Fishery Management Report No. 18-33

Fishery Management Report for Recreational Fisheries in the Tanana River Management Area, 2017

by

Brandy Baker

December 2018

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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TABLE OF CONTENTS

Page

TABLE OF CONTENTS (Continued)

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

ABSTRACT

Season summaries for the sport fisheries and the whitefish personal use spear fishery in the Tanana River Management Area (TRMA) for 2017 and preliminary information for 2018 are presented.

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 about 570 river mi (912 km) to the Yukon River.

Much of the 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 caught species are Arctic grayling, stocked rainbow trout, northern pike, stocked salmon and Arctic char, coho salmon, lake trout, burbot, and king salmon.

Key words: Arctic grayling, burbot, Chatanika River, Chena River, Chinook, chum, coho, Delta Clearwater River, Fielding Lake, Harding Lake, Quartz Lake, king, 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

INTRODUCTION

This annual report provides background and the most recent (i.e., 2017) information on the management of recreational fisheries within the Tanana Management Area (TRMA). The report is provided for the Alaska Board of Fisheries (BOF), Fish and Game Advisory Committees (ACs), the general public, and other interested parties. Background information includes descriptions of the fisheries; the regulatory process; geographic, administrative and regulatory boundaries; funding sources; summaries of fisheries assessments; and management objectives with associated rationales. Current information includes: updated summaries of catch, effort, and harvest data; significant issues or developments for particular fisheries, regulatory actions, and future informational needs.

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.

The Division of Sport Fish is primarily funded by the state of Alaska and the Federal Aid in Fisheries Restoration program. ADF&G funds are collected 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. Secondary funding sources may include contracts with government agencies and the private sector.

This area management report provides information regarding the TRMA and its fisheries for 2017 with preliminary information from the 2018 season. This report is organized into 2 primary sections: a management area overview that includes a description of the TRMA and a summary of effort, harvest, and catch for the area; and a section summarizing significant fisheries by species and area.

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 the 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, and the 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; the greater Fairbanks North Star Borough population is about 100,000) is the largest community.

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

- 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/Delta Junction, 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 Advisory Committees (ACs), and special interest groups such as fishing associations and clubs. Members of the public provide their input concerning regulation changes and allocation through submitting 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 meetings allow opportunity for direct public interaction with ADF&G staff attending the meetings to answer questions and provide clarification of proposed regulatory changes regarding resource issues of local and statewide concern. The Boards Support Section within ADF&G's Division of Administrative Services provides administrative and logistical support for the BOF and ACs. During 2017, ADF&G had direct support responsibilities for 84 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 2016. At that meeting, major changes to the TRMA regulations included the following:

1. Set lines were prohibited for Jack and Grizzly lakes located in the Upper Nabesna River drainage.
2. The winter subsistence ice fishery within the Chatanika River was closed to pike fishing between the mouth of Goldstream Creek and a regulatory marker ~3 river miles upstream.
3. The listing of stocked waters was updated by the addition of Cushman Lake and the removal of Artillery, Cavalry, Horseshoe, Kenna, Kimberly, Luke, No Mercy, Rockhound, South Johnson, and Stryker lakes.
4. Established an annual household harvest limit of 10 whitefish for the Chatanika River spear fishery.

During the 2017 BOF meeting in Valdez, boundaries for the winter subsistence ice fishery within the Chatanika River was closed to pike fishing between the mouth of Goldstream Creek and a regulatory marker ~1 river mile upstream.

Further details of the regulation changes since 2016 may be found in the individual fisheries sections of this report.

For additional TRMA BOF actions from 1986 through 2013, see Arvey 1992; Arvey et al. 1990; Brase 2006, 2009b; Brase and Baker 2012a-b and 2014; Burr et al. 1998; Doxey 2000, 2007; Parker 2007, 2009a; and Parker and Viavant 2000.

ADF&G EMERGENCY ORDER AUTHORITY

ADF&G has emergency order (EO) authority (5 AAC 75.003) to modify time, area, and bag/possession limit regulations. EOs are implemented to address conservation issues for resident species. EOs are also used for inseason management of salmon 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 2013 through 2018 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 nonnavigable waters on public lands. Following the *State of Alaska v. 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 priority subsistence use by qualified rural residents in nonnavigable 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.

Development of regulations for subsistence fisheries under the federal subsistence program occurs within the established Federal Subsistence Board (FSB) process. The public provides 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 for which the federal government asserts management responsibility include those within and adjacent to the Delta River Wild and Scenic River Corridor; the Tangle Lakes Archaeological District; the headwaters of the Chisana and Nabesna rivers within the Wrangell-St. Elias National Park and Preserve and adjacent to the Tetlin National Wildlife Refuge; and within the boundaries of Denali National Park and Preserve. The TRMA fisheries fall under the purview of the Eastern Interior RAC (EIRAC).

REGION III DIVISION OF SPORT FISH 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, an area biologist for each of the 5 management areas, an assistant area management biologist for the Tanana drainage, and a stocked-water biologist. Area biologists evaluate fisheries and propose and implement management strategies through plans and regulations in order to meet divisional goals. A critical part of these positions is interaction with the BOF, ACs, and the general public. The stocked waters biologist plans and implements the regional stocking program for recreational fisheries. The regional management supervisor also supervises 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. This Statewide Harvest Survey (SWHS) is designed to provide estimates of effort, harvest, and catch on a site-specific basis. It is not designed to provide estimates of effort directed toward a single species. Species-specific catch-per-unit effort (CPUE) information can seldom be derived from the report. Questionnaires are mailed to a stratified random sample of households containing at least 1 individual with a valid fishing license (resident or nonresident). 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 available the following year; hence, the results for 2017 were not available until fall 2018. 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, all TMRA sites are grouped into "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) that 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, which 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 2009 (data since 2006) in a Fishery Data Series report (Sigurdsson and Powers 2009–2014, 2016, *in prep*).

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 that drains an area of approximately 45,918 square mi (73,898 km^2; Brabets et al. 1999; Figures 2 and 3). The glacial Tanana River is formed by the confluence of the Chisana and Nabesna rivers near Tok and the Alaska–Canada border, and flows toward the northwest for ~570 mi (970 km) to its terminus at the Yukon River.

Most of the 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 area's access to sport fisheries. The Fairbanks North Star Borough and part of the Denali Borough lie within the TRMA. Approximately 100,000 people live in this area, which encompasses the city of Fairbanks; Fort Wainwright Army Base; Eielson Air Force Base; and the communities of Nenana, North Pole, and Salcha (U.S. Census Bureau, 2010). Other communities and municipalities located within the TRMA include Anderson, Big Delta, Cantwell, Delta Junction, Dot Lake, Dry Creek, Ester, Fort Greely Army Base, Fox, Healy, Lake Minchumina, Livengood, Manley Hot Springs, Minto, Nabesna, Northway, Tanacross, Tetlin, Tok, Two Rivers, and Whitestone.

The TRMA offers various fishing opportunities ranging from lake trout *Salvelinus namaycush* in the high-elevation lakes along the Denali Highway to some of the highest-quality Arctic grayling *Thymallus arcticus* 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 which are commonly targeted by sport anglers. The common species include king and coho salmon, Arctic grayling, burbot *Lota*, lake trout, and northern pike *Esox lucius*. Chum salmon *O. keta*, Dolly Varden *S. malma*, sheefish (inconnu) *Stenodus leucichthys*, least cisco *Coregonus sardinella*, humpback whitefish *C. pidschian*, broad whitefish *C. nasus*, and round whitefish *Prosopium cylindraceum* are caught occasionally by sport anglers.

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

Rainbow trout *O. mykiss* are not native to the Tanana River drainage but have been stocked in many lakes and are sterile. Arctic char *S. alpinus*, coho salmon, and king salmon are also stocked in selected lakes. Arctic grayling, reared from eggs collected in the spring, Chinook salmon reared from eggs collected in the summer, and coho salmon reared from eggs collected in the fall are all stocked the following season.

ESTABLISHED MANAGEMENT PLANS AND POLICIES

The regulations governing fisheries in the TRMA in 2018 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). Specific management plans that affect TRMA sport fisheries include:

- *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

Salmon fisheries are often the most contentious fisheries in Alaska, and those within the TRMA are no exception. In terms of allocation, subsistence salmon fisheries have a regulatory priority over commercial, personal use, and sport fisheries in times of conservation concerns. This priority can lead to regional and/or user group conflicts when commercial fisheries occur in the lower Yukon River before subsistence users in the upper portion of the drainage have the opportunity to harvest any salmon in their fish wheels and nets. In recent years, the Division of Commercial Fisheries has issued emergency orders to reduce harvest of salmon (particularly king salmon) in the Yukon River drainage commercial and subsistence fisheries (JTC 2011–2018).

