 62% of the total catch of 3,559 fish (Table 20), which is a higher retention rate than any other fish species in the Tanana River drainage, indicating the consumptive value of this fishery to Interior Alaska residents. The Middle Tanana River and the Lower Chena River fisheries provide most of the catch and harvest in the TRMA. These fisheries are on the same stock of burbot, which could be characterized as a "Middle Tanana" stock.

Fishery Objectives and Management

There are no specific management plans or fishery objectives in place for Tanana River burbot.

Current Issues and Fishery Outlook

Residents of Fairbanks typically target specific winter fishery locations near the mouth of the Chena River and nearby, on the Tanana River. These targeted areas may be experiencing some localized depletion of the larger Middle Tanana River stock.

Recent Board of Fisheries Actions

There have been no recent actions taken by the BOF with regards to the Tanana River burbot fishery.

Current or Recommended Research and Management Activities

Exploitation rates of burbot in the Upper Tanana River drainage are not considered excessive; however, 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 (Evenson 1991a). Subsistence fisheries for burbot are known to occur in the Upper Tanana River drainage, but harvests in these fisheries may be underreported as subsistence permits for non-salmon species are not required throughout the area. Current estimates of stock status or of total harvest for the Upper Tanana River drainage are unavailable. However, since this part of the river showed low relative abundance of burbot compared to other river sections and may have seasonally intense effort and harvest; there is concern for local depletion.

The department will continue to monitor these small burbot fisheries through the SWHS and assess trends which may indicate a fishery is getting higher use and may therefore warrant

further research and/or management activities. A Tanana River Burbot Management Plan may be developed that sets thresholds for regulatory action if harvest rates change such that they appear to be unsustainable.

Tanana River Drainage Lakes

Background and Historical Perspective

Burbot also inhabit deep lakes of the TRMA and they may colonize suitable ponds and gravel pits when flooded by nearby rivers. Sport fishing for burbot occurs year-round, but the majority of the effort in the TRMA appears to occur in the fall and winter. Closely-attended fishing lines are most commonly used when fishing for burbot in lakes.

Although current exploitation rates of burbot in TRMA lakes are not considered excessive, studies suggest there is low burbot abundance in most of the easily accessible lakes examined within the Tanana River drainage. Population density of burbot in many lakes declined dramatically in the early 1980s due to unsustainable rates of sport fishing exploitation. Stock assessment studies conducted in lakes of the Tanana River drainage have demonstrated the detrimental effects of long-term high exploitation rates on stocks (Lafferty et al. 1992).

Before restrictive regulations were put into effect, burbot fishing in TRMA lakes occurred primarily in the Fielding and the Tangle Lakes system (Parker 2009a). From 1981 to 1984, harvests of burbot at Fielding Lake averaged 330 fish per year which is believed to have caused a decline in the adult population. Due to low recruitment, a cycle of high and low abundance has occurred thereafter (Parker 2001b). In 1987, bag limits in these lakes were reduced from five to two fish and the use of setlines was eliminated, due to concerns of overharvest. In 1994 the department issued an EO to close the Fielding Lake burbot fishery until further notice.

In 1999, the Fielding Lake burbot population was estimated to be 598 fish (TL > 18 inches (~450 mm)), in 2000 it had increased to 759 fish (Parker 2001b) and in 2008 there was another increase to 894 burbot (Parker *In prep.*). Because of these increases the Fielding Lake burbot fishery was reopened in 2001 with a bag and possession limit of one fish per day. Harvest in Fielding Lake was not reported immediately after the fishery reopened, but 11 fish were harvested in 2003, with an increase to 51 fish in 2006 (Table 20). No burbot harvest has been reported in Fielding Lake since 2007, a possible result of a bait prohibition adopted in 2007 to protect the lake trout population.

The burbot bag and possession limit in all lakes of the TRMA (except Harding, Fielding, T lakes; and the Tangle Lakes system) is 5 fish/day.

Recent Fishery Performance

In 2010, no burbot were reported harvested in Fielding Lake, but 37 were harvested in the Tangle Lakes system, and 220 burbot were harvested from George Lake (Table 20).

Fishery Objectives and Management

Statistical simulations of the Fielding Lake burbot population suggest that a 10% exploitation rate can be sustained on an optimum population size of about 1,000 burbot (>18 inches (~450 mm)). Therefore, the management objectives for the Fielding Lake burbot fishery are to: 1) maintain a population size of 1,000 burbot > 18 inches in size (~450 mm); and, 2) ensure that the harvest plus hooking mortality of released burbot is less than 10% of the population size.

Current Issues and Fishery Outlook

The Fielding Lake burbot population can currently sustain a total fishing mortality of about 90 fish. In the past 5 years anglers have reported harvesting from 0 to 51 burbot in Fielding Lake (Table 20). This number is unlikely to substantially increase, as opportunity to harvest burbot is now limited due to the bait prohibition adopted by the BOF in 2007.

Recent Board of Fisheries Actions

In 2007, the BOF prohibited the use of bait in Fielding Lake. This action was put in place to protect lake trout; however, this action directly impacted the burbot fishery as most anglers use bait for burbot fishing.

There have been no other recent actions taken by the BOF with regards to the TRMA burbot fisheries that occur in lakes.

Current or Recommended Research and Management Activities

Levels of harvest in small, high elevation lakes such as Fielding and the Tangle Lakes system are thought to be sustainable and if harvests should reach 100 fish per year, impacts upon the population should be investigated. The number of burbot annually harvested from Fielding and the Tangle lakes is obtained from the SWHS, these numbers will continue to be monitored and if the annual harvest exceeds 100 fish in each population, further restrictions may be required.

WHITEFISH

Chatanika River

Background and historic perspective

The Chatanika River supports a large spawning population of whitefish (primarily humpback and least cisco). During late summer and fall, humpback whitefish and least cisco migrate up the Chatanika River to spawn in the middle section of the river between Hard Luck Creek and a few miles upstream of the Elliot Highway Bridge. They then move downriver to as yet undefined overwintering areas. It's quite possible that some of overwintering areas are outside of the Minto Flats complex. Fleming (1999) described the potential compound life history of the stocks, which might include long migrations in the Tanana and Yukon rivers. During the course of northern pike research, humpback whitefish and least cisco have been observed moving into the Minto Lakes immediately after breakup where they feed during the summer before moving upriver to spawning areas.

Historically, the only major sport fishery for whitefish in the TRMA was the spear fishery on the Chatanika River in the vicinity of the Elliot Highway Bridge. This fishery traditionally took place in September, while least cisco and humpback whitefish were migrating upstream to spawn. Both of these species were harvested, as were a small percentage of round whitefish. The fishery became very popular during the 1980s, and harvests had increased to 25,000 fish by 1987 (Brase 2009b).

This fishery had no bag limit until 1988, when a 15 fish bag limit was implemented. Harvest decreased in 1988 after the bag limit was imposed, but increased again in 1989. The decline in humpback whitefish abundance from 41,211 fish in 1988 to 17,322 fish in 1989 (Table 21; Hallberg 1989; Timmons 1990), combined with harvest estimates that were considered unsustainable prompted the department to close the fishery by EO in October 1990 and again in

September 1991 (Brase 2008). In 1992, the BOF adopted a department proposal to limit the fishery to the month of September and to limit the area where the fishery took place to downstream of a point one mile (~1.6 km) above the Elliot Highway Bridge. During 1992, the department also adopted an in-house Chatanika River whitefish management plan that set threshold abundance levels required to allow harvest. The threshold abundance level for humpback whitefish was 10,000 spawners, and the threshold abundance level for least cisco was 40,000 spawners.

Stock assessments done in 1992 and 1993 (Table 21; Fleming 1993, 1994) indicated abundance levels above the threshold levels in the management plan. However, harvest rates in those years were very low and attributed to poor weather conditions which reduced fishing success during the peak of migration (Burr et al. 1998)

Stock assessment during 1994 (Fleming 1996) indicated that the abundance of least cisco was below the management plan threshold allowing harvest; therefore, the fishery was closed by EO in September 1994. The fishery remained closed by EO through 2001, when the BOF closed the spear fishery by regulation.

Recent Fishery Performance

When the BOF prohibited the use of spears in the sport fishery, it reduced the bag and possession limit to 5 whitefish for hook-and-line gear and prohibited the retention of least cisco. There is little participation in this sport fishery due to the difficulty in catching whitefish by hook-and-line.

Alaska residents holding a sport fishing license may obtain a *Personal Use Whitefish and Sucker Permit* (5 AAC 77.190) which allows them to harvest whitefish with dip nets, fyke nets, beach seines, or fish wheels in the Fairbanks Nonsubsistence Area (5 AAC 99.015(a)(4)). To apply for a permit, anglers must contact ADF&G in Fairbanks.

In 2007, the BOF added spears as a legal gear type in the personal use whitefish fishery. Separate permits, specific to the Chatanika River, were designed that designated the dates, fishing area, and household limits for this fishery. In that first year, the department issued 100 household permits with a household limit of 10 whitefish. After 2007, because of high demand for permits, the low number of participants, and the low level of harvest (Brase and Baker 2011; Table 22) the number of issued permits was doubled to 200. Results from 2009 and 2010 indicated that participation and harvest rates slightly increased. This increase in participation and success may be due to people improving their spearing technique and finding a good location to harvest whitefish. Results from 2011 indicate lower success rates (Table 22), which may have been due to unusually high water through the spearing season.

Fishery Objectives and Management

An unpublished *Chatanika River Personal Use Whitefish Spear Fishery Management Plan* was developed in 2007. This plan outlines a history of the Chatanika River whitefish fishery and the fishery's current management objectives.

The draft management objectives are as follows:

1) To maintain an orderly fishery that produces a sustainable harvest; and,

2) To stay within these permit guidelines:

- Permits will be issued starting in mid-August;
- Permits will be only issued to Alaska residents who hold a sport fish license, and only one permit will be issued per household;
- Permits will be issued from the Fairbanks ADF&G office;
- Permits must be filled out and returned after fishing is complete or October 31;
- If a permit is not returned, the permittee may not be eligible to receive another the following year;
- Permit will specify fishery area and fishery dates; and,
- Maximum total fishery harvest level of 1,000 whitefish (any species).

Current Issues and Fishery Outlook

Overall there appears to be satisfaction from the participants in the personal use spear fishery. They report enjoying the opportunity to participate in the fishery and are satisfied with the 10 fish household limit. In 2009 and 2010, the total numbers of permits were issued in 3 days or less, and in 2011 all 200 permits were issued in less than 5 hours. In 2011, after the permits were issued, over 100 additional fishermen came into the office over the next two days seeking a permit, indicating the popularity of the spear fishery.

Anglers interested in spearing whitefish are encouraged to look for other stocks that might provide opportunity for fall spear fishing. Because of ongoing interest, it is possible that new spear fisheries may emerge on small stocks of whitefish in some of the clearwater tributaries of the Tanana River, and reported harvest levels should be watched in future years, especially from those streams that are easily accessible. To date there has been little success at developing spear fisheries on other stocks.

Recent Board of Fisheries Actions

At the 2010 meeting, the BOF adopted a proposal which repealed the exceptions to the general sport bag and possession limits and seasonal closures for whitefish in the Chatanika River. There was not a conservation concern in opening the hook-and-line sport fishery for whitefish year-round, as whitefish are difficult to catch using hook-and-line gear compared to personal use gear (spear). This change reduced the complexity of the regulations for the Chatanika River as the sport fishing regulations for whitefish will revert back to the areawide season (year-round) and bag and possession limits (15 fish).

In 2007, the BOF added spears as a legal personal use gear in the Chatanika River.

Current or Recommended Research and Management Activities

In 2008, separate abundance estimates were obtained for Chatanika River populations of least cisco and humpback whitefish (Table 21, Wuttig 2009). The humpback whitefish estimate was 22,490 fish (SE = 2,777); the estimate of least cisco was 15,870 fish 10 inches or more in length ($\geq$ 250mm) (SE = 1,429). These results suggest that the humpback whitefish population is at or slightly above the historical average, whereas the least cisco population remains below the historical average. The 2008 least cisco estimate reinforces the department's view that the population remains low as the estimate was more precise than previous years' estimates (Table 21).

The lack of recovery in the least cisco population indicates that continued conservative management of the Chatanika River personal use whitefish spear fishery is prudent.