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 must acquire a Recreation Access Permit (RAP) for getting onto the military installations (Ft. Wainwright Army Base, and Eielson Air Force Base) and check-in, either online or by telephone, before entering an area to ensure training exercises are not occurring. Annually, some stocked lakes are closed to public access due to training exercises in portions of the Donnelly Training Area (DTA) near Delta Junction. These inconveniences may discourage casual anglers from fishing the stocked lakes in these areas. In 2017 and 2018, two military training exercises occurred that increased the number of closures to the DTA stocked lakes.

Invasive Species

In late fall 2010, large mats of an invasive aquatic plant *Elodea sp.* were identified in Chena (Badger) Slough (Amy Larsen, National Park Service Biologist, Fairbanks, 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 3 years. This plant has the potential to spread throughout the Chena River drainage and possibly further into the Tanana River drainage, which may degrade fish habitat by displacing native vegetation. In 2013, the United States Fish and Wildlife Service (USFWS) assisted with a pilot program to determine the feasibility of using a suction dredge to remove *Elodea* from Chena (Badger) Slough. Preliminary results indicate that although it is possible to remove the plants with the dredge, it is a slow and laborious process (Mitch Osborne, USFWS biologist, Fairbanks, personal communication). In 2015, *Elodea* was documented in Totchaket Slough (downriver from the Chena River terminus) and it has spread extensively throughout Chena Lakes.

The Fairbanks Soil and Water Conservation District is coordinating the substantial multi-agency effort working towards the eradication of *Elodea* in the Tanana Drainage. Efforts include public outreach, surveys, permitting (e.g., completion of environmental impact statements), monitoring, grant/funding proposals, and eradication. Public outreach has included educating pilots, signage at boat launches, and community meetings with residents concerned with the proposed chemical application of Floridone. Funding remains a significant challenge and the USFWS has been a major contributor. Survey areas have been expanded to include float ponds and remote lakes accessed by float planes, such as Dune Lake. Mechanical removal of *Elodea* was conducted in the Chena River at several locations using divers in 2016. In 2017, Floridone™ was systematically applied to Badger Slough, and in 2018 the slough was reassessed, and no *Elodea* was observed. In 2018, Tochaket Slough and Chena Lakes were treated with Floridone™. The potential of *Elodea* to negatively impact fisheries habitat is significant, even in stocked lakes. For example, the decomposition of all aquatic plants during winter 2018-2019 after treatment in Chena Lakes could kill all fish and eliminate this popular winter fishery for one season. *Elodea* was discovered in Chena Lake, Birch Lake and Bathing Beauty Pond during the 2018 open water season. A treatment schedule for new water bodies will be developed through the winter and continued eradication and identification efforts will be ongoing pending funding and permits.

In contrast with a true invasive species (*Elodea*), department staff often encounter members of the public who believe that northern pike are an invasive species in the Tanana drainage. Northern pike are invasive in Cook Inlet freshwaters (Kenai and Susitna River drainages, Anchorage Bowl lakes), but they are native to the Yukon, Kuskokwim, and Tanana River drainages.

ACCESS PROGRAMS

The Wallop-Breaux Amendment to the Sport Fish Restoration Act (Dingell-Johnson or D–J) mandates that at least 15% of the federal funds collected from taxes on boat gas and sport fishing equipment be used by the states for 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, restrooms, and parking areas.

During 2017–2018, these funds were used to complete construction of a public-use cabin on Little Donna Lake, completion of the Tanana River boat launch and kiosk at Big Delta, completion of a new boat launch at Birch Lake, maintenance of boat launches in Nenana and Manley Hot Springs, construction of an ice-house for state parks, installation of a bridge on the Donna to Little Donna lake trail, trail hardening of the Donna and Lisa Lake trails, replacement of trail and fishing signs, general maintenance of boat launches and cabins, and installation of a floating dock at the Tanana Lakes recreation area.

INFORMATION AND EDUCATION

Information regarding regulations, publications, stocking and fishing reports, news releases, and EOs for the TRMA can be found from the *Fishing* and *Sport* links at the ADF&G website (http://www.adfg.alaska.gov/index.cfm?adfg=fishingSport.main). Links on this website (e.g. *Fishing Information*, *Sport Fishing Brochures*, and *Interior*) can be used by anglers to learn about fisheries and download relevant 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 3 regional information and education (I&E) staff located in the Fairbanks office. An Information Officer II, Education Associate II, and a seasonal Fishery Technician 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, and the regional webpage; and coordinate the Fairbanks Outdoor Show booth, Kid's Fish and Game Fun Day, and the Becoming an Outdoors Woman (BOW) program.

An Education Associate II provides several essential services for Region III. Primary services include 1) working with regional schools providing hands-on curriculum in sport fishing, fish anatomy, fish biology, and aquatic education, via the *Salmon in the Classroom* program; 2) developing and producing web-based content, especially in the form of "how-to" sport fishing videos, which highlight fisheries, angling techniques, hatchery function, and services; 3) instructing fishing classes and holding fishing events for the *Becoming an Outdoors-Woman* program, UAF Outdoor Adventures, Fairbanks North Star Borough school district, public fishing events at area lakes, and other organizations as requested; 4) assisting in the execution of *Kids fishing is Fun Day*; and 5) coordinating Region III's social media presence through Facebook, which is used to inform the public on an array of topics including regulation changes, lake stocking announcements, and other pertinent sport fishing news.

SPORT FISHING EFFORT, HARVEST, AND CATCH

Effort, harvest, and catch statistics for TRMA sport fisheries have been estimated from responses to the SWHS since 1977 and reported under the headings of the "Tanana River drainages" (Area U)[1]. Estimates of angling effort in the TRMA averaged approximately 79,700 angler-days during the 5 years, prior to 2017 (2012–2016; Table 1). Recent 5- and 10-year averages are presented to help identify a potential change or trend for the current reporting year (2017).

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. Overland transportation to off-road waters include hiking, ORVs, snowmachines, or dog teams. Access to the many remote sites requires light aircraft equipped with tundra tires, floats, or skis.

Opportunities for sport angling are available year-round in the TRMA. During 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. In the TRMA, stocked lakes (40%) and the Chena River (17%) received the highest percentage of effort from 2012–2016 (Table 1). The most popular fish species caught and harvested in the TRMA were stocked species, Arctic grayling, northern pike, and burbot (Table 2). On average from 2012–2016, Arctic grayling were most commonly caught species and rainbow trout were the most commonly harvested.

Information regarding the guided sport fishery for 2017 has not been updated and therefore is not reported in this report. In 2016, however, most of the guided fishing effort took place on Chena Lakes due to the rise in winter tourism in Fairbanks. The guide logbook data reported in Appendix B have been combined for the entire Tanana River drainage because there are too few guides to separate out the fish released and fish harvested numbers by individual fishery (department confidentiality policy). Note that the SWHS reports catch, which includes both harvested and released totals, and harvest; while the guide logbook reports both fish released and fish kept. Catch and harvest from guided anglers is included in the SWHS estimates.

SECTION II: FISHERIES

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

KING AND CHUM SALMON

Chena River

Background and Historical Perspective

The Chena River flows through the city of Fairbanks near its confluence with the Tanana River (Figure 4). It is approximately 160 miles long, and in the summer of 1967 it caused severe flooding in downtown Fairbanks. The flood was the impetus to begin construction in 1973 of the Moose

[1] Alaska Sport Fishing Survey database [Internet]. 1996– . Anchorage, AK: Alaska Department of Fish and Game, Division of Sport Fish (cited October 30, 2018). Available from: http://www.adfg.alaska.gov/sf/sportfishingsurvey/

Creek Dam at river mi 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 recent average annual returns of over 5,400 fish from 2013 to 2017 (Table 3). Adult king salmon enter the Yukon River during or shortly after breakup and migrate up the Tanana River to enter the Chena River (920 mi from the Bering Sea) starting late June. 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 Moose Creek Dam). The run ends in early August.

Chum salmon are primarily available in July and August and are targeted or caught incidentally while fishing for king salmon. Although chum salmon are generally more abundant than king salmon and are subject to a more liberal bag and possession limit (3 fish per day vs 1 fish per day for king salmon), average harvest and catch is about half that of king salmon (Tables 4 and 5). The poor quality of chum salmon flesh for human consumption by the time the fish reach the Chena River is likely a contributing factor. Adult coho salmon have not been documented in the Chena River drainage; however, juveniles were reportedly captured during a University of Alaska study (Brian Walker, personal communication).

Chena River king salmon escapements have been annually assessed since 1986 using either mark-recapture experiments or a counting tower located above the Moose Creek Dam (Table 3; Barton 1987, 1988; Barton and Conrad 1989; Skaugstad 1990b, 1994; Evenson 1991a, 1992–1993, 1995, 1996; Evenson and Stuby 1997; Stuby and Evenson 1998; Stuby 1999–2001; Doxey 2004; Doxey et al. 2005; Brase and Doxey 2006; Brase 2012). More recently, sonar technology has been used to try to improve counts during turbid and high water conditions (Savereide 2012a-b, Stuby and Tyres 2016). Counting conditions at the dam can be highly variable depending on water level and turbidity. The numbers of chum salmon that return in conjunction with the king salmon are determined, but once the king salmon run ends, the counting tower ceases to operate. The chum salmon escapement estimates are considered a minimum and not discussed since the chum salmon migration continues into September. In 2005 and 2011, the Chena River was extremely high and turbid throughout most of the king salmon run; therefore, escapement was not estimated. In 2014 and 2016, the Chena River was high and turbid throughout much of the king salmon run; however, an abundance estimate was produced by using a Dual Frequency Identification Sonar (DIDSON). In 2017 and 2018, sonar was almost exclusively used to enumerate the entire run and a precise estimate of escapement was produced because of advancements in modeling species apportionment, improved sonar technology, and experience in operating the sonar.

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. A guideline annual sport harvest objective of 300–600 king salmon in the Chena River was adopted by the BOF in 1990. An aerial survey escapement index of 1,700 fish was set by Division of Commercial Fisheries in 1992. In 1993, Division of Sport Fish staff expanded this aerial survey escapement index into an actual escapement goal of 6,300 fish, as measured at the counting tower. This point objective was calculated based on averages of available escapement data. 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, the department formed an escapement goal (EG) committee to evaluate and calculate EGs for the Chena and Salcha river king salmon and for some Yukon River drainage chum salmon stocks. The EG process is designed to set escapement ranges that maximize potential yield and is periodically updated as more data is collected, and modelling efforts evolve. The current biological escapement goal (BEG) range is 2,800–5,700 king salmon. There is no escapement goal for chum salmon in the Chena River.

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 1 fish 20 in (~510 mm) or longer. The river is 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 salmon 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 because it provides one of the few opportunities to catch large fish near Fairbanks. Most sport anglers release their catch because the salmon flesh has deteriorated significantly by the time the fish have traveled the 1,000 or more miles from the Bering Sea (Tables 4 and 5).

Recent Fishery Performance

In 2018, indices of run strength from the Lower Yukon River were moderate and fishing was permitted in the Tanana with an annual bag limit of 1 king salmon 20 in (~510 mm) or greater; however, the use of bait in all tributaries was prohibited from July 2 to August 15 (i.e., to the end of the king run). In 2017, the return of king salmon to the Yukon River was above average (JTC 2017) and no sport fishing restrictions were implemented.

Estimated annual harvests of king salmon between 1983 and 1992 ranged from 0 to 375 fish, and then increased 1,280 in the mid-1990s (Brase 2009*b*). In 2017, 18 king salmon were harvested on the Chena River, while the 5-year average (2012–2016) harvest was 8 fish (Table 4). Low returns since 2013 have placed restrictions on the king fishery in the Chena that are reflected in the decreased harvest trend (Appendix A1). In 2017, the catch was 57 fish and the 5-year average was 70 fish (Table 5).

Chum salmon harvests and catches in the Chena River have been low and sustainable (Tables 4 and 5), and current trends are anticipated to continue.

Fishery Objectives and Management

In 2001, the BOF adopted policy to manage salmon harvests so that escapements fall within the BEG ranges set by ADF&G. The BEGs are evaluated on a 3-year cycle in synchrony with the BOF meeting cycle for the AYK Region.

Commercial and subsistence salmon harvests occur along almost the entire length of the mainstem Yukon and Tanana rivers (JTC 2011). In 2001, the BOF adopted the *Chena and Salcha River King Salmon Sport Harvest Management Plan* (5 AAC 74.060) that mandated all the Tanana River fisheries (commercial, subsistence, personal use, and sport) for king salmon 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. To attain this BEG, restrictions may be placed on any or all Tanana River fisheries.

Restrictions to the king salmon sport fishery are often dictated by run strength measured by assessment projects in the Lower Yukon River (Pilot Station sonar and test net projects) and restrictions to subsistence fishers. A poor run and concurrent subsistence restrictions often result in restrictions to the Chena River sport fishery prior to drainage specific information measured by the department's tower and sonar operations at the Moose Creek Dam. For example, the sport fishery was closed preemptively all season in 2014 and 2015 because of low counts at the Lower Yukon River assessment projects, despite returns that ultimately exceeded the BEG within the Chena River (Table 3). If preemptive restrictions are not in place, the Chena River sonar/tower operations are used to manage the sport fishery. Counts are monitored daily and research staff are consulted to gauge run timing and strength. To meet the BEG, restrictions (e.g., gear and bag limits) are implemented to appropriately reduce harvest, or more aggressive measure may be taken (e.g., increased bag limits) to provide increased fishing opportunity. Consultations with research and senior staff, and with partnering agencies (e.g., Division of Commercial Fisheries) are made prior to regulatory changes.

Current Issues and Fishery Outlook

Sport fishing opportunities for king salmon in the Tanana River drainage will continue to be closely linked to Yukon River drainage run strength and management of subsistence fisheries. Evidence of improving run strength in the Yukon River to near average levels, coupled with good recent escapements in the Chena River since 2014, will help to prevent restrictions to sport fishing for king salmon in the Tanana River drainage.

Recent Board of Fisheries Actions

The BOF has taken no actions 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

The enumeration project at the Moose Creek Dam has evolved and currently entails a counting tower paired with an ARIS sonar positioned on each bank. This dual system combined with the refined mixture model to better apportion king and chum salmon (Stuby and Tyers 2016) is highly accurate and robust to the dynamic counting conditions and high water that occurs in the Chena River. For example, sonar was used exclusively for calculating the last 4 estimates of escapement (2014–2017). This approach should continue.

Salcha River

Background and Historical Perspective

The Salcha River is located approximately 40 miles east of Fairbanks via the Richardson Highway. It is a tannic, groundwater-fed system approximately 120 miles long, originating from 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 annual returns that average larger than those from the Chena River (Table 3). Run timing is essentially the same as the Chena River stock. In the Salcha River, chum salmon are caught incidentally to king salmon and coho salmon are not present.

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; Skaugstad 1988–1990a, 1992–1994; Burkholder 1991; Evenson 1995, 1996; Evenson and Stuby 1997; Stuby and Evenson 1998; Stuby 1999–2001; Doxey 2004; Doxey et al. 2005; Brase and Doxey 2006; Brase 2012; Savereide 2012a-b, 2014, Stuby and Tyers 2016). In 2014, the Salcha River counting tower was contracted out to Bering Sea Fishermen's Association (BSFA) for operation, with funding from the U.S./Canada Yukon River Pacific Salmon Treaty. BSFA closely followed the project design and methodology established by the Division of Sport Fish who operated the tower from 1993 to 1998. King and chum salmon counts were reported daily to the Division of Commercial Fisheries. In 2016, Division of Sport Fish reassumed responsibility of operating the counting tower and integrated sonar to ensure enumeration during periods of high water. Beginning in 2016 Adaptive Resolution Imaging Sonar (ARIS) was used in addition to the counting tower. The ARIS operates similarly to the DIDSON sonar that is used on the Chena River; however, the ARIS has a larger detection zone, which is needed for the wider Salcha River.

There has been a 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. 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 3 mi (4.8 km) upriver from the Richardson Highway Bridge (5 mi or 8 km upstream from the confluence of the Salcha and Tanana rivers). All spawning occurs upstream of the marker.

Until 1989, the Salcha River king salmon sport fishery had greater harvests than were seen on the Chena River. Estimated annual harvests between 1983 and 1992 ranged from 47 to 871 fish (Brase 2009*b*). Subsequently, harvest and catch did not increase as dramatically in the Salcha River as in the Chena River, but average harvest continues to be slightly higher on the Salcha River (Table 4), even with a much smaller portion of the river open to salmon fishing.

The bag and possession limits for king salmon in the Tanana River drainage have remained unchanged since the early 1960s, at 1 fish 20 in (~510 mm) or longer.

Recent Fishery Performance

In 2014 and 2015, the entire Tanana River drainage was preemptively closed to sport fishing for king salmon based on low preseason forecasts, downriver restrictions, and run strength indices – these closures remained in place for the entire season.

In 2017, early indices of run strength projected an average-sized run and downriver subsistence fisheries were open, but with restrictions to fishing time and net size to ensure escapements. The tributaries of the Tanana were not preemptively closed to sport fishing but were restricted by prohibiting the use of bait from July 2 to Aug 10. Only 20 fish were harvested from the Salcha River, and catches returned to levels observed prior to 2012 (Tables 4 and 5).

In 2018, the escapement of king salmon to the Yukon River was below average and the use of bait was prohibited in all tributaries of the Tanana through August 15.

Fishery Objectives and Management

The current BEG for Salcha River king salmon (3,300–6,500 fish) was established in 2001. Unlike the Chena River, the Salcha River king salmon BEG range has been met or exceeded every year since 1990, although there was no escapement count in 2014 due to high water that precluded the operation of the counting tower. In 2017, high water precluded visual counts for most of the run. Sonars (ARIS and DIDSON) were operated in 2017 for the first time and difficulties arose with

high water and their ability to reliably cover the entire river channel. Because it was believed that a significant portion of the run passed undetected, the estimate (2,675) produced is considered a minimum, but still does not indicate that the BEG was not achieved. In 2018, tower counts were used in addition to the sonars and an accurate estimate of king salmon (4,053) was attained (Table 3).