LAKE TROUT

Background and Historical Perspective

Since 1986, the department has conducted research on wild lake trout populations due to high harvest rates and perceived declines in lake trout abundance that had occurred in many TRMA lakes. Today, lake trout regulations regionwide are conservative to protect existing wild lake trout populations. Specific life history features of lake trout (slow growth, delayed maturity, and non-consecutive spawning), combined with the short growing season at higher altitudes, increases the vulnerability of the species to overharvest (Burr 1987, 2006). The impact of even modest fishing pressure can be significant.

Lakes containing wild lake trout in the TRMA include Harding, Fielding, Two Bit, Landmark Gap, Glacier, Sevenmile, and the Tangle lakes system. The bag and possession limit for wild lake trout in most areas of the TRMA is two fish with no size limit, exceptions are the Tangle Lakes system (bag and possession limit of 1 fish with no size limit), Fielding Lake (bag and possession limit of 1 fish and the fish must be $\geq$ 26 inches in length (~660 mm)) and Harding Lake (bag and possession limit of 1 fish and the fish must be $\geq$ 30 inches in length (~760 mm)).

The lake trout population in Harding Lake is unique in that although it was originally stocked; it now has a naturally reproducing lake trout population. Between 1981 and 1984 a total of 16 individuals ranging in age from 2 to 11 years old were captured during lake surveys. This was the first solid evidence that the Harding Lake stocked lake trout were reproducing (Doxey 1985). In 1998, artificial spawning substrate was placed in Harding Lake to enhance lake trout spawning habitat (Viavant 1996). Fish were observed to be using the substrate, although it is unclear what the success rate has been. For more details about the history of lake trout in Harding Lake see Brase (Brase 2009b).

Prior to 2001, lake trout were stocked in various lakes throughout the TRMA. Stocked lakes that may still contain lake trout in the TRMA include: Craig, Four-Mile, 14-Mile, Moose, Crystal #1, Kenna, Lost, Rapids, Coal Mine #5, Paul's Pond, Chet, Ghost, Nickel and North Twin lakes.

There are consistently small numbers of lake trout catches reported in some lakes in the TRMA. Most of these fish are believed to be residuals from past stocking events. Lake trout have not been stocked in the TRMA since 2001, although the Fairbanks experimental hatchery did produce and stock a small number of lake trout into North Twin Lake in 2009.

Recent Fishery Performance

In 2010, there was a harvest of 948 lake trout in the TRMA (Table 23). The Tangle Lakes system has consistently produced the highest wild lake trout harvest in the TRMA. In 2010, the number of lake trout harvested from this system was 657 fish with a catch of 3,317 fish (Table 23). The 2010 lake trout harvest in the Tangle Lakes system was well above the recent 5-year average harvest of 289 fish.

In 2010, 48 lake trout were harvested from Fielding Lake (Table 23) which continues the low harvest trend seen since more restrictive fishing regulations were enacted in 2007.

Fishery Objectives and Management

In 2007, the BOF adopted the *Tanana River Area Wild Lake Trout Management Plan* (5 AAC 74.040) which provides guidelines for regulations based upon current effort and harvest levels, specific population data, and biological characteristics of the water body (Burr 2006). The *Tanana River Area Wild Lake Trout Management Plan* provides criteria for the BOF, public, and department to address in future proposals directed towards lake trout fisheries. The lake area model (LA model) is the primary tool for determining if fishing mortality estimated by the SWHS for specific lakes is likely sustainable. The LA model estimates yield potential of lake trout from a water body using lake surface area as a surrogate for available habitat volume, and regulatory actions will be introduced when harvests combined with an estimated 10% hooking mortality of the released fish have exceeded the yield potential for two consecutive years.

Harding Lake is managed under both the special management categories of the *Tanana River Area Stocked Waters Management Plan* (5 AAC 74.065) and the *Tanana River Area Wild Lake Trout Management Plan* (5 AAC 74.040).

Current Issues and Fishery Outlook

The Harding Lake annual lake trout yield estimate from the LA model is 90 fish with a 30-inch minimum size (~760 mm; J. Burr, ADF&G, Sport Fish Biologist, Fairbanks; personal communication). Since this 30-inch minimum size regulation was changed in 2007, catch and harvest of lake trout has decreased, indicating that this regulation change may be resulting in a sustainable lake trout fishery in Harding Lake.

In the Tangle Lakes system, average harvest from 2005–2009 was 289 lake trout (Table 23). A 10% hooking mortality of the catch is combined with harvest to determine total mortality. Catch over the past 5 years has averaged 1,558 fish. When the harvest of 289 fish is combined with an additional 10% hooking mortality of 126 fish, a total estimated fishing mortality of lake trout from the Tangle lakes system is 415 fish per year. The sustainable lake trout yield for the Tangle Lakes system is 731 fish per year based on the LA model (Burr 2006).

A sustainable lake trout harvest for Fielding Lake is about 78 fish (for fish over 26 inches (~660 mm)) per year based upon the LA model (Burr 2006). From 2005 to 2009, the harvest of lake trout from Fielding Lake averaged 57 fish per year (Table 23). Catch of lake trout averaged 500 fish from 2005 to 2009 with a high catch in 2005 of 862 fish (Table 23). The estimated harvest combined with estimated hooking mortality of 44 fish gives annual average total fishing mortality of 101 fish. Given the low abundance of lake trout and the high proportion that are caught and released, the continued use of bait in this fishery would have likely resulted in total lake trout fishing mortality exceeding the estimated sustained yield.

Recent Board of Fisheries Actions

There were no proposals adopted by the BOF at the 2010 meeting specific to the TRMA lake trout fisheries.

At the 2007 BOF meeting, the BOF took several actions with regards to lake trout in the TRMA: 1) the *Tanana River Area Wild Lake Trout Management Plan* (5 AAC 74.040) was adopted. This plan provides regulatory guidelines to manage lake trout populations and provides the BOF with a consistent means to address proposals regarding lake trout submitted by the public and department; 2) the BOF increased the minimum length limit from 26 to 30 inches (~660-760 mm) for lake trout retained from Harding Lake; 3) the BOF changed the gear restrictions in

Harding Lake to allow only one single hook or one single-hook, artificial lure; 4) the BOF removed the 18 inch (~460 mm) minimum size limit for lake trout retention in the Tangle Lakes system; and 5) a single-hook restriction was established on Fielding Lake and bait was eliminated to further reduce lake trout harvests.

Ongoing or Recommended Research and Management Activities

The last population estimate for lake trout in Fielding Lake was in 1999 when 264 adults larger than ~22 inches (≥550 mm) were estimated (Parker et al. 2001). A multiyear mark-recapture population study was initiated in 2010. Results will be available in 2013.

STOCKED WATERS

Background and historic perspective

The program of stocking hatchery produced fish to augment angling opportunity in Alaska began in 1952 when lakes along the road system near Fairbanks were stocked with rainbow trout and coho salmon. The first sport fish hatchery in Alaska (then the Territory of Alaska) was constructed at Birch Lake in 1952 and remained in operation until the 1960s. Subsequently hatcheries at Fire Lake, Ft. Richardson, Elmendorf AFB, Clear Air Force Station, and other locations have supplied fish to TRMA waters.

Some initial stocking events were "bucket-biology" experiments where fish were simply transported from one lake to another, often without good documentation. Stocking Alaska's waterways has changed over the years and now there are restrictive policies in place which outline criteria determining where fish can be stocked, what species may be stocked, and what brood source can be used. In addition, all potential brood source and hatchery raised fish must undergo pathology testing to ensure they are disease-free before being used as broodstock or outstocked into any water bodies.

At present, just over 100 lakes may be stocked in the TRMA. They range in size from Harding Lake at about 2,500 acres to small urban ponds less than 1 acre in surface area. Piledriver Slough is the only stream that has been stocked with (sterile) rainbow trout; however, this practice ended in 2010. These stocked waters offer a range of fishing opportunities including neighborhood urban ponds, large and small roadside lakes, remote lakes that are only trail-accessible and sometimes only in winter, and a few remote lakes only accessible by airplane. They function within the spectrum of fisheries management to provide diverse angling opportunities, shift pressure from wild stocks, and provide harvest alternatives. Diversity also provides an opportunity for winter fishing.

A variety of fish may be currently stocked in the TRMA, including rainbow trout, Arctic grayling, Arctic char, king, and coho salmon. These fish are produced at the Anchorage hatcheries, transported by truck to Fairbanks and/or Delta Junction, and stocked in area lakes in the early summer and late fall. Occasionally, lakes are stocked in the winter.

Fish have been stocked at four sizes: 1) fingerling (2 grams); 2) subcatchables (20-60 grams); 3) catchables (100-200 grams); and, 4) surplus broodstock (rainbow trout only, up to 1,500 grams). Size-at-stocking depends on management needs at a particular stocking location, lake characteristics (productivity, prone to winterkill, etc.), and hatchery production capability. For example, catchables are stocked in roadside and urban ponds because frequent angler use exceeds the pond's ability to sustain the fishery with fingerling stockings. Conversely,

fingerlings are stocked into remote lakes because those lakes have the ability to meet the lower demand, plus it is too expensive to transport larger fish with aircraft.

Recent Fishery Performance

Fishing the stocked waters of the TRMA is very popular because the bag and possession limits are typically very liberal (10 fish, only 1 fish 18 inches or larger (~460 mm)) and most of the lakes/ponds are easily accessible. Approximately 59% of the recent 5-year average annual TRMA sport harvest comes from the stocked lakes in the area, although catch of stocked species has been in a steady decline since 2002, likely a result of reduced hatchery production (Table 24).

Fishery Objectives and Management

In 2004, the BOF adopted the *Tanana River Area Stocked Waters Management Plan* (5 AAC 74.065) into regulation. This plan defines how ADF&G should meet the public demand for diverse fishing opportunities. The plan defines three management approaches: regional, conservative, and special. Special management lakes are managed to produce larger fish, although anglers may have a lower probability of catching those fish. Lakes in the TRMA that are in the special management category include: Harding, Little Harding, Summit (near Cantwell), Monte, Donnelly and Rainbow lakes. Dune and Koole lakes are managed under the conservative management approach. All remaining lakes in the TRMA fall under the regional management approach.

The Region III general stocking plan, a component of the Statewide Stocking Plan, is annually updated by stocked waters staff. The stocking plan is a comprehensive list of the species, the life stage, the stocking frequencies, and the maximum numbers of fish that can be stocked for all lakes in the stocking program. The projected numbers of fish to be stocked annually for a 5-year period are also listed in this report. The 2011 Region III stocking plan may be accessed electronically via the ADF&G website.

Current Issues and Fishery Outlook

There are many issues currently facing the stocked waters program which fuel the need to replace the aging Anchorage facilities. These include reduction in size and numbers of catchable fish, detection of the *Myxobolus cerebralis* parasite (which causes "whirling disease") at the Elmendorf Hatchery (limiting where fish reared here can be stocked), increased need to stock only triploid fish (which have three sex chromosomes instead of two, making them sterile) in lakes that may flood or pose risk when fish are illegally moved after stocking.

A separate issue, but one of high importance, is a lack of public access to many small ponds/gravel pits in the Fairbanks area. Without guaranteed public access ADF&G is unable to stock a waterbody and therefore an opportunity is lost for small neighborhood fisheries to develop.

Recent Board of Fisheries Actions

At both the 2010 and 2007 meetings the BOF adopted the updated stocked waters list.

In 2007, the BOF adopted a proposal to change the management approach for Koole Lake from the regional to conservative under the *Tanana River Area Stocked Waters Management Plan*. This change reduced the bag and possession limit from 10 fish (all species combined), of which only one may be 18 inches or greater in length (~450 mm) to 5 fish (all species combined), of which only one may be 18 inches or greater in length (~450 mm).

Current or Recommended Research and Management Activities

In 2005, the Alaska Legislature approved the construction of new hatcheries in both Fairbanks and Anchorage to replace the outdated Anchorage facilities at Ft. Richardson and Elmendorf AFB, which were no longer producing as many fish as they once did due to changes to the base boiler systems. These changes resulted in less hot water, which is necessary for accelerating fish growth rates. The new William Jack Hernandez (Anchorage) and Ruth Burnett (Fairbanks) Sport Fish Hatcheries are currently in operation and will begin producing catchable sized fish in 2012. Once these hatcheries become fully operational, the biomass of fish stocked in the TRMA is predicted to double.