Inseason management of king salmon in the Salcha River is conducted identical to the Chena River to ensure the BEG is met.

Current Issues and Fishery Outlook

Typically, more king salmon are caught and harvested from the Salcha River than from the Chena River, likely due to better water clarity and larger run size. In recent years king salmon escapement has been made on the Salcha River, while the Chena River has not. This has occasionally resulted in differing regulations between the two systems (e.g., Salcha River open to king salmon sport fishing, while the Chena River is closed), which can be confusing to anglers.

Recent Board of Fisheries Actions

There have been no actions taken by the BOF with regards to 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

In 2016, the Division of Sport Fish took over operation of the Salcha River escapement monitoring project, which was previously operated by BSFA. In 2016, funds for the operation were provided by US/Canada Yukon River restoration and enhancement funds (R&E). During 2017–2019, the Alaska Sustainable Salmon Fund (AKSSF) will provide funding. Sport Fish Division will continue to conduct visual counts and work to refine its new sonar operations. Paired sonar and tower counts are recommended to improve the accuracy and reliability of the mixture model parameter outputs during periods of poor visibility.

COHO SALMON

Delta Clearwater River

Background and Historical Perspective

Coho salmon spawn in small spring-fed tributaries on the south side of the Tanana River drainage, and in the mainstem Tanana River. These waters, particularly near Delta Junction, provide critical habitat for the largest known aggregations of coho salmon in the Yukon River drainage. Because these spring-fed tributaries do not freeze and coho salmon spawn into the late fall, these fish provide the last open-water fishing opportunities for salmon 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 5).

The DCR supports the largest documented spawning stock of coho salmon in the Yukon River, with escapements averaging over 9,289 fish/year during 2013–2017 (Table 6). The DCR is about 20 mi (32 km) in length, is road accessible, and supports the largest recreational fishery for coho salmon in the Tanana River drainage. From 2012 to 2016, an average of 235 coho salmon were harvested and 3,914 fish were caught annually in the DCR (Tables 4 and 5). In 2017, the harvest of 236 fish was on par with the 5-year average (Table 4).

Annual escapement index counts of coho salmon have been conducted by boat survey since 1972. Escapement counts are conducted in an index section (the navigable portion of the river from the confluence with the Tanana River upstream approximately 18 river mi (29 km)) from an elevated platform on a riverboat during the peak of the coho salmon spawning period (generally late October or early November). The index section encompasses most of the spawning area of the run (>95%) and extends 18 river mi (29 km) upstream from its confluence with the Tanana River.

Coho salmon are the last of the salmon species to enter the Yukon River and are often in the DCR starting in mid-September. The peak of the run is in late October. Property owners living near the river have reported coho salmon spawning as late as January. The springwater provides favorable overwintering habitat for juvenile coho salmon. Carcass sampling from 1984 to 1990 indicated that, on average, 14% of returning coho salmon were 3 years old, 79% were 4 years old, and the remaining 7% were 5 years old (Parker 1991). In this study, the majority of the coho salmon fingerlings in the DCR reared for 3 winters (including 1 winter rearing in river gravel), then smolt and spent 1 winter in the ocean before returning (Parker 1991).

Recent Fishery Performance

Coho salmon in the DCR attract both local and nonlocal anglers who want the opportunity to catch a salmon late into the fall/early winter. Anglers can fish from shore or from boats that can be launched at the state park campground or at a boat launch at river mi 8.5 (~13.5 km) off of Remmington Road. Coho salmon are caught from mid-September through October using various spoons, large spinners, or flies.

The coho salmon fishery on the DCR has grown in popularity since 1984 (Parker 2009*b*). The majority of coho salmon caught are released (Tables 4 and 5) likely because 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 2017, the catch of 2,844 coho salmon was below the 5-year average of 3,914 fish (Table 5).

Fisheries Objectives and Management

The DCR is the only river in the entire Yukon Drainage for which there is a coho salmon escapement goal. The sustainable escapement goal (SEG) for coho salmon (5,200–17,000 fish) for the DCR was adopted by the BOF in 2004, which replaced the previous minimum threshold of 9,000 fish. The goal continues to be based on a visual survey conducted from a boat 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 mi (29 km). In 2018, the escapement goal was not met with a count of 2,884 coho salmon (Table 6).

ADF&G monitors DCR coho salmon escapement between mid-September and early October to determine whether any inseason management action is necessary. Management objectives state that if 2,500 fish are found in the lower 8 mi (13 km) of river between September 15 and October 1, it is likely that the escapement goal will be achieved and no management actions to restrict harvest will be taken. If less than 1,500 fish are counted during the same time period, the sport fishery may be closed by EO after consideration of other run strength indices such as run timing and Lower Tanana commercial fish catches. The background daily bag and possession is three salmon in combination other than king (i.e., chum and coho). Yukon River sonar counts and catch rates from fish wheels in the Tanana River are used as preliminary indices of DCR coho salmon

run strength. In general, these indices are poor predictors and if the return to the DCR appears marginal, then early season boat surveys in the DCR are relied on more heavily.

Current Issues and Fishery Outlook

Coho salmon returns to the DCR have varied considerably with escapements ranging between 4,285 and 19,553 since 2007 (Table 6). This level of variability is expected to continue and the probability of any restrictions to the fishery in a given year will remain small. The initial count conducted on October 5 was 1,788 coho salmon in the lower 8 mi (13 km), which didn't trigger an EO due to the run timing being later than average for 2018 and index projects in the lower Yukon predicting an above average run. In 2014, coho escapement was not met and harvest was not restricted due to a similar initial count and run timing and size predictions from index projects in the Lower Yukon.

Recent Board of Fisheries Actions

The last BOF action germane to the DCR coho salmon sport fishery was in 1998, when a bag and possession limit of 3 fish for coho and chum salmon, in combination, was established for the entire Tanana River drainage.

Current or Recommended Research and Management Activities

The preliminary survey in the lower river (8 mi or 13 km) during mid-September, and the entire 18-mi (29 km) survey area during peak spawning will continue to be conducted annually. The early survey is important for predicting potential run strength and the peak surveys are needed to assess the run to determine if the SEG of 5,200–17,000 coho salmon will be met.

KING, COHO, AND CHUM SALMON

Other TRMA Fisheries

Background and Historical Perspective

Several other river drainages in the TRMA support spawning populations of salmon; these include the Chatanika (king and chum salmon), tributary streams of the Nenana (king, chum, and coho salmon), and 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 Richardson Clearwater River, Providence Creek, and Blue Creek.

The Nenana River drainage is believed to support the second largest coho salmon spawning population in the Tanana River drainage after the DCR and has been surveyed regularly by boat and aerial survey since 1993 (Table 6).

The Chatanika River king salmon population was assessed periodically 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 annual high-water events that resulted in poor viewing conditions and low-quality estimates in most years.

Teck-Pogo Inc. (now owned by Northern Star), a gold mining corporation working a large ore body within the Goodpaster River drainage, conducted aerial surveys for king salmon from 1998 to 2003 as part of environmental assessment studies. In 2004, Teck-Pogo Inc. contracted BSFA to monitor the Goodpaster River king salmon escapement for 20 years. BSFA has operated a counting tower on the North Fork of the Goodpaster River annually.

Fishery Objectives and Management

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

When an EO is implemented that restricts fishing regulations for king salmon, it typically covers all king salmon fisheries in the Tanana drainage. However, exceptions may apply for the Chena and Salcha River where there are reliable in-season metrics of run strength (i.e., counting towers and sonars) as well as a management plan in regulation. For example, harvests may be permitted in the Salcha River, whereas the Chena River and the remaining portions of the Tanana Drainage are restricted to catch-and-release.

In 2018, early indices of run strength for king salmon projected an average-sized run and down river subsistence fisheries were permitted but restricted to time and mesh to help ensure that escapement goals were met. Sport fishing regulations for the tributaries of the Tanana River were subsequently restricted by prohibiting the use of bait from July 2 to Aug 15.

Current Issues and Fishery Outlook

There are no significant fisheries issues and management of these tertiary systems will continue to be managed in accordance to the run strength of the runs into the Yukon River and Tanana River tributaries.

Recent Board of Fisheries Actions

There have been no BOF actions taken on other TRMA salmon producing tributaries since 2010 when the Board adopted a proposal that relocated the regulatory boundary marker in the Chatanika River and closed the Tok River drainage to sport fishing for salmon to provide protection for a developing stock.

Current or Recommended Research and Management Activities

The only other current research project related to salmon within the Tanana River Drainage are the annual aerial or foot surveys of coho salmon performed by Division of Commercial Fish in select tributaries such as the Richardson Clearwater or Julius Creek (Table 6). These counts can be highly variable due to production or survey conditions. The counts for 2018 were delayed due to the late season, unusually mild fall weather, and subsequent late run timing of coho salmon. Consequently, survey data were not available (Table 6).