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 appears to be much lower. For this reason, ADF&G is now stocking sub-catchable rainbow trout into Quartz Lake. This problem with survival can be averted if stocking of fingerlings can occur earlier in the summer when the water temperatures are cooler.

The ongoing 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 TRMA and support summer fisheries. Coho and king salmon also do well in most lakes and provide an aggressive fish during winter when other species are less active. Arctic char are long-lived and can grow to a 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.

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TABLES AND FIGURES

Table 1.–Number of angler–days of sport fishing effort expended by recreational anglers and total sport harvest of freshwater fish species in statewide, Region III (AYK-UCUS) and the Tanana River Management Area (TRMA) waters; 2000–2010.

	Year											5-yr Average	10-yr Average
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2005-2009	2000-2009
Angler Days													
Statewide	2,627,805	2,261,941	2,259,091	2,219,398	2,473,961	2,463,929	2,297,961	2,543,674	2,315,601	2,216,445	2,000,167	2,367,522	2,367,981
Region III	241,574	194,138	220,276	206,705	217,041	183,535	175,274	204,032	183,084	194,019	184,824	187,989	201,968
Region III as a % of Statewide	9%	9%	10%	9%	9%	7%	8%	8%	8%	9%	9%	8%	9%
TRMA	121,785	91,135	108,462	99,934	116,486	93,398	79,677	100,956	72,335	92,737	96,859	87,821	97,691
TRMA as a % of Region III	50%	47%	49%	48%	54%	51%	45%	49%	40%	48%	52%	47%	48%
Total FW Harvest													
Statewide	1,218,307	1,043,036	1,109,901	1,052,301	1,185,153	994,001	885,912	954,028	931,248	946,936	864,629	942,425	1,032,082
Region III	164,483	114,278	161,753	125,109	136,623	108,887	103,379	113,693	100,567	94,923	87,561	104,290	122,370
Region III as a % of Statewide	14%	11%	15%	12%	12%	11%	12%	12%	11%	10%	10%	11%	12%
TRMA	89,118	49,197	86,796	58,055	57,918	43,196	35,248	40,717	30,949	30,689	31,783	36,104	52,063
TRMA as a % of Region III	54%	43%	54%	46%	42%	40%	34%	36%	31%	32%	36%	35%	43%

Source: Howe et al. (2001a–d); Jennings et al. (2004, 2006a–b, 2009a-b, 2010a-b, 2011a-b); Walker et al. (2003).

Table 2.–Number of fish harvested and caught by recreational anglers fishing in the Tanana River drainage (includes stocked waters), 2000–2010.

	Year	King Salmon	Chum Salmon	Coho Salmon	Landlocked Salmon	Rainbow Trout	Dolly Varden/ Arctic Char	Lake Trout	Arctic Grayling	Northern Pike	Burbot	Sheefish	Whitefish	Other Species
Harvest														
	2000	177	97	310	16,945	49,690	4,009	1,133	8,560	3,467	3,740	220	385	385
	2001	667	29	1,122	10,197	19,919	3,368	445	7,074	4,207	1,297	9	785	78
	2002	478	307	541	17,693	38,562	6,645	709	12,987	3,436	4,009	92	1,086	251
	2003	2,153	63	1,317	6,680	26,292	4,854	860	10,084	2,947	2,561	59	167	18
	2004	1,319	98	716	8,459	25,554	4,111	646	6,773	4,895	3,446	177	1,485	239
	2005	483	144	267	3,056	17,829	2,752	1,082	10,061	4,624	2,487	129	114	168
	2006	638	315	629	2,499	16,998	1,818	791	5,982	3,276	1,903	53	252	94
	2007	549	41	339	4,289	17,841	2,038	648	6,739	3,900	3,623	37	656	17
	2008	254	61	170	5,352	10,576	2,990	506	8,122	1,381	1,227	83	227	0
	2009	836	71	115	2,540	10,053	2,733	1,193	8,134	3,016	1,879	23	96	0
	2010	313	62	369	2,832	11,056	1,965	1,086	8,298	2,652	2,010	0	1,300	106
5-yr Average														
2005–2009		552	126	304	3,547	14,659	2,466	844	7,808	3,239	2,224	65	269	56
10-yr Average														
2000–2009		755	123	553	7,771	23,331	3,532	801	8,452	3,515	2,617	88	525	125
Catch														
	2000	2,040	290	2,537	49,619	143,180	10,535	4,012	133,991	20,520	5,720	361	933	746
	2001	2,422	1,240	6,791	24,121	59,441	8,212	2,304	110,064	20,512	2,005	41	1,798	246
	2002	3,227	1,109	5,694	47,019	108,597	15,147	4,816	177,070	25,146	4,869	98	1,597	278
	2003	7,000	1,791	15,377	19,880	80,447	13,224	3,595	144,505	26,591	3,332	415	1,018	994
	2004	6,339	1,196	5,796	23,785	73,299	14,855	3,816	142,373	36,710	4,591	518	1,831	732
	2005	1,633	1,372	2,844	11,972	46,646	7,904	5,164	128,377	33,900	3,226	454	682	537
	2006	2,619	1,445	5,230	7,102	50,484	9,980	3,678	93,276	18,866	3,296	73	969	135
	2007	2,463	305	3,343	13,450	53,861	7,147	2,523	149,388	31,577	5,427	37	1,181	82
	2008	915	636	1,739	9,593	41,522	7,172	2,000	116,973	10,330	1,590	195	1,418	0
	2009	2,632	526	4,330	8,795	42,664	6,161	4,526	146,575	18,881	4,256	38	1,539	43
	2010	1,859	158	3,679	7,276	49,225	5,800	5,034	122,898	20,076	3,164	300	1,760	268
5-yr Average														
2005–2009		2,052	857	3,497	10,182	47,035	7,673	3,578	126,918	22,711	3,559	159	1,158	159
10-yr Average														
2000–2009		3,129	991	5,368	21,534	70,014	10,034	3,643	134,259	24,303	3,831	223	1,297	379

Source: Howe et al. (2001a–d); Jennings et al. (2004, 2006a–b, 2009a-b, 2010a-b, 2011a-b); Walker et al. (2003).

Table 3.–Abundance estimates and methods of estimation for king salmon in the Chena, Salcha, Chatanika and Goodpaster rivers, 1999–2011.

	Chena		Salcha		Chatanika		Goodpaster	
Year	Abundance	Method	Abundance	Method	Abundance	Method	Abundance	Method
1999	6,485	Tower	9,198	Tower	503	Tower	1,743	Helicopter
2000	4,694	M-R[a]	4,595	Tower	398	Tower	2,175	Helicopter
2001	9,696	Tower	13,328	Tower	964	Tower	1,457	Helicopter
2002	6,967	M-R[a]	4,644 [b]	Tower	719	Tower	1,440	Helicopter
2003	8,739[c]	Tower	11,758 [d]	Tower	1,008	Tower	3,004	Helicopter
2004	9,645	Tower	15,761	Tower	2,444	Tower	3,673	Tower
2005	no estimate[e]	Tower	5,988	Tower	no estimate[e]	Tower	1,184	Tower
2006[f]	2,936	Tower	10,400	Tower	ND	ND	2,479	Tower
2007[f]	3,564	Tower	5,631 [b]	Tower	ND	ND	1,581	Tower
2008[f]	3,212	Tower	5,300 [b]	Tower	ND	ND	1,880	Tower
2009[f]	5,253	Tower	12,788	Tower	ND	ND	4,280	Tower
2010[f]	2,382	Tower	6,135	Tower	ND	ND	1,125	Tower
2011[f]	no estimate[e]	Tower	7,200	Tower +Aerial	ND	ND	1,325	Tower
BEG Range	2,800–5,700		3,300–6,500		No escapement goal		No escapement goal	
10-yr Average 2001–2010	5,823		9,181		ND		2,210	
5-yr Average 2006–2010	3,472		8,067		ND		2,269	

Source: Brase 2012; Brase and Doxey (2006); Doxey (2004); Doxey et al. (2005); Savereide (2012a-b); Stuby (2000 and 2001).

[a] M-R = Mark Recapture experiment.

[b] Should be considered a minimum count due to high and/or turbid water conditions.

[c] Likely 11,100 king salmon when expanded for non-counting days.

[d] Likely 15,500 king salmon when expanded for non-counting days.

[e] No estimates were produced due to extreme high water events throughout run. Chena River king salmon escapement was likely within the BEG range.

[f] Preliminary results.

Table 4.–Sport harvest of king, coho, and chum salmon in the Tanana River drainage, 2000–2010.

	Year											5-yr Average	10-yr Average
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2005-2009	2000-2009
King Salmon													
Chena River	70	536	178	976	762	57	265	78	150	413	32	193	349
Salcha River	72	108	269	1,127	481	351	317	471	74	397	143	322	367
Chatanika River	0	23	0	13	37	0	0	0	30	0	16	6	10
Goodpaster River[a]	ND	ND	ND	ND	ND	ND	ND	0	0	0	0	0	0
Other Tanana	35	0	31	37	39	75	56	0	0	26	122	31	30
Total Tanana Drainage	177	667	478	2,153	1,319	483	638	549	254	836	313	552	755
Coho Salmon													
Nenana River drainage	6	118	24	11	78	0	37	0	86	10	160	27	37
Delta Clearwater River	252	816	517	1,272	511	267	580	311	65	105	209	266	470
Other Tanana	52	188	0	34	127	0	12	28	19	0	0	12	46
Total Tanana Drainage	310	1,122	541	1,317	716	267	629	339	170	115	369	304	553
Chum Salmon													
Chena River	61	0	167	0	28	32	118	0	15	0	50	33	42
Minto Flats	24	16	117	0	0	32	130	0	0	53	0	43	37
Salcha River	0	0	23	25	14	64	15	32	46	0	12	31	22
Delta Clearwater River	12	0	0	0	0	0	52	0	0	0	0	10	6
Other Tanana	0	13	0	38	56	16	0	9	0	18	0	9	15
Total Tanana Drainage	97	29	307	63	98	144	315	41	61	71	62	126	123

Source: Howe et al. (2001a–d); Jennings et al. (2004, 2006a–b, 2009a-b, 2010a-b, 2011a-b); Walker et al. (2003).

[a] Prior to 2007 the Goodpaster was closed to salmon fishing. In 2007 the Goodpaster was open to catch and release only.

Table 5.–Sport catch of king, coho and chum salmon in the Tanana River drainage, 2000–2010.

	Year											5-yr Average	10-yr Average
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2005-2009	2000-2009
King Salmon													
Chena River	222	1,579	1,920	3,012	4,571	503	1,208	824	530	1,506	515	914	1,588
Salcha River	198	707	1,157	3,752	1,514	582	747	1,575	299	982	1,108	837	1,151
Chatanika River	0	55	86	13	168	12	0	0	86	0	16	20	42
Goodpaster River[a]	ND	ND	ND	ND	ND	ND	ND	0	0	104	0	40	21
Other Tanana	1,620	81	55	223	86	536	568	64	0	40	220	242	327
Total Tanana Drainage	2,040	2,422	3,227	7,000	6,339	1,633	2,619	2,463	915	2,632	1,859	2,052	3,129
Coho Salmon													
Nenana River drainage	124	739	98	461	1,046	0	97	15	298	19	410	86	290
Delta Clearwater River	1,890	5,394	5,311	14,665	4,061	2,640	4,864	3,210	475	4,311	3,214	3,100	4,682
Other Tanana	523	658	285	251	689	204	269	118	966	0	55	311	396
Total Tanana Drainage	2,537	6,791	5,694	15,377	5,796	2,844	5,230	3,343	1,739	4,330	3,679	3,497	5,368
Chum Salmon													
Chena River	242	390	779	189	505	398	292	26	185	101	50	200	311
Minto Flats	36	16	117	25	28	95	130	0	0	70	0	59	52
Salcha River	0	57	38	1,047	355	82	166	165	46	35	24	99	199
Delta Clearwater River	12	65	23	50	42	0	533	105	0	0	11	128	83
Other Tanana	0	712	152	480	266	797	324	9	405	320	73	371	347
Total Tanana Drainage	290	1,240	1,109	1,791	1,196	1,372	1,445	305	636	526	158	857	991

Source: Howe et al. (2001a–d); Jennings et al. (2004, 2006a–b, 2009a-b, 2010a-b, 2011a-b); Walker et al. (2003).