ARCTIC GRAYLING

Chena River

Background and Historical Perspective

Due to its ease of access and high proportion of large fish, the Chena River Arctic grayling population offers high-quality opportunities to anglers. There is road access for nearly the entire length of the river from its outlet to mi 57 (91 km) of Chena Hot Springs Road. It flows through Fairbanks, North Pole, Eielson Air Force Base, Fort Wainwright Army Base, the Chena River State Recreation Area, and affords anglers several options for access. The Chena River State Recreation Area, in particular, is a popular boating, camping, and fishing destination for residents and nonresident visitors traveling along the road system.

The Chena River Arctic grayling fishery has been popular since before statehood, and has increased in popularity as Fairbanks and the surrounding area have been developed and access has improved. The fishery occurs almost entirely during open-water from April through October. Anglers target Arctic grayling throughout the road- and boat-accessible sections of the river and its tributaries, and some anglers fly in to the headwaters to begin float trips for fishing. Badger Slough (historically referred to as Chena Slough) is a particularly important tributary because it provides significant spawning and rearing habitat, as well as easily accessible fishing locations.

From the late-1970s through the mid-1980s, the Chena River supported 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, with most of this effort thought to be targeting Arctic grayling (Brase 2009*c*). Between 1986 and 1987, estimates of abundance declined (Table 7; Clark and Ridder 1987a, 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/yr; Brase 2009*c*) compared to the 1985–1986 average harvest (7,051 fish/yr; Brase 2009*c*) suggested a decline in the Arctic grayling population. Therefore, in 1988 the daily bag and possession 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 prohibited.

Although harvest decreased for 2 years after the imposition of these restrictions, and abundance estimates increased after 1989, both harvest and effort increased substantially in 1989 (Brase 2009*c*), prompting the lowering of the bag limit from 5 per day to 2 per day. This additional restriction was not sufficient to reduce harvest, and in 1991 the fishery was restricted by EO to catch-and-release only (Brase 2009c). The BOF made this a permanent regulatory change in 1994. After this change, catches declined and have remained relatively stable at about 1,500 fish/yr in recent years (Table 8).

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

The Chena River Arctic grayling population assessments were conducted using mark-recapture experiments from 1991 to 1998, and then again in 2005 (Table 7; Clark et al. 1991; Clark 1994–

1996; Ridder 1998b, 1999; 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 probably cannot sustain a large annual harvest that would be similar to historic levels.

Prior to 2007, the SWHS divided the Chena River into the "upper river" and "lower river" at the South Fork (river mi 77 or ~124 km). Since 2007, the Chena River was divided into the upper and lower sections at the Moose Creek Dam (river mi 45 or ~72 km; Figure 4). The SWHS provides separate estimates of effort, catch, and harvest of all species for each section. Species distributions and regulations that close salmon fishing and prohibit the use of bait above the dam suggest that almost all the effort in the SWHS-designated upper river is directed toward Arctic grayling. The lower river supports a multi-species fishery that includes king salmon, burbot, and northern pike. Although 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 sport fishery.

Recent Fishery Performance

Much like salmon, catch rates of Arctic grayling are highly dependent on river conditions: lower in years dominated by high turbid flow and higher in years dominated by clear water. Lower flow allows grayling to easily see a lure or a fly. For example, in 2004, water levels were low in the Chena River and grayling catches were higher than average. In 2005, 2008, 2011, 2012, and 2016, water levels were high throughout much of July and Arctic grayling catches were lower than average. The 2017 catch of Arctic grayling in the Chena River was 25,594 fish, slightly below the 5-year average (26,760 fish; Table 8).

Fishery Objectives and Management

In 2004, the BOF adopted the *Tanana River Area Wild Arctic Grayling Management Plan* (5 AAC 74.055), which directed ADF&G to 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 3 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). 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 *Unpublished*) to provide guidance. The management objectives are abundance based that may be refined as angler preferences change and more abundance-based information is collected. The objectives are to:

- Maintain a minimum abundance of 8,500 Arctic grayling ≥ 12 in (~305 mm) in total length in the upper river (river mi 45–90, or river km 72–144); and,
- Maintain a minimum abundance of 2,200 Arctic grayling ≥ 12 in (~305 mm) in total length in the lower river (downriver from river mi 45 or ~72 km at the Moose Creek Dam).

Current Issues and Fishery Outlook

The Chena River remains popular as a destination for Arctic grayling fishing, and in general angler reports are good.

Recent Board of Fisheries Actions

There have been no actions taken by the BOF since 2010 when it clarified that Chena Slough (also known as Badger Slough) is part of the Chena River and therefore falls under the same regulations. The BOF modified the gear regulations on the Chena River so that the same gear may be used throughout the drainage including Badger Slough (previously there were differences in hook size regulations between the upper and lower portions of the river).

Current or Recommended Research and Management Activities

The Chena River Arctic grayling population should be assessed prior to the 2022 BOF meeting. The most recent abundance estimate was in 2005 (Table 7). Proposals to open the Chena River Arctic grayling fishery to harvest predictably occur for nearly every BOF meeting and current information is desired to adequately address anticipated proposals.

Questions still remain regarding fish that spawn in the assessment area during May and their contribution to the summer fishery within the assessment area. An integrated study that assesses the spring and summer populations together with a rigorous telemetry study would permit a drainage wide assessment of abundance and better address the effects of proposed regulatory changes.

Delta Clearwater River

Background and Historical Perspective

The Delta Clearwater River (DCR) is the largest of several spring-fed streams near Delta Junction (Figure 5). 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 locations in other nearby rivers 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. However, Arctic grayling are not known to spawn or overwinter in the DCR or RCR. It is unclear how Arctic grayling recruit to these summer feeding streams; however, summer 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 ~9.5 in (240 mm), were at a low of 3,000 fish in 1996 (Ridder 1998a). The population later increased to 7,991 fish in 2000 and 14,799 in 2006, probably because of a series of changes to the bag and possession limits that reduced harvests (Gryska 2001; Wuttig and Gryska 2010; Table 10). In the last 10 years, estimates of total catch of Arctic grayling in the DCR have ranged from 8,912 fish in 2008 to 22,112 fish in 2007, and catch in 2017 (14,717 fish) was above the 5-year average of 11,905 fish (Table 8).

Recent Fishery Performance

Species-specific estimates of effort 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 2017, the angler effort on the DCR was 5,263 angler/days, above the 5-year average of 4,583 angler/days (Table 1). Harvests remain negligible and catches of Arctic grayling appear stable (Tables 8 and 9). Population models suggest that a harvest of 900 Arctic grayling $\leq$12 in (~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 states 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 3 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, or modify other methods and means. DCR Arctic grayling are managed under the special management approach.

Specific management objectives for the Delta Clearwater River Arctic grayling recreational fishery were updated in 2003 (Parker 2003a).

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

Current Issues and Fishery Outlook

Catch levels are very high in the DCR, averaging over 13,000 fish annually over the past 10 years and harvest remains minimal with a 5-year average of 139 fish (Table 8; 9). The catch is near the 2006 estimated population size, suggesting that at least some fish are caught multiple times. The apparent repeated handling is responsible for some level of mortality, although catch-and-release mortality is probably low (<5%, McKinley 1993). In 2006, the abundance of Arctic grayling over 12 in total length (270 mm FL) in the DCR was estimated at 14,799 fish (Table 10; Wuttig and Gryska 2010), nearly doubling the 2000 estimate, which was germane to fish 240 mm FL. This notable increase in abundance, particularly those ≥14 in (~355 mm), suggests that low hooking mortality rates coupled with healthy Arctic grayling spawning populations in nearby rivers and streams are both contributing to the continued success of the fishery.

Recent Board of Fisheries Actions

There have been no actions taken by the BOF with regards to the DCR Arctic grayling fishery since 2010 when the BOF adopted a proposal that clarified method and means in waters that had either catch-and-release regulations or exceptions to the general bag and possession limits for Arctic grayling.

Current or Recommended Research and Management Activities

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

Tangle Lakes System

Background and Historical Perspective

The Tangle Lakes system is located in the upper portion of the Tanana River drainage near the Denali Highway and includes several lakes near tree line (~3,000 ft or 915 m) 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. The watershed includes 150,000 acres of land, 160 miles of streams, and 21 lakes.

The Delta River Corridor is managed by 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

The Tangle Lakes system consistently accounts for the highest or second highest number of Arctic grayling caught and harvested for any water body within the TRMA. This performance is in part due to some the highest observed densities of Arctic grayling within the state (Gryska 2011a) and ease of access. In 2017, the catch of Arctic grayling was 16,908 fish and the harvest was 1,274 (Tables 8 and 9).

Fishery Objectives and Management

The Arctic grayling fishery 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, 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. Mineral exploration in recent years 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 effort (Table 1). The portion of the Delta River that is federally designated as a 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 10.5 mi (17 km) section of the Delta River that is designated as Wild and Scenic was estimated at 44,212 fish (SE = 9,108) ≥240 mm FL (10 in TL) and 23,152 fish (SE = 3,189) ≥270 mm FL (12 in TL). These densities are the highest observed among published estimates for Arctic grayling populations in Alaska (Gryska 2011a).