[a] Prior to 2007 the Goodpaster was closed to salmon fishing. In 2007 the Goodpaster was open to catch and release only.

Table 6.–Number of salmon commercially harvested in the Yukon and Tanana rivers, 1995–2011.

	Total Yukon River (includes Tanana)				Tanana River Portion			
Year	King	Summer Chum	Fall Chum	Coho	King	Summer Chum	Fall Chum	Coho
1995	126,204	824,487	284,178	47,206	2,747	37,428	74,117	6,900
1996	91,890	689,542	107,347	57,710	447	46,890	17,574	7,142
1997	116,421	230,842	59,054	35,818	2,728	25,287	0	0
1998	44,625	31,817	0	1	963	570	0	0
1999	70,767	29,412	20,371	1,601	690	148	0	0
2000	9,115	7,272	0	0	0	0	0	0
2001	0	0	0	0	0	0	0	0
2002	24,128	13,558	0	0	836	3,198	0	0
2003	40,438	10,685	10,996	25,243	1,813	4,461	4,095	15,119
2004	56,151	26,410	4,110	20,232	2,057	6,610	3,450	18,649
2005	32,029	41,264	180,162	58,311	453	8,986	49,637	21,778
2006	45,829	92,116	166,179	64,942	84	44,621	23,353	11,137
2007	33,634	198,201	88,654	44,540	281	14,674	13,591	1,333
2008	4,641	151,786	119,497	35,600	0	1,842	5,976	2,408
2009	316	170,272	25,876	8,311	0	7,777	1,893	752
2010	9,897	232,888	2,550	3,750	0	5,466	1,735	1,700
2011	82	275,161	238,979	76,303	0	8,651	9,267	6,784
5-yr Average 2006–2010	18,863	169,053	80,551	31,429	73	14,876	9,310	3,466
10-yr Average 2001–2010	24,706	93,718	59,802	26,093	552	9,764	10,373	7,288

Source: JTC 2010; D. Green, Commercial Fisheries Biologist, ADF&G, Fairbanks; personal communication.

Table 7.–Number of salmon harvested in subsistence and personal use fisheries in the Yukon and Tanana rivers, 1995–2009.

	Total Yukon River (includes Tanana)				Tanana River Portion			
Year	King	Summer Chum	Fall Chum	Coho	King	Summer Chum	Fall Chum	Coho
1995	48,934	119,503	131,369	28,642	2,178	12,441	50,031	19,219
1996	43,521	103,408	129,222	30,510	1,392	8,391	36,832	15,091
1997	56,291	97,500	95,425	24,295	3,025	4,215	19,834	11,945
1998	54,090	86,088	62,869	17,781	2,276	6,088	14,372	7,481
1999	52,525	70,705	89,998	20,970	1,955	3,036	15,733	9,547
2000	35,916	64,925	19,307	14,717	1,058	1,141	311	5,150
2001	53,059	58,385	35,154	21,654	2,449	558	3,536	9,000
2002	42,746	72,435	19,393	15,261	1,193	687	3,205	9,519
2003	55,313	68,452	57,178	24,129	2,349	3,062	13,380	10,912
2004	53,876	69,903	62,436	20,965	1,589	2,024	9,183	11,817
2005	52,699	79,054	91,597	27,078	1,966	2,166	23,079	19,645
2006	47,799	91,184	84,133	19,650	1,318	1,272	17,258	10,850
2007	54,112	76,989	101,160	19,649	1,853	2,080	30,066	7,980
2008	43,820	68,532	89,152	16,789	731	1,449	16,316	8,478
2009	33,027	68,050	66,039	15,830	1,412	1,561	16,157	7,121
5-yr Average (2005–2009)	46,291	76,762	86,416	19,799	1,456	1,706	20,575	10,815
10-yr Average (2000–2009)	47,237	71,791	62,555	19,572	1,592	1,600	13,249	10,047

Source: JTC 2009; D. Jallen, Commercial Fisheries Biologist, ADF&G, Fairbanks; personal communication.

Table 8.–Coho salmon escapement estimates from the Tanana River drainage, 2000–2011.

Surveyed Stream	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	5-yr Average 2006–2010	10-yr Average 2001–2010
Delta Clearwater River	9,225	46,875	38,625	102,800	37,550	31,175	15,950	14,650	7,500	16,850	5,867	6,180	12,163	31,784
Richardson Clearwater River	2,175	1,531	874	6,232	8,626	2,024	271	553	265	155	1,002	575	449	2,153
Nenana Drainage														
Lost Slough	55[a]	242	0	85	220	430	194	ND	1,342	410	1110	ND	764	448
Teklanika River	66[a]	855	328	658	450	325[b]	160[b]	ND	1,539[c]	ND	280	ND	280	514
Otter Creek	879	3,741	1,910	4,535	3,370	3,890	1,916	ND	1,652	680	720	ND	1,242	2,490
Julius Creek	370	6	15	1	280	280	0	ND	0	2	0	ND	1	65
Wood Creek[f]	0[d]	699	935	3,055	840	1,030	634	ND	578	470	340	ND	506	953
Clear Creek[f]	385[e]	962	160[e]	884	140[e]	35[e]	972	ND	292	0[d]	130	ND	465	648
Glacier Creek[f]	100[e]	216	42[e]	62[e]	90[e]	70[e]	14[e]	ND	0[d]	0[d]	0[d]	ND		216
Lignite Creek	95	135	130	67	91	378	168	ND	343	113	234	ND	215	184
June Creek	120	148	95	74[c]	85[c]	201[c]	66[c]	ND	42[c]	18	ND	ND	18	87

Source: US/Canada Yukon River Panel Joint Technical Committee (JTC 2009), C. Stark, Biologist, Bering Sea Fishermen's Association, Fairbanks; personal communication.

[a] High, muddy water ; poor visibility.

[b] Silty; poor visibility.

[c] Incomplete survey (access to private property issue).

[d] Beaver dam blocking stream mouth.

[e] Numerous beaver dams; stream out of bank in places; fair visibility.

[f] Tributaries to Julius Creek.

Table 9.–Estimated abundance of Arctic grayling by size and by river section of the Chena River, 1985–1998, 2005.

	Lower River (below RM 45)				Upper River (RM 45–90)					
Year	Stock size 150–269 mm (~6-10.5 in)	(SE)	Quality size ≥270mm (~10.5 in)	(SE)	Stock size 150–269 mm (~6-10.5 in)	(SE)	Quality size ≥270mm (~10.5 in)	(SE)	Total Abundance[a]	(SE)
1985	ND		ND		ND		ND		112,391	ND
1986	ND		ND		ND		ND		61,581	(26,987)
1987	ND		ND		ND		ND		31,502	(3,500)
1988	ND		ND		ND		ND		22,204	(2,092)
1989	ND		ND		ND		ND		19,028	(1,542)
1990	ND		ND		ND		ND		31,815	(4,880)
1991	5,100	(561)	1,426	(188)	14,513	(2,328)	5,717	(846)	26,756	(2,547)
1992	9,394	(1,108)	1,921	(338)	13,495	(1,570)	4,538	(647)	29,348	(2,055)
1993	10,514	(1,492)	1,533	(311)	20,694	(3,627)	6,877	(1,486)	39,618	(4,289)
1994	14,200	(1,085)	2,335	(274)	21,239	(3,350)	6,601	(1,228)	44,375	(2,647)
1995	14,150	(1,450)	2,059	(294)	21,660	(3,209)	7,276	(1,292)	45,145	(3,852)
1996	11,863	(962)	2,780	(245)	15,611	(2,970)	11,209	(1,229)	41,463	(3,363)
1997[b]	10,205	(2,348)	2,044	(374)	ND	ND	9,458	(1,688)	≥21,707[c]	(2,916)
1998[b]	7,212	(1,520)	1,804	(427)	6,028	(1,161)	12,519	(2,051)	27,563	(2,459)
2005	5,541	–[d]	2,190	(268)	14,764	–[d]	5,203	(543)	27,698	(3,661)
Management Objectives			2,200				8,500			

Source: Clark (Clark 1989–1991, 1993–1996); Clark and Ridder (1987; 1988); Holmes et al. (1986); Ridder (1998c, 1999b); Ridder and Fleming (1997); and Wuttig and Stroka (2007).

[a] Total abundance is for fish ≥ 150 mm (~6 in) FL unless otherwise indicated.

[b] One boat used to fish the upper section.

[c] Abundance estimate does not include fish 150 to 239 mm (~6-10 in) FL for the upper section.

[d] In 2005 standard errors were not calculated for Arctic grayling 150–269mm (~6-10.5 in).

Table 10.–Sport catch of Arctic grayling in the Tanana River drainage, 2000–2010.

	Year											5-yr Average	10-yr Average
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2005-2009	2000-2009
Chatanika River Total	9,204	3,002	15,313	13,178	8,729	9,326	7,885	10,394	11,229	6,990	4,659	9,165	9,525
Upper Chatanika	4,524	2,176	10,065	7241	5,771	6,394	5,861	6,642	9,243	2,253	3,428	6,079	6,017
Lower Chatanika	4,567	826	5,248	5,937	2,958	2,932	2,024	3,752	1,986	4,737	1,231	3,086	3,497
Nenana River Total	2,094	4,535	7,113	4,425	6,197	9,284	2,110	3,120	10,159	9,494	4,551	6,833	5,853
Nenana River (excluding Brushkana)	638	2,146	2,387	2488	3,367	4,487	833	2,081	2,789	5,157	1,977	3,069	2,637
Brushkana Creek	1,456	2,389	4,726	1937	2,830	4,797	1,277	1,039	7,370	4,337	2,574	3,764	3,216
Chena River Total	43,459	35,881	44,508	36,098	55,376	31,026	26,322	45,673	28,909	26,316	27,067	31,649	37,357
Upper Chena	24,880	18,478	21,488	20,667	34,710	20,367	15,485	31,366	20,315	14,356	18,274	20,378	22,211
Lower Chena	16,296	17,403	23,020	15,431	20,666	10,659	10,837	14,307	8,594	11,960	8,793	11,271	14,917
Piledriver Slough	7,224	4,927	8,199	6,037	4,789	3,962	2,972	3,316	5,030	5,295	6,717	4,115	5,175
Salcha River	7,200	5,831	7,532	6,756	7,355	6,525	2,391	11,759	4,531	14,811	5,670	8,003	7,469
Goodpaster River	1,290	1,815	1,346	1,499	1,735	2,464	1,467	2,947	3,116	3,417	1,574	2,682	2,110
Delta Clearwater River	8,690	12,574	12,913	17,576	14,212	19,922	12,542	22,112	8,912	20,714	12,081	16,840	15,017
Fielding Lake	2,594	2,028	2,932	1,989	2,802	4,437	952	5,199	4,589	3,605	14,095	3,756	3,113
Tangle Lakes	18,574	12,970	25,768	23,931	15,007	18,695	11,103	32,491	20,166	30,536	27,682	22,598	20,924
Other Tanana	18,507	15,021	32,663	15,722	15,768	11,749	15,290	7,160	12,104	14,814	11,897	12,223	15,880
Total Tanana	118,836	98,584	158,287	127,211	131,970	117,390	83,034	144,171	108,745	135,992	115,993	117,866	122,422

Source: Howe et al. (2001a–d); Jennings et al. (2004, 2006a–b, 2009a-b, 2010a-b, 2011a-b); Walker et al. (2003).

Table 11.–Sport harvest of Arctic grayling in the Tanana River drainage, 2000–2010.