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 Historical Perspective

Numerous smaller Arctic grayling fisheries occur throughout the Tanana Drainage. 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 stream, flowing through upland hills of the White Mountains for about 80% of its length before it enters Minto Flats wetlands complex. In the uplands the river has a mix of pools, riffles, and gravel bars, and

in the flats the channel is incised with high 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 operations high in the of tributaries.

In the upper river, Arctic grayling are primarily targeted by anglers, and downstream this transitions to more of a northern pike, burbot, sheefish, salmon, and whitefish fishery. Prior to 1992, the Chatanika River Arctic grayling bag and possession limit was 5 fish/day with no size limit. From 1992 to 2009, regulations allowed for a daily bag and possession limit of 5 fish $\geq$12 in (~305 mm) in length, 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 et al. 1990; Fleming et al. 1992; Holmes 1983, 1985; Holmes et al. 1986; Ridder et al. 1993; Roach 1994, 1995; Tack 1973; Wuttig 2004; Wuttig and Gryska 2011). The Chatanika River is difficult to survey due to its length and shallow depth, so abundance has often been reported as a density index rather than a point estimate (Brase 2009c). In 1995 and 2002, researchers reported no immediate conservation problems 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 ($\geq$270 mm FL) in the Chatanika River since the last assessment in 2002 (Table 11).

The Nenana River is a turbid, glacier-fed tributary of the Tanana River 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. Recreational cabins are scattered throughout this area, and there is some sport fish guide activity in the area. Catches of Arctic grayling have averaged 12,317 fish/year and harvests have averaged 1,007 fish/year between 2012 and 2016 in the Nenana River drainage streams (Tables 8 and 9).

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 a single stock for management purposes.

The Salcha River Arctic grayling fishery has supported consistent catch and harvest over recent years and comprises a substantial proportion of the harvest for Arctic grayling in the TRMA (Tables 8 and 9). Most of the Arctic grayling fishery 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 affected 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 (Table 1).

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 in (~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 the minimum length limit for harvest was removed.

The Salcha River Arctic grayling population was annually assessed from 1988 to 1994 and appeared to be stable or possibly increasing (Table 12; Clark and Ridder 1987*b*, 1988, 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 and the estimated population of fish ≥270 mm (13,407; SE = 1,643) within the index area was sufficient to support current harvest levels (Gryska 2011*b*).

Other waters that support important 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

For these fisheries, there are no concerning trends in catch and harvest, and exploitation rates appear sustainable.

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 3 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, modify other methods and means).

Except for the Five-Mile Clearwater (located on the south side of the Tanana River between Fairbanks and Delta Junction), 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. The background bag and possession limit that was instituted in 1975 for Arctic grayling in the Tanana River drainage is 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 1 of which may be over 12 in 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 ADF&G 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 a minimum abundance of 9,000 fish (greater than or

equal to 270 mm (~11 in) fork length) in the assessed portion of the river in May. The most recent abundance estimate of Arctic grayling ≥270 mm FL during May 2006 was 32,907 (SE=10,363) which far exceeded the management objective (Gryska 2010).

Recent Board of Fisheries Actions

There have been no actions taken by the BOF with regards to the other TRMA Arctic grayling fisheries since 2010 when the BOF adopted several proposals specific to the Arctic grayling fisheries in the TRMA. A proposal was adopted that restricted gear to 1 single-hook, artificial lure rather than allowing 2 single hooks or artificial flies per line in TRMA water bodies where there were 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.* Additionally, a proposal was adopted that brought several small Arctic grayling waters in the TRMA into compliance with the *Tanana River Area Wild Arctic Grayling Management Plan* regional management approach by removing spawning closures and length and gear restrictions.

Current or Recommended Research and Management Activities

Arctic grayling populations should be assessed when needed to evaluate sustainability, identify discrete stocks, or identify unknown population traits that may affect management. Future regulations should be consistent with *Tanana River Area Wild Arctic Grayling Management Plan*.

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 protection and enhancement of habitat, conservation of fish and wildlife, and continuation of public uses within the area. The Chatanika, Tolovana, and Tatalina rivers, as well as 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 terminus at the southwestern end of Minto Flats. The waterways of Minto Flats are slow and meandering.

The Minto Lakes, a group of large interconnected, generally shallow, and heavily vegetated lakes in the eastern Minto Flats that are popular for northern pike fishing and hunting for waterfowl and moose. In addition to those who use boats to access this area, 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. Minto Lakes are thought to support the majority (>90%) 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.

Minto Lakes are a major northern pike spawning and summer feeding area. In winter, much of the flowing and standing water within Minto Flats becomes anoxic, forcing fish to move to discrete oxygenated areas of the Chatanika and Tolovana rivers. Partial winterkills are thought to occur, which can confound modeling of population dynamics to assess angler impacts. Northern pike are

typically the only fish targeted by sport anglers in the Minto Flats area. These large piscivores are located throughout Minto 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 13). It was primarily a summer fishery until the mid-1980s, when an intensive sport fishery developed on concentrations of northern pike overwintering in the Chatanika River just upstream from the mouth of Goldstream Creek, which was also a traditional subsistence area. A subsistence fishery for northern pike (and whitefish) also occurs near the village of Minto and other historic sites in the eastern portions of Minto Flats (Andrews 1988). Gillnets are used throughout the open-water period, and northern pike are taken through the ice with hook-and-line.

From 1984 to 1986, total harvest of northern pike from the Minto Flats complex doubled from 3,128 fish to 6,488 fish (Brase 2009c). It was believed and later demonstrated by Roach (1998) and Albert et al. (2016) using radiotelemetry that fish overwintering in the Chatanika are composed mostly (~75–90%) of fish that utilize Minto Lakes during the open water period (i.e., for spawning and feeding). Moreover, these radio telemetry studies identified that fish spawning within Minto Lakes are a unique stock that exclusively spawns in Minto Lakes and overwinters in the Chatanika River upstream of Goldstream Creek; this overwintering area has been termed the Chatanika Overwintering Area. After 1987, regulations were implemented that closed 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 in long.

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. Since 2007, harvests have shifted downwards, and the recent 5-year average was 392 fish. Catches have followed a similar pattern. Consistent high water during 2016, ~6-8 ft higher than during low precipitation years, affected levels of effort, harvest, and catch. In 2016, stands of young (~20-25 years old) birch trees surrounding Minto Lakes had been flooded and killed, indicating an unusually high and persistent water event. Similar summer water levels in Minto Flats were observed in 2017 and 2018.

Currently, Minto Flats is closed to sport fishing for northern pike from October 15–May 31; the bag and possession limit is 5 fish, only 1 of which may be ≥30 in (762 mm) long.

Northern pike population assessments were performed in Minto Flats every 3 to 5 years from 1987 through 1991 (Table 14). Minto Flats contains an estimated 15,000 ac (6,000 ha) of summer northern pike habitat (R. A. Holmes and G. A. Pearse, 1987 report to the Alaska Board of Fisheries on northern pike stock status and regulatory concerns in the Arctic-Yukon-Kuskokwim region). Based on difficulties encountered during these early mark-recapture studies and radiotelelemetry studies conducted by Roach (1998), the assessment area and study design was modified. Beginning in 1996 through 2008, experiments that estimated abundance of northern pike were done within an assessment area termed the Minto Lakes Study Area (MLSA, Figure 6). The

resulting estimates were used as an index of abundance of northern pike for the entire Minto Flats wetland complex (Table 14). The 2008 estimate of 16,045 northern pike ≥400 mm (~16 in) was similar to estimates from 2003 or 1997 (25,227 and 16,547 fish, respectively; Scanlon 2006; Roach 1998). For pike ≥600mm (~24 in), the 2008 estimate of 2,219 fish was significantly smaller than the 2000 and 1997 estimates (5,331 and 3,251 fish, respectively; Scanlon 2001; Joy 2009).

Recent Fishery Performance

The 2017 catch of northern pike in Minto Flats was 7,918 fish, which was well above the recent 5-year average (2012–2016) of 3,108 (Table 13). In 2017, fishing effort in Minto Flats was above average, with an estimated 2,570 angler-days compared to the 5-year average of 1,126 days (Table 1). Fishing effort is not estimated by target species in the SWHS; however, S fishing effort in Minto Flats is almost exclusively directed at northern pike.

Although Minto Flats is closed to northern pike sport fishing from October 15 through May 31, a subsistence fishery occurs throughout the winter. To participate in any subsistence fishery in Alaska, fishers must be Alaska residents. Residents must acquire a Tolovana Subsistence Northern Pike Permit from 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 and early in the spring. The subsistence northern pike harvest recently averaged 604 fish during (2012–2016) by an average number of 113 permits issued (Table 15). For 2017, the harvest was 137 northern pike with 93 permits issued, this substantial drop was likely due to a recently-adopted 3-mile closed area and a relatively cold winter and spring. In 2018, the number permits (168) and harvest (744 fish) increased because the BOF changed the closed area in 2017 from 3 mi to 1 mi based on an agenda change request submitted by the Fairbanks Advisory committee.