	Year											5-yr Average	10-yr Average
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2005–2009	2000–2009
Chatanika River Total	773	317	1,357	955	583	607	644	461	989	208	774	582	689
Upper Chatanika	400	143	694	303	311	424	514	231	518	105	491	358	364
Lower Chatanika	373	174	663	652	272	183	130	230	471	103	283	223	325
Nenana River Total	517	389	982	697	716	2,268	464	577	928	468	538	941	801
Nenana River (excluding Brushkana)	297	142	306	455	156	1,619	245	440	587	203	120	619	445
Brushkana River	220	247	676	242	560	649	219	137	341	265	418	322	356
Chena River Total	0	0	0	0	0	0	0	0	0	0	0	0	0
Upper Chena	0	0	0	0	0	0	0	0	0	0	0	0	0
Lower Chena	0	0	0	0	0	0	0	0	0	0	0	0	0
Piledriver Slough	0	0	32	0	0	0	0	0	0	211	0	42	24
Salcha River	1,544	602	1,287	1,225	1,501	806	703	1,365	576	2,165	1,556	1,123	1,177
Goodpaster River	63	873	229	56	176	617	212	676	528	640	443	535	407
Delta Clearwater River	0	91	51	0	111	140	85	172	214	0	14	122	86
Fielding Lake	705	424	587	351	491	623	56	636	738	33	585	417	464
Tangle Lakes	2,020	1,738	2,686	2,438	1,251	1,825	1,181	1,131	1,897	2,125	2,656	1,632	1,829
Other Tanana	1,648	1,099	3,815	2,541	1,640	2,353	1,548	1,223	1,655	1,993	899	1,754	1,952
Total Tanana	7,270	5,533	11,026	8,263	6,469	9,239	4,893	6,241	7,525	7,843	7,465	7,148	7,430

Source: Howe et al. (2001a–d); Jennings et al. (2004, 2006a–b, 2009a-b, 2010a-b, 2011a-b); Walker et al. (2003).

Table 12.–Estimated abundance of Arctic grayling ≥ 240 mm FL in a 14 mile (23 km) long index section of the Delta Clearwater River, 1996–2000, 2006.

Year	Abundance	Standard Error
1996	3,000	370
1997	7,420	920
1998	5,570	780
1999	6,977	401
2000	7,991	940
2006[a]	14,799	2,204

Source: Gryska 2001; Ridder 1998a, 1999; Ridder and Gryska 2000; Wuttig and Gryska 2010.

[a] The 2006 estimate is for Arctic grayling ≥ 270 mm FL.

Table 13.–Abundance of select size classes of Arctic grayling in an ~18 mile (29.6 km) section of the Chatanika River from ~2 mi (3.2 km) above the Elliott Hwy Bridge downstream to the mouth of Any Creek, 1995, 2002, 2007.

Year	Capture Method	>250 mm	SE	>270mm	SE	>330 mm	SE
1995	electrofishing	–	–	3,027	–	267	–
2002	hook & line	–	–	205	36	124	–
2007	electrofishing	–	–	2,132	526	407	172
	hook & line	1,026	190	–	–	363	82

Source: Fish (1996); Wuttig (2004); Wuttig and Gryska (2011).

Table 14.–Abundance estimates of Arctic grayling (N) for the Lower Salcha River (bridge to river mile 25 (~40 km)) during mid-to-late June, 1988–1994, 2004.

Year	N (SE)	Size (mm FL)	Date	N (SE) [a]	Size (mm FL)
1988[b]	2,181 (542)	≥150	May 24–June 8	1,182	≥270
1989	6,935 (766)	≥150	June 12–20	2,081	≥270
1990	5,792 (659)	≥150	June 19–27	1,564	≥270
1991	4,182 (907)	≥200	June 18–July 2	1,756	≥270
1992	7,076 (2,555)	≥200	June 15–25	2,235	≥270
1993	15,950 (2,442)	≥150	June 7–17	3,031	≥270
1994	14,562 (1,762)	≥150	June 13–30	2,767	≥270
2004[c]	–	–	June 29–July 15	2,042 (434)	≥270

Source: Clark et al. (1991); Clark and Ridder (1987b, 1988, 1990); Gryska (2011b); Ridder et al. (1993); Roach (1994, 1995).

[a] Standard Errors (SE) for fish > 270mm could not be calculated for the 1988–1994 estimates (Roach 1995).

[b] Sample section in 1988 was ~10 mi (16 km) long.

[c] Preliminary results.

Table 15.–Sport harvest and catch of northern pike in the Tanana River drainage, 2000–2010.

	Year											5-yr Average	10-yr Average
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2005–2009	2000–2009
Harvest													
Minto Flats	266	641	483	1,260	1,199	1,880	935	1,712	258	765	569	1,110	940
Minto Flats complex [a]	390	654	650	1,284	1,390	2,052	1,204	1,809	386	873	609	1,265	1,069
George Lake	259	610	223	738	149	853	217	776	264	567	681	535	466
Healy Lake	86	0	39	0	45	0	9	0	0	88	0	19	27
Deadman Lake	123	28	35	0	76	24	42	0	72	13	0	30	41
Volkmar Lake	10	40	127	24	30	12	55	0	51	26	59	29	38
Mineral Lake (into Station Creek)	20	73	0	57	0	177	41	45	0	170	168	87	58
Other Tanana	2,579	2,802	2,362	844	3,205	1,506	1,708	1,270	608	1,279	1,135	1,274	1,816
Total Tanana Harvest	3,467	4,207	3,436	2,947	4,895	4,624	3,276	3,900	1,381	3,016	2,652	3,239	3,515
Catch													
Minto Flats	1,402	2,849	8,806	8,706	19,205	14,839	7,284	11,346	2,926	6,623	6,477	8,604	8,399
Minto Flats complex[a]	1,784	2,916	10,085	12,997	21,159	16,768	8,447	14,077	3,988	7,915	8,088	10,239	10,014
George Lake	4,957	5,146	2,149	4,097	2,723	4,484	2,958	6,889	1,442	3,152	4,010	3,785	3,800
Healy Lake	248	0	255	449	151	0	27	0	0	704	0	146	183
Deadman Lake	432	379	571	546	754	1,091	179	345	180	707	0	500	518
Volkmar Lake	10	390	304	339	603	280	186	174	51	244	381	187	258
Mineral Lake (into Station Creek)	439	344	666	244	0	977	122	465	0	440	309	401	370
Other Tanana	12,650	11,337	11,116	6,919	11,320	10,300	6,947	9,627	4,669	5,719	7,288	7,452	9,060
Total Tanana Catch	20,520	20,512	25,146	25,591	36,710	33,900	18,866	31,577	10,330	18,881	20,076	22,711	24,203

Source: Howe et al. (2001a–d); Jennings et al. (2004, 2006a–b, 2009a-b, 2010a-b, 2011a-b); Walker et al. (2003).

[a] Includes Minto Flats, Tolovana River and the Lower Chatanika River.

Table 16.–Estimated northern pike abundance in the Minto Lakes Study Area, 1987–1988, 1990–1991, 1996–1997, 2000, 2003, 2008.

	≥ 400mm (~16 in)		≥ 525 mm (~20 in)		≥ 600mm (~24 in)	
Year	Abundance	SE	Abundance	SE	Abundance	SE
1987	–	–	11,257	3,075	–	–
1988	–	–	13,233	3,143	–	–
1990	–	–	27,418	6,800	–	–
1991	–	–	17,633	5,480	–	–
1996	23,850	7,799	20,695	6,765	7,616	883
1997	16,547	1,754	14,639	1,552	3,251	174
2000	–	–	–	–	5,331	1,152
2003	25,227	4,529	13,900	2,918	7,683	2,347
2008	9,854	1,701	–	–	2,092	448

Source: Burkholder (1989; 1990); Hansen and Burkholder (1992); Joy (2009); Roach (1997, 1998a); Scanlon (2001, 2006).

Table 17.–Number of subsistence permits issued, returned and reported fished and the total subsistence harvest of northern pike in the Tolovana River drainage, 1994–2011.

Year	Permits			Total Harvest
	Issued	Returned	Fished	
1994	47	46	24	995
1995	55	52	20	1,023
1996	70	61	24	1,616
1997	86	73	40	1,333
1998	69	65	32	431
1999	54	50	24	400
2000	34	29	13	352
2001	49	43	19	214
2002	32	31	13	521
2003	119	105	57	966
2004	98	90	42	393
2005	79	69	31	386
2006	102	96	55	786
2007	118	109	54	1,837
2008	146	136	79	1,339
2009	113	108	51	560
2010	96	90	42	115
2011	70	69	27	100
5-Yr Average 2005–2009	112	104	54	982
10-Yr Average[a] 2000–2009	89	82	41	735

Source: ADF&G, Commercial Fisheries Division, Fairbanks; unpublished data.

[a] These years are used to compare and summarize with the SWHS estimates.

Table 18.–Estimates of abundance of northern pike >18 inches (~450 mm) in George and Volkmar lakes, 1985–2009.

	Volkmar Lake		George Lake[a]	
Year	Abundance	SE	Abundance	SE
1985	4,020	250	No Survey	
1986	4,028	587	No Survey	
1987	4,230	634	8,495	1,086
1988	2,196	148	15,117	4,086
1989	1,115	179	12,354	1,473
1990	2,019	349	8,107	892
1991	2,509	289	10,939	959
1992	2,542	369	7,001	540
1993	No Survey		No Survey	
1994	No Survey		No Survey	
1995	No Survey		No Survey	
1996	No Survey		No Survey	
1997	No Survey		No Survey	
1998	No Survey		No Survey	
1999	No Survey		No Survey	
2000	615	161	No Survey	
2001	No Survey		No Survey	
2002	No Survey		No Survey	
2003	No Survey		No Survey	
2004	No Survey		No Survey	
2005	1,814	449	No Survey	
2006	No Survey		16,204	3,293
2007	No Survey		No Survey	
2008	No Survey		No Survey	
2009	4,017	307		

[a] Spring abundance for George Lake for fish > 18 inches (~450 mm) using the Darroch estimator in 1987–1988; the Peterson estimator in 1989–1991; and using the unstratified Program Capture estimator from 1992 to 1993, and in 2006 a Peterson estimator (Wuttig and Reed 2010).

Table 19.–Catch–age estimates of total and exploitable abundances, with coefficients of variation (CV), of Tanana River burbot, 1987–1998.

Year	Total Abundance [a]	CV	Total Exploitable Abundance [b]	CV
1987	281,255	0.155	77,877	0.168
1988	262,542	0.161	74,591	0.167
1989	242,706	0.170	73,246	0.163
1990	226,347	0.175	70,345	0.162
1991	198,666	0.178	67,714	0.164
1992	157,388	0.177	62,774	0.163
1993	153,969	0.206	56,227	0.173
1994	148,921	0.239	48,976	0.179
1995	176,044	0.308	43,420	0.194
1996	273,975	0.430	41,514	0.213
1997	402,186	0.489	52,168	0.244
1998	578,153	0.563	69,024	0.282

Source: Evenson (1988, 1994) and Stuby and Evenson (1999).

[a] Total abundance is defined as the number of fish at large prior to harvest, without consideration of the gear selectivity adjustment.

[b] Total exploitable abundance is the number of fish that are potentially vulnerable to the fishery (a portion of 5, 6, 7, and 8 year old fish plus all fish 9 years or older).

Table 20.–Sport harvest and catch of burbot in the Tanana River drainage, 2000–2010.

	Year											5-yr Average	10-yr Average
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2005–2009	2000–2009
Harvest													
Lower Tanana River and tributaries	73	0	13	87	160	149	140	90	365	0	0	149	108
Middle Tanana River and tributaries	1,356	758	1,895	1,001	1,594	1,685	698	1,636	519	361	968	980	1,150
Chena River	702	230	58	487	1,433	248	311	960	202	262	125	397	489
Salcha River	0	0	77	0	0	9	0	60	0	361	110	86	51
Upper Tanana River and tributaries	460	151	199	749	119	136	225	495	0	658	82	303	319
Fielding Lake	0	0	0	11	30	25	51	0	0	0	0	15	12
Tangle Lakes	0	29	22	9	0	0	0	12	17	0	37	6	9
George Lake	0	0	0	47	0	149	76	0	17	52	220	59	34
Other Tanana	1,149	129	1,745	170	110	86	402	370	107	185	468	230	445
Total Tanana Harvest	3,740	1,297	4,009	2,561	3,446	2,487	1,903	3,623	1,227	1,879	2,010	2,224	2,617
Catch													
Lower Tanana River and tributaries	218	0	26	87	218	335	149	180	365	0	0	206	158
Middle Tanana River and tributaries	1,854	1,371	2,397	1,500	2,087	1,872	1,541	1,735	777	465	1,548	1,278	1,560
Chena River	1,236	281	83	573	1,977	310	539	1,290	227	287	157	531	680
Salcha River	0	0	77	0	0	9	0	60	0	361	110	86	51
Upper Tanana River and tributaries	727	151	268	860	129	211	354	1,695	0	2,859	330	1,024	725
Fielding Lake	48	0	0	11	30	50	89	0	0	34	0	35	26
Tangle Lakes	0	29	22	19	0	34	0	54	17	0	37	21	18
George Lake	0	0	0	47	0	248	76	0	84	52	220	92	51
Other Tanana	1,564	173	1,996	235	150	157	548	413	120	198	762	287	555
Total Tanana Catch	5,720	2,005	4,869	3,332	4,591	3,226	3,296	5,427	1,590	4,256	3,164	3,559	3,831

Source: Howe et al. (2001a–d); Jennings et al. (2004, 2006a–b, 2009a-b, 2010a-b, 2011a-b); Walker et al. (2003).

Table 21.–Humpback whitefish and least cisco abundance estimates from the Chatanika River, 1988–1997, 2008.

Year	Humpback Whitefish	Least Cisco
1988	41,211 (SE = 5,155)	ND
1989	17,322 (SE = 1,655)	53,409 (SE = 5,110)
1990	No Survey	
1991[a]	15,313 (SE = 2,078)	135,065 (SE = 24,513)
1992	19,187 (SE = 1,617)	75,035 (SE = 8,555)
1993	13,112 (SE = 1,096)	46,562 (SE = 5,971)
1994	12,700 (SE = 1,138)	27,639 (SE = 3,211)
1995	No Survey	
1996	No Survey	
1997	16,107 (SE = 1,260)	22,811 (SE = 4,496)
1998–2007	No Survey	
2008	22,490 (SE = 2,777)	15,345 (SE = 1,350)[b]

Source: Fleming (1993, 1994, 1996, 1997); Hallberg (1989); Timmons (1990, 1991); Wuttig (2009).

[a] Estimates are for humpback whitefish > 359 mm FL (~14 in), and least cisco > 289 mm FL (~11 in).

[b] Estimates for least cisco > 250 mm FL (~10 in).

Table 22.–Chatanika River personal use whitefish spear fishery permit results, 2007–2011.

Year	Permits Issued	Permits Returned	Number of Households that Fished	Whitefish Species: Least Cisco	Humpback	Round	Unknown	Total Whitefish Harvest	Average Harvest/ Permit
2007	100	97	52	47	158	9	53	267	5.13
2008	200	191	92	53	367	37	65	522	5.67
2009	200	194	124	104	501	77	68	750	6.05
2010	200	198	141	103	657	94	100	954	6.77
2011	200	196	129	172	284	66	22	583	4.52

Table 23.–Sport harvest and catch of wild lake trout in the Tanana River drainage, 2000–2010.

	Year											5-yr Average	10-yr Average
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2005-2009	2000-2009
Harvest													
Harding Lake	67	44	48	41	72	48	171	28	23	0	192	54	54
Fielding Lake	18	12	0	83	101	112	108	40	7	18	48	57	50
Tangle Lakes	376	112	414	505	270	224	272	383	232	333	657	289	312
Other Tanana	672	277	247	231	203	698	240	197	244	842	51	444	385
Total Tanana Harvest	1,133	445	709	860	646	1,082	791	648	506	1,193	948	844	801
Catch													
Harding Lake	258	435	597	518	479	707	1,140	263	104	303	845	503	480
Fielding Lake	221	106	137	423	520	862	634	227	226	552	309	500	391
Tangle Lakes	1,626	591	2,464	1,631	976	2,327	895	1,890	1,119	1,559	3,317	1,558	1,508
Other Tanana	1,907	1,172	1,618	1,023	1,841	1,268	1,009	143	551	2,112	220	1,017	1,264
Total Tanana Catch	4,012	2,304	4,816	3,595	3,816	5,164	3,678	2,523	2,000	4,526	4,691	3,578	3,643

Source: Howe et al. (2001a–d); Jennings et al. (2004, 2006a–b, 2009a-b, 2010a-b, 2011a-b); Walker et al. (2003).

Table 24.–Contribution of stocked fish to the Tanana River drainage total harvest and catch, 2000–2010.

	Year											5-yr Average	10-yr Average
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2005–2009	2000–2009
Effort													
Effort on Stocked Waters	59,049	40,388	49,508	41,859	51,606	35,001	32,693	37,303	34,091	38,832	43,513	35,584	42,033
Total TRMA Effort	121,785	91,135	108,462	99,934	116,486	93,398	79,677	100,956	72,335	92,497	96,859	87,773	97,667
Percent Stocked Waters Effort	48%	44%	46%	42%	44%	37%	41%	37%	47%	42%	45%	41%	43%
Harvest													
Rainbow trout	49,690	19,725	38,516	26,228	25,344	17,791	16,878	17,841	10,576	9,866	10,910	14,590	23,246
Landlocked salmon	16,966	10,197	17,693	6,680	8,459	3,056	2,551	4,289	5,352	2,540	2,832	3,558	7,778
Arctic grayling	1,161	1,051	1,884	1,704	296	806	1,068	498	546	292	775.25	642	931
Arctic char	3,760	2,581	6,452	4,595	3,796	2,617	1,631	1,967	2,780	2,704	1,667	2,340	3,288
Lake trout	142	153	180	167	115	256	378	116	237	409	330	279	215
Other	361	39	244	0	192	0	43	0	0	0	19	9	88
Total stocked fish harvest	72,079	33,746	64,969	39,374	38,202	24,526	22,549	24,711	19,491	15,811	16,533	21,418	35,546
Total TRMA Harvest (stocked+wild)	89,118	49,197	86,796	58,055	57,918	43,196	35,248	40,717	30,949	30,689	31,783	36,160	52,188
Percent Stocked Waters Harvest	81%	69%	75%	68%	66%	57%	64%	61%	63%	52%	52%	59%	66%
Catch													
Rainbow trout	142,353	59,197	108,551	80,308	72,867	46,497	50,306	53,744	41,522	42,443	48,609	46,902	69,779
Landlocked salmon	49,871	24,121	47,084	19,880	23,797	11,972	7,352	13,450	9,593	8,795	7,276	10,232	21,592
Arctic grayling	13,611	8,483	15,692	16,465	10,338	11,212	10,028	5,095	11,312	10,583	6,655	9,646	11,282
Arctic char	9,119	6,764	14,244	12,470	13,127	7,417	9,476	6,968	6,130	5,678	4,714	7,134	9,139
Lake trout	663	835	1,213	987	1,020	1,169	1,814	362	548	1,433	1,188	1,065	1,004
Other	689	207	271	0	343	0	43	6	0	0	31	10	156
Total stocked fish catch	216,306	99,607	187,054	130,110	121,492	78,267	79,019	79,625	69,105	68,932	68,473	74,990	112,952
Total TRMA Catch (stocked+wild)	374,484	239,197	394,667	318,169	315,841	244,711	197,153	270,784	194,083	240,966	221,497	229,539	279,006
Percent Stocked Waters Catch	58%	42%	47%	41%	38%	32%	40%	29%	36%	29%	31%	33%	39%

Source: A. Behr, Stocked Waters Biologist, ADF&G, Fairbanks; personal communication; Catch and harvest data: *Source*: Howe et al. (2001a–d); Jennings et al. (2004, 2006a–b, 2009a-b, 2010a-b, 2011a-b); Walker et al. (2003).

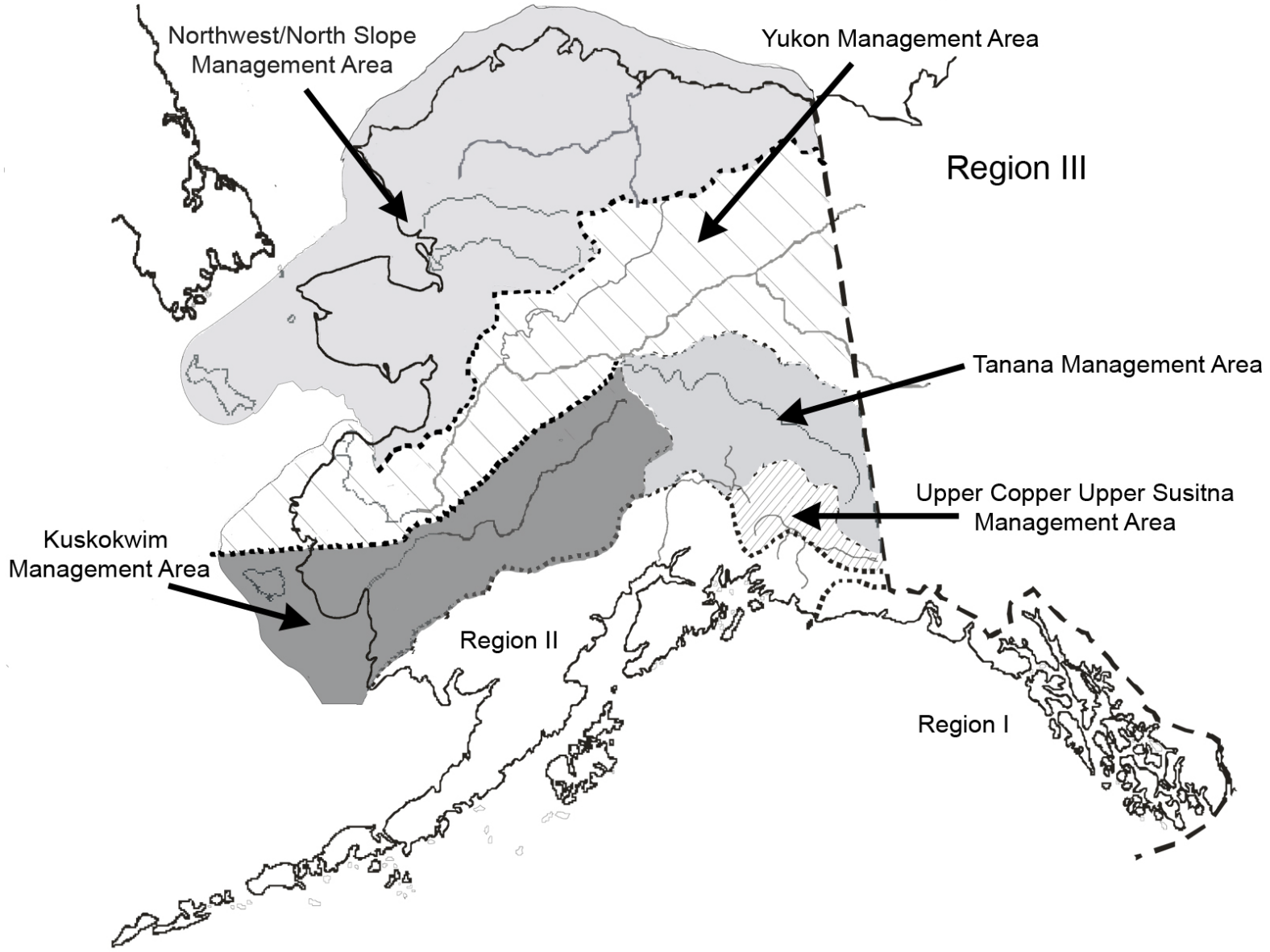

Figure 1.–Map of the sport fish regions in Alaska and the five Region III management areas.