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 assessed northern pike population annually.

The sport fishing plan establishes the open season for the sport fishery from June 1 to October 14 and a bag and possession limit of 5 fish, only 1 of which may be ≥30 in (762 mm). Additionally, if 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 may be ≥ 30 in within the lakes and all flowing waters of Minto Flats for the remainder of the calendar year.

The subsistence management plan is:

1. Subsistence fishing for northern pike is open year-round to Alaskan residents; however, a permit is required;
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. Starting January 1, 2017, a 1-mile reach of the Chatanika upstream from the mouth of Goldstream Creek to an ADF&G regulatory marker located at the boundary of the Fairbanks Nonsubsistence Use Area was closed to ice-fishing,
4. Gillnets may be used only April 15–October 14; and
5. A hook-and-line may be used only if fishing through the ice.

If 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 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 1 mi [~1.6 km] below the boat launch).

Current Issues and Fishery Outlook

Recent harvests of northern pike in the lakes and flowing waters of the Minto Flats area have been below the maximum 20% exploitation rate specified in regulation. Since 2005, subsistence harvests have been appreciable, primarily by residents of the Fairbanks North Star Borough, and there has been a downward trend in sport fish harvest (Tables 13 and 15). In 2008, the assessment area within Minto Lakes was geographically expanded (Area A), which included all of the historical assessment area (Area B). The 2008 abundance for Area A was 16,045 northern pike larger than ~16 in (400 mm; Table 14) and 20% of this abundance was 3,209 fish, well above the combined sport and subsistence harvests. Therefore, if sport and subsistence harvests continue to maintain current levels and the population of northern pike in Minto Flats does not decrease, there should be no need for restrictions to the sport fishery relative to the 20% exploitation threshold.

Prior to closing the lower 3 mi of the Chatanika River upstream of Goldstream Creek, there was a concern over the selective exploitation of larger female northern pike by a growing contingent of subsistence fishers from the Fairbanks North Star Borough. The institution of bag and possession limits significantly curtailed harvests after large increases were observed in 2007 and 2008 (Table 15). The number of permits increased again during 2014–2016 with the highest number of permits issued to date in 2016 (201 permits) and 2016 harvests exceeded 1,000 fish. In 2017, the number of permits issued dropped to half of the previous year (93) and harvest was a tenth (137) of the harvest from 2016. This significant drop in harvest and participation was due to the 3-mi closed area implemented after the 2016 BOF meeting. Preliminary harvest data from 2018 shows an increase in the number of permits and harvest slightly above the 5-year average (Table 15) due to the shift from the 3-mile closed area to a 1-mile closed area after the BOF meeting in Valdez.

A potential problem with the management plan is that it is based on a 20% exploitation rate of an assessed population or fish >16 in (406 mm). However, northern pike harvested through the ice are primarily composed of larger fish and past and recent sampling efforts have found that fish >30 in are almost exclusively female. This presumed selective harvest of females could explain the decline in abundance of female fish after the winters of 2006/2007 and 2007/2008. In June of 2008 after two years of large winter subsistence harvests from the Chatanika River, the estimated abundances were only 2,092 northern pike ≥24 in, and 635 for fish ≥30 in. In contrast, in June of 2003, after a decrease in subsistence harvests, the estimated abundance of fish ≥24 in was 7,683. For a more detailed explanation of recent fisheries information please refer to Special Publication

No. 18-20: An Overview of Minto Flats Northern Pike Subsistence and Sport Fisheries: A Report to the Board of Fisheries (Gleason et al. 2018).

Recent Board of Fisheries Actions

The Minto Flats Northern Pike Management plans regarding the sport and subsistence fisheries (5 AAC 74.044 and 5 AAC 01.244) were amended during the 2016 BOF. These amendments closed ice fishing (sport and subsistence) from the confluence of the Chatanika River and Goldstream Creek to an ADF&G regulatory marker approximately 3 river miles upstream.

Shortly thereafter, an Agenda Change Request was submitted to change the 3-mile closed area in the Chatanika River to a 1-mile closed area, also with the lower boundary at the mouth of Goldstream Creek. This proposal was adopted at the 2017 BOF meeting in Valdez.

Current or Recommended Research and Management Activities

Conducting a northern pike population stock assessment in the Minto Flats is a high priority for the immediate future to address regulatory proposals and reevaluate the population of northern pike >600 mm FL and >750 mm FL. Defensible information on the size and sex composition of fish caught through the ice in the winter subsistence fishery is needed. Finally, a better understanding on the relative importance of all overwintering areas within the Minto Flats is desired to assess relative exploitation of discrete summer or spring spawning populations.

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 in these lakes, 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. It is unknown whether these use patterns are still valid assumptions. Much of the hook and line effort directed towards northern pike in the TRMA is nonconsumptive fishing (no retention).

George Lake is a 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 (~4,500 ac) but shallow, with a maximum depth of only 35 feet (~10 m), and much of the shoreline is privately owned. The lake has 1 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). During the open-water season, fishing pressure is believed to be highest 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 prevent snowmachine access. Year-to-year total fishing effort at George Lake can be variable due to poor snowmaching conditions (low snowfall and open water on the Tanana) and

difficult boat access (low creek levels). During the ice-fishing season, northern pike are taken by hook-and-line, as well as with spears.

Based on the most recent population estimates, the northern pike population in George Lake appears healthy and current harvests 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 members of the local Fish and Game AC have expressed satisfaction with their summer fishing experiences at George Lake because of good catch rates, particularly of larger-sized fish (e.g., > 24 in [~610 mm]).

A stock assessment conducted during 2006 indicated a higher proportion of larger fish in the population compared to 1987. In 1987, 48% of the northern pike population was estimated to be ≥18 in (~450 mm; Clark et al. 1988). In 2006, 79% of the northern pike population was estimated to be ≥ 18 in (~450 mm; Wuttig and Reed 2010).

Volkmar Lake is remote but 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 is thought to occur through the ice during spring when temperatures are more moderate, and the Tanana River can still 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 16; Pearse 1991; Pearse and Burkholder 1993; Pearse and Hansen 1993; Pearse 1994a; Scanlon 2001; Wuttig and Reed 2010; Wuttig 2010).

In 1995, a record 1,263 angler-days occurred on Volkmar Lake, with a harvest of 1,084 pike (Parker 2009a). In 1996, effort and harvest fell to the lowest recorded level (191 angler-days and 9 fish harvested; Parker and Viavant 2000). In 1996, anglers reported that size and abundance of pike in Volkmar Lake had declined. At the 1997 BOF meeting, the BOF adopted a bag and possession limit of 1 fish, no size limit, as a conservation measure. It is thought that the large harvest in 1995 was responsible for the decline in population and harvests at that level were not sustainable (Parker 2009a).

In 2000, the estimated abundance of northern pike ≥18 in (~450 mm) in Volkmar Lake was 615 fish (Scanlon 2001). Angler effort and harvest were minimal after 1997, presumably due to the 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 1,814 fish (Wuttig and Reed 2010), and in 2009 the population had increased to 4,017 fish (Table 16; Wuttig 2010).

Recent Fishery Performance

Annual catch and harvest estimates of northern pike in both George and Volkmar lakes can vary considerably from year to year (Table 13). This variation is in part attributed to ice conditions on the Tanana River crossings during the winter and the water-level fluctuations in George Creek during the summers.

Both these lakes are almost exclusively northern pike fisheries; therefore, estimates of effort may be applied to these lakes more readily than for other multi-species fisheries. Fishing effort in George Lake ranged from 249 to 1,645 angler-days in the past 10 years (2007–2016; Table 1), and in 2017 effort was only 148 days. For 2017, catch (494) and harvest (0 fish) were well below average (Table 13).

Fishing effort in Volkmar Lake ranged from 0 to 360 angler-days in in the past 10 years (2007–2016; Table 1), and in 2017 effort was only 36 days. For 2017, catch (11 fish) and harvest (11 fish) were below average (Table 13).

Fisheries Objectives and Management

George Lake

The management objective for George Lake is to maintain a population size greater than 9,200 northern pike ≥18 in (~450 mm) in size. An abundance less than this is the threshold at which a management action to restrict harvest would be considered by the department.

Volkmar Lake

The management objective for Volkmar Lake is to maintain a population of northern pike ≥18 in (~450 mm) of 2,000 fish or greater; although no formal abundance or exploitation-based management objective exists for Volkmar Lake, this was selected as the population size at which any regulatory change would be considered to increase or decrease harvest.

Current Issues and Fishery Outlook

George Lake

Since 2012 there have been significant algal blooms in George Lake that turned the lake surface green in summer and dark brown with detritus the following winter. These blooms are of concern because they may significantly alter ecosystem functioning and ultimately fish production and survival. For example, the decay of excessive algae may inhibit sight feeding for all fish, alter zooplankton composition, and decrease winter dissolved oxygen concentration due to the decaying process of organic matter. Anecdotal reports of dead fish in the shallows in the early summer of 2010 and 2013 were received; however, those reports were never confirmed and could be attributed to normal overwintering mortality. In 2016, the department initiated a more formalized, and long-term study to help explain these changes and monitor the lake's limnology.