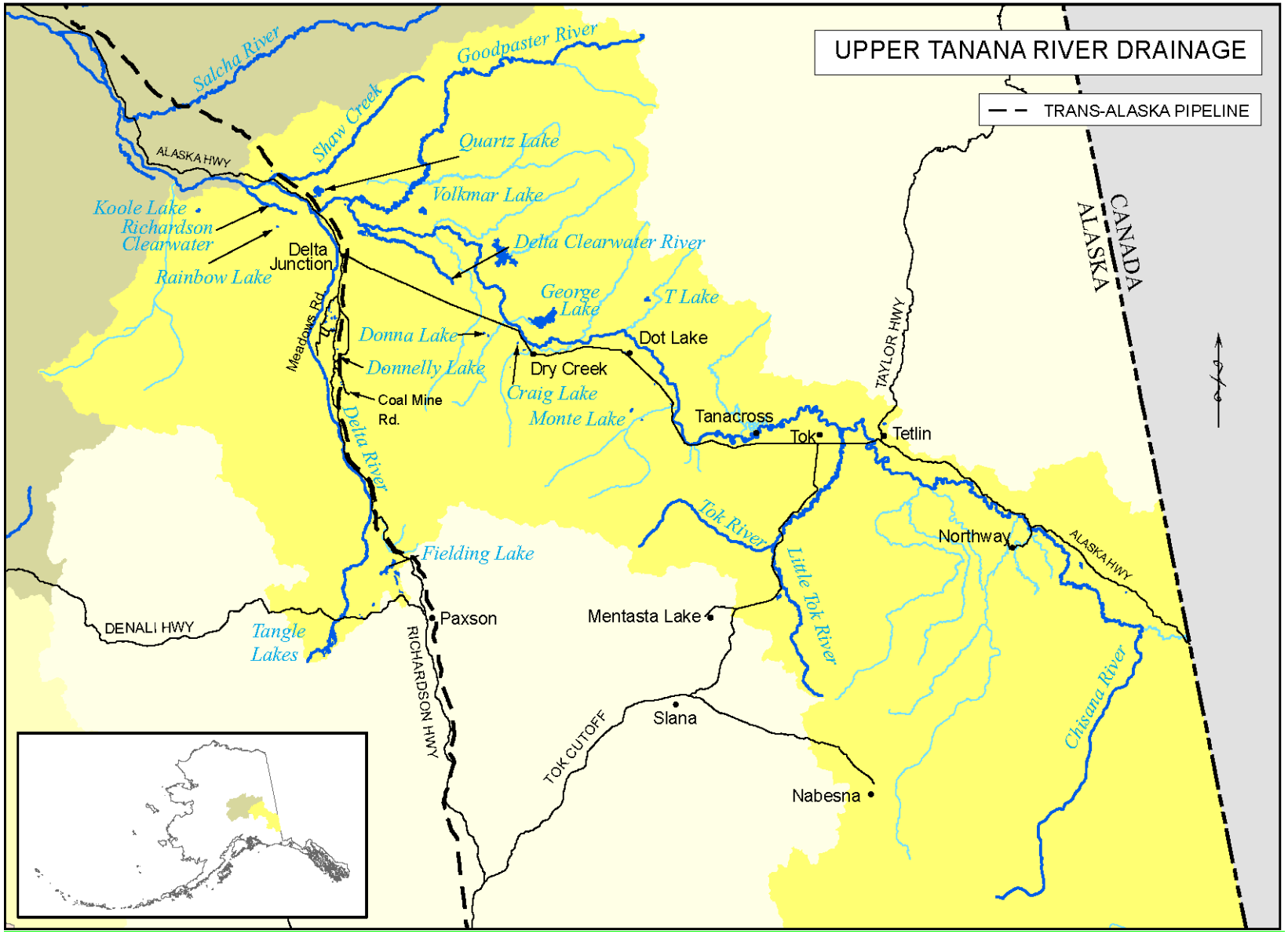

Figure 2.–Map of that portion of the Tanana River drainage located upriver from the Salcha River.

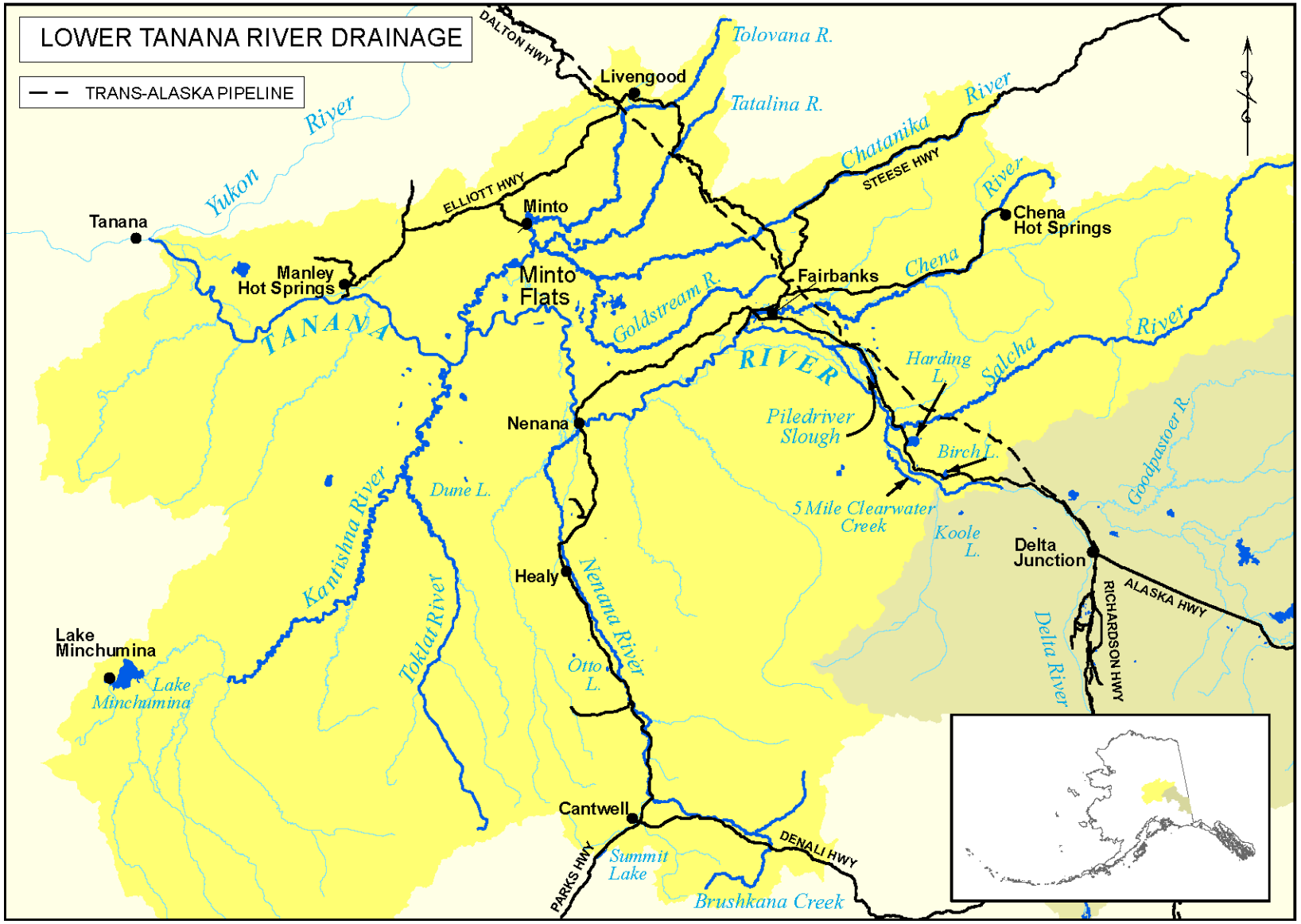

Figure 3.–Map of that portion of the Tanana River drainage located downriver from Shaw Creek.

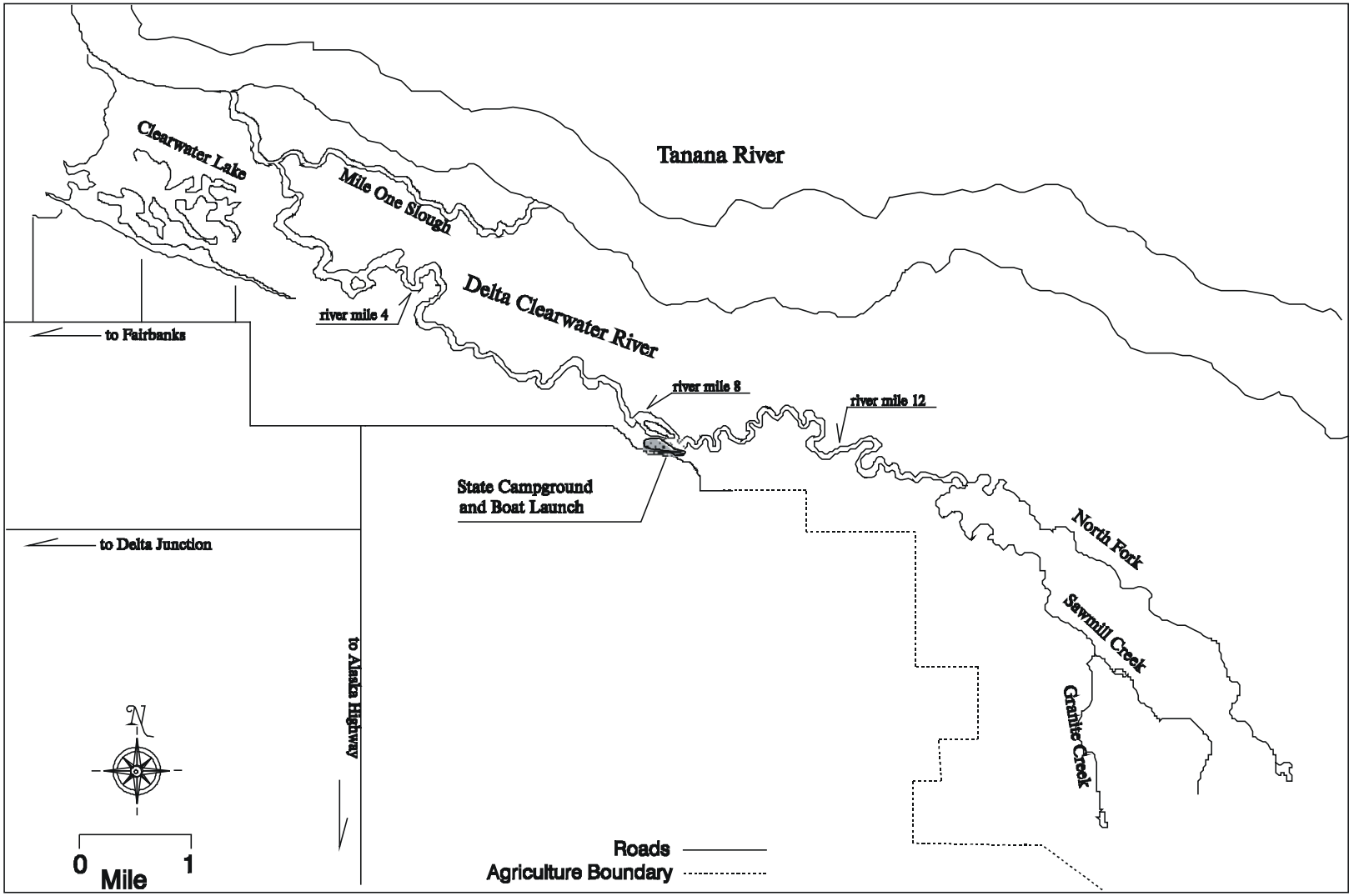

Figure 4.–Map of the Delta Clearwater River.