Recent Board of Fisheries Actions

There have been no actions taken by the BOF with regards to George and Volkmar lakes since 2010, when the BOF adopted a proposal that changed the bag and possession limit in Volkmar Lake from 1 northern pike (no size limit) to 2 fish, of which only 1 can be over 30 in (~750 mm) in length. The BOF also adopted a proposal that reduced the spring spawning closure for northern pike in Volkmar and George lakes by 20 days from March 31 to April 20. In 2013, the BOF adopted a proposal that increased the northern pike sport fishing season to year-round in all lakes of the TRMA, except for Harding, Little Harding, George, and Volkmar lakes; and all the lakes of the Tolovana River drainage (including Minto Flats).

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. The importance of monitoring the George Lake population is elevated due to the recent trend of algal blooms and growing lake shore developments. Long-term (≥5-year) monitoring of water quality is recommended.

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 are a high-profile game fish in Harding Lake because they can readily be caught around the lake's shorelines, ~75% of which is developed with residential houses or recreational cabins. In 2000, northern pike fishing at Harding Lake was closed due to low abundance; details about the closure, population changes, and habitat rehabilitation efforts are discussed by Brase (2009c). In summary, rehabilitation of the northern pike population is dependent on reestablishing vegetated littoral habitat. In the fall of 2016, the lake elevation was 716.5 ft, which was 0.5 ft below to goal of 717 ft, and substantially higher than the observed level in 2012 of 714 ft. In 2012, the estimated abundance of northern pike ≥450 mm FL was 567, which was still below the level of 1,000 fish ≥450 mm FL needed to open the fishery to catch-and-release (Doxey 2003). With no change in the population size after 13 years of closure, consideration should be given to allowing a limited catch-and-release fishery because the population has appeared to have stabilized at a new equilibrium, and continued closures seem to not have had the desired effect of rebuilding the population.

In Little Harding Lake, northern pike were captured for the first time in 2011 since it was last chemically treated with rotenone during the 1970s in an attempt to create a trophy stocked rainbow trout fishery. The mechanism by which these fish were reintroduced is unknown, but the illegal transfer of fish from nearby Harding Lake is suspected. Little Harding Lake is currently stocked with rainbow trout. In 2016, a stock assessment of the northern pike population in Little Harding Lake was conducted to determine if stocking efforts should continue. Only 37 fish were captured and an estimate could not be produced. However, the catch information indicated that the northern pike population was sufficiently small enough to continue stocking catchable-sized (8-10 in) rainbow trout.

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 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 of the Tanana River. Other lakes in the Upper Tanana River drainage with northern pike populations are Sand, "T," Mansfield, Dog, Tetlin, Takomahto, Jatahmund, Island, and American Wellesley lakes.

Northern pike colonize suitable gravel pits and other ponds when rivers 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 in which these northern pike fisheries are a part.

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 northern pike fisheries in roadside situations.

Studies on abundance and age and sex composition were conducted in East Twin Lake in 1993 (Pearse 1994a) and Deadman Lake in 1994 (Hansen and Pearse 1995). In both cases, 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 1994b).

Providing harvest opportunity at sustainable levels is the primary management responsibility. 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.

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

BURBOT

Tanana River

Background and Historical Perspective

The Tanana River is the second largest tributary of the Yukon River; approximately 570 miles long and is highly turbid in the summer due to glacial runoff. The largest Tanana River mainstem sport fishery, based on harvest, is the 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 where up to a total of 15 hooks may be used. In flowing waters of the Tanana River drainage, the bag and possession limit for burbot is 15 fish, 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 possibly increasing (Table 17; Evenson 1988, 1991b, 1994, 1997; Stuby and Evenson 1999). Radiotelemetry studies on burbot have also been conducted. Extensive movements and exchange of burbot within the Tanana River drainage tend to minimize effects of concentrated local fishing effort; and overall, stocks in the Tanana River appear to be lightly exploited (Evenson 1997).

Although 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 2 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 limit of 10 fish per day 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 harvest and catch of burbot in the TRMA varies between 1,000 to 5,400 fish annually. The recent 5-year average of annual harvest (2012–2016) was 1,575 burbot, compared

to 1,032 during 2017 (Table 18). The Middle Tanana River and the Lower Chena River fisheries provide for 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 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; however, extensive movements and exchange of burbot within the Tanana River drainage tend to minimize effects of concentrated local fishing effort.

Recent Board of Fisheries Actions

In 2016, the regulations for Jack and Grizzly Lakes (in the Upper Tanana River drainage near the Wrangell mountains) were changed, and consequently the use of set lines are no longer permitted.

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 1991b). Subsistence fisheries for burbot are known to occur in the Upper Tanana River drainage, but harvests in these fisheries may be underreported because 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, because 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 localized depletion.

ADF&G will continue to monitor these small burbot fisheries through the SWHS and assess trends that may indicate a fishery is getting higher use and may therefore warrant further research and/or management activities.

Tanana River Drainage Lakes

Background and Historical Perspective

Burbot also inhabit deep lakes of the TRMA and may colonize suitable ponds and gravel pits when flooded by nearby rivers or illegally transported. 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 Fielding Lake 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 2001). In 1987, bag and possession limits in these lakes were reduced from 5 to 2 fish and the use of setlines was prohibited, due to concerns of overharvest.

In 1999, the Fielding Lake burbot population was estimated to be 598 fish (TL > 18 in [~450 mm]); in 2000 it had increased to 759 fish (Parker 2001). Because of these increases, the Fielding Lake burbot fishery was reopened in 2001 with a bag and possession limit of 1 fish. Catch and harvest had remained low and decreased to zero after a bait restriction was established in 2007. Since 2007 no burbot have been harvested except for 67 burbot in 2012 (Table 18). The overall lack of harvest and only two years out of ten reporting catch is most likely due to the prohibition of bait that was established in 2007.

The burbot bag and possession limit in all lakes of the TRMA (except Harding, Fielding, and T lakes; and the Tangle Lakes system) is 5 fish. Currently, the regulation for Fielding Lake is the most restrictive with no set lines or bait allowed, and a bag and possession limit of one burbot.

Recent Fishery Performance

In 2017, no burbot were reported harvested from Fielding Lake, Tangle Lakes, or George Lake (Table 18). Burbot harvests in George Lake have varied in the last 10 years with a range of 0 to 312. Ice conditions on the Tanana river for access, the popularity of the burbot fishery, private ownership around the lake, and a public use cabin have all contributed to the varied harvest levels. The harvest of 0 burbot in 2017 was probably due to the lake ice thickness (over 55 in thick) and the cold temperatures in the spring that limited participation (Table 18). The most recent abundance estimate was ~3,200 fish ≥450 mm FL, and exploitation rates appear to be sustainable (i.e., ≤10% annually).

Fishery Objectives and Management

Statistical simulations of Fielding Lake burbot population suggest that a 10% exploitation rate can be sustained on an optimum population size of about 1,000 burbot (>18 in [~450 mm]). Therefore, the management objectives for the Fielding Lake burbot fishery are to 1) maintain a population size of 1,000 burbot > 18 in in size (~450 mm); and, 2) ensure that the total fishing mortality (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. Since 2007 the harvest of burbot been has 0 for every year except 2012 when 67 burbot were harvested (Table 18). Harvests will remain minimal because of the bait restriction adopted by the BOF in 2007 to protect the lake trout population.

The burbot harvest in George Lake should continue to be monitored. No formal management plan exists for George Lake, but consecutive years (i.e., three or more) of higher than the 5-year average harvests would increase concerns of over-exploitation and trigger further research and discussions of regulatory changes.

Recent Board of Fisheries Actions

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

Current or Recommended Research and Management Activities

An assessment of the burbot population is recommended to develop a management strategy for George Lake because of variability in annual harvests, cabin developments, and changes to the lake's limnology.

WHITEFISH

Chatanika River

Background and Historical 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 primarily between Murphy Creek and the Elliot Highway Bridge. They then move downriver to as yet undefined overwintering areas. It is suspected that some of the overwintering areas are outside of the Minto Flats complex within the mainstem Tanana River. Fleming (1999) described the potential complex life history of these 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 near 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/yr 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 (SE = 5,155) in 1988 to 17,322 (SE = 1,655) fish in 1989 (Table 19; 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 2009c). In 1992, the BOF adopted an ADF&G 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 1 mile (~1.6 km) above the Elliot Highway Bridge. During 1992, ADF&G 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 19; 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 that reduced fishing success during the peak of migration (Hallberg and Bingham 1994).

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 prohibited the use of spears in the Chatanika River whitefish sport fishery by regulation.

In 2007, the BOF added spears as a legal gear type in the personal use whitefish fishery. Separate permits, specific to the Chatanika River, 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. In 2007, there