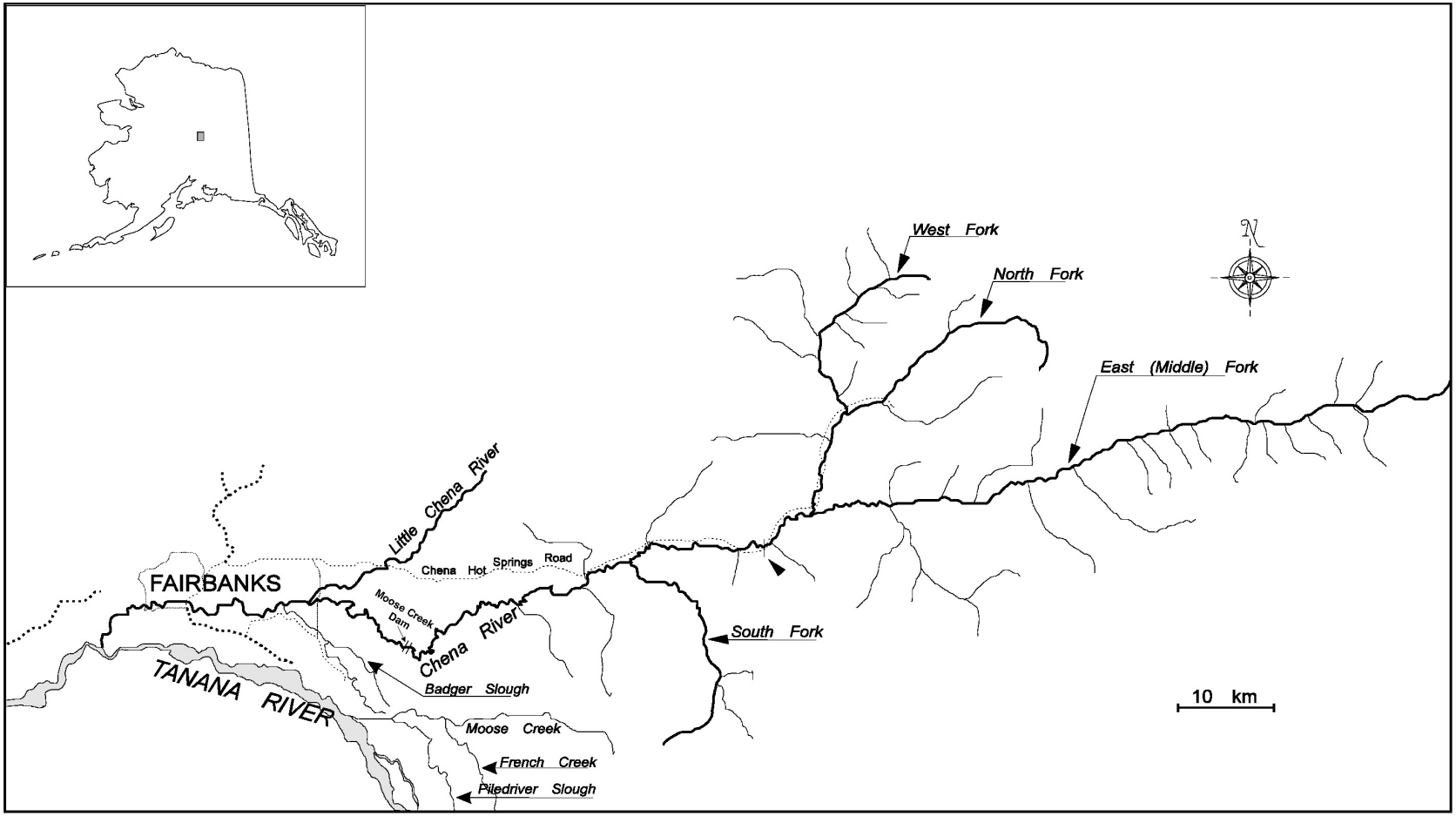

Figure 5.–The Chena River drainage.

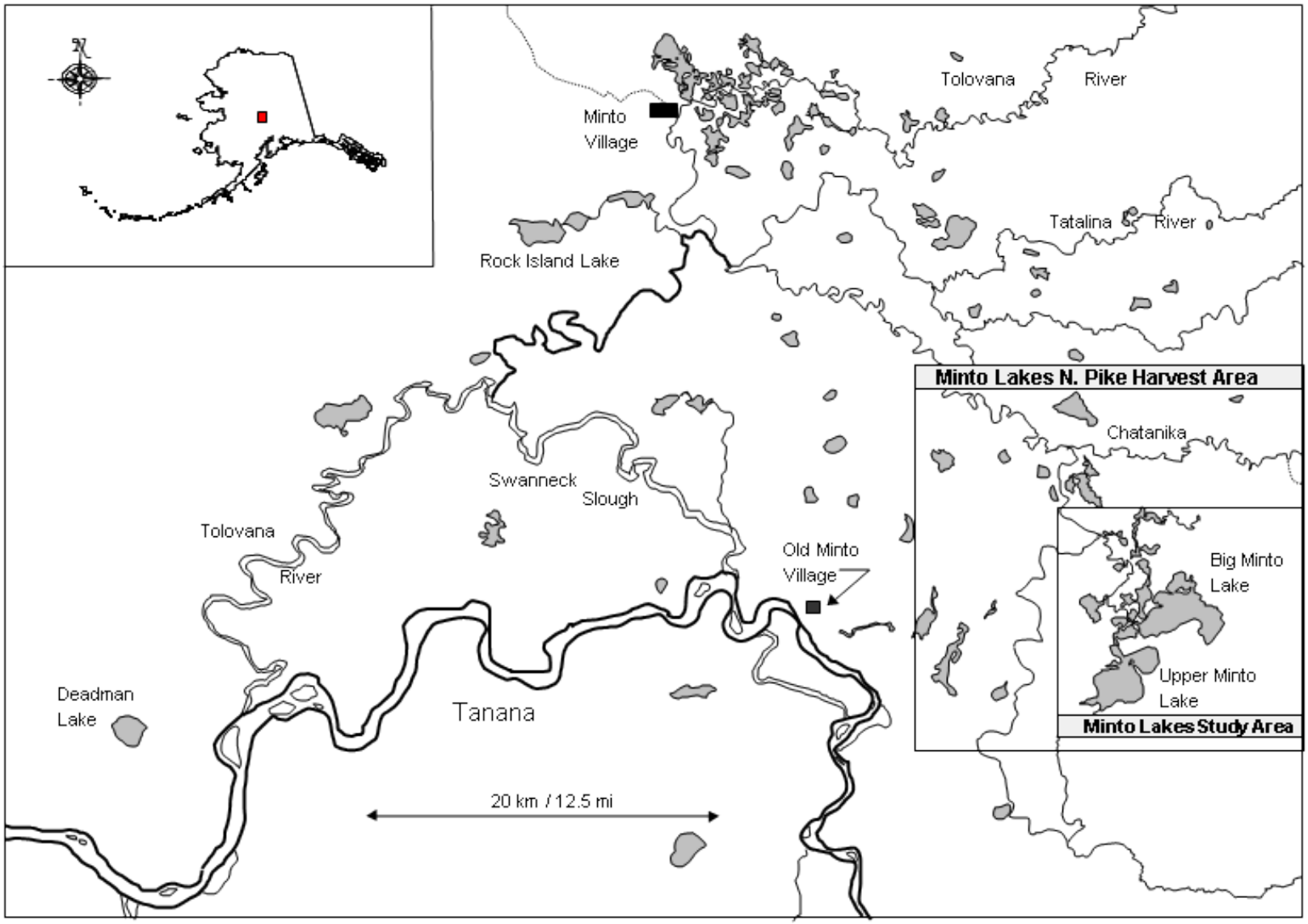

Figure 6.–Minto Flats wetland complex with demarcation of harvest reporting area and the northern pike population assessment area.

APPENDIX A

Appendix A1.–Emergency orders issued for Tanana River Management Area sport fisheries, 2006–2011.

Year	E. O. Number	Explanation
2006	3–KS–02–06	Increased the sport fish bag and possession limit for king salmon 20 inches or greater in length to two fish in all waters of the Salcha River open to salmon fishing and the Tanana River within a 1/2 mile radius of the mouth of the Salcha River, effective July 27, 2006.
2007	3–NP–01–07	Reduced the sport fish bag and possession limit for northern pike in all lakes and flowing waters of the Minto Flats area to two fish, only one of which may be 30 inches or greater in length, effective June 1–October 14, 2007.
2008	3–NP–01–08	Reduced the sport fish bag and possession limit for northern pike in all lakes and flowing waters of the Minto Flats area to two fish, only one of which may be 30 inches or greater in length, effective June 1–October 14, 2008.
2009	3-CS-02-09	Prohibited the retention of chum salmon in all waters of the Tanana River drainage effective 12:01 a.m. Friday, September 4, 2009.
2010	3-KS-04-10	Closed sport fishing for king salmon in all waters of the Chena River drainage and the Tanana River within a 1/2 mile radius of the mouth of the Chena River effective 12:01 a.m., Wednesday, July 28, 2010.
	3-CS-01-10	Prohibited the retention of chum salmon in all waters of the Tanana River drainage effective 12:01 a.m., Friday, August 20, 2010
2011	3-KS-05-11	Prohibited the retention of king salmon in all flowing waters of the Tanana River drainage effective 12:01 a.m. Saturday, July 23, 2011. The use of bait in all tributaries of the Tanana River drainage was also prohibited.

APPENDIX B

Appendix B1.–Estimates of effort (number of days fished) for select areas of the Tanana River drainage, 2000–2010.

	Year											5-yr Average	10-yr Average
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2005–2009	2000–2009
Total Chena	22,452	19,177	18,869	21,828	31,485	17,491	13,372	24,026	14,802	16,804	15,408	17,299	20,031
Upper Chena	10,250	6,831	6,243	7,374	11,320	8,773	4,257	9,507	5,688	6,017	8,007	6,848	7,626
Lower Chena[a]	12,202	12,346	12,626	14,454	20,165	8,718	9,115	14,519	9,114	10,787	7,401	10,451	12,405
Piledriver Slough	6,234	5,190	4,246	2,317	2,546	1,079	1,293	1,519	1,900	4,695	2,338	2,097	3,102
Total Chatanika	5,748	2,680	3,844	4,223	5,487	4,605	3,947	5,312	3,558	3,526	4,137	4,190	4,293
Upper Chatanika	2,836	1,372	1,907	1,834	2,917	2,711	2,520	2,352	1,966	1,897	2,438	2,289	2,231
Lower Chatanika[a]	2,912	1,308	1,937	2,389	2,570	1,894	1,427	2,960	1,592	1,629	1,699	1,900	2,062
Salcha River	4,862	5,471	5,954	5,032	4,859	4,851	4,866	5,656	3,394	6,124	6,567	4,978	5,107
Harding Lake[b]	2,519	1,038	2,094	2,246	2,675	1,118	1,913	749	1,504	1,068	2,336	1,270	1,692
Minto Flats	1,230	1,118	2,349	2,023	1,892	3,124	2,416	2,595	887	2,984	1,424	2,401	2,062
Nenana Drainage[c]	1,644	2,010	2,061	1,834	1,801	2,086	1,296	979	1,721	2,699	1,666	1,756	1,813
Delta Clearwater River	2,626	4,671	4,580	6,006	3,357	4,507	4,850	5,149	2,248	5,018	4,193	4,354	4,301
Tangle Lakes Drainage above Wildhorse Creek	5,303	4,004	4,994	5,820	3,737	4,299	3,600	5,463	3,443	4,065	7,050	4,174	4,473
George lake	734	1,128	700	716	377	1,939	601	705	526	1,645	1,256	1,083	907
Fielding Lake	827	525	826	840	1,010	1,248	1,065	1,139	1,203	788	1,548	1,089	947
Volkmar Lake	22	188	372	313	193	44	139	57	145	134	184	104	161
Quartz lake	11,047	8,327	9,795	7,169	7,852	5,696	6,281	5,522	4,860	6,905	8,214	5,853	7,345
Coal Mine Road Lakes	1,117	504	1,023	425	481	102	507	503	971	548	805	526	618
Goodpaster River	472	787	912	925	612	1,402	892	1,305	823	1,949	1,132	1,274	1,008
Other Tanana	54,948	34,317	45,843	38,217	48,122	39,807	32,639	40,277	30,350	33,545	38,601	35,324	39,807
Total Tanana	121,785	91,135	108,462	99,934	116,486	93,398	79,677	100,956	72,335	92,497	96,859	87,773	97,667

Source: Howe et al. (2001a–d); Jennings et al. (2004, 2006a–b, 2009a-b, 2010a-b, 2011a-b); Walker et al. (2003).

[a] Includes unspecified reaches.

[b] Harding Lake was closed to northern pike fishing in the summer of 2000.

[c] Includes Brushkana Creek.

APPENDIX C

Appendix C1.–Angler effort (days fished) and fish species kept and released in the Tanana River Area, as reported in the freshwater guide logbooks, 2006–2010.

Year	Angler Effort	King Salmon	Coho Salmon	Dolly Varden	Lake Trout	Rainbow Trout	Arctic Grayling	Northern Pike	Sheefish
Fish Kept (Harvested)									
2006	676	10	58	0	ND	1	68	ND	ND
2007	1,555	17	274	2	0	101	78	23	0
2008	1,156	10	153	4	0	68	12	20	0
2009	1,290	31	75	9	0	349	7	57	1
2010	1,101	6	95	1	0	10	43	124	0
Fish Released									
2006	676	13	144	38	ND	629	2,338	ND	ND
2007	1,555	29	169	0	0	961	3,167	160	0
2008	1,156	3	59	16	0	773	1,477	154	4
2009	1,290	28	133	8	2	148	5,353	135	5
2010	1,101	31	54	0	3	12	6,072	318	0

Source: Sigurdsson and Powers (2009-2011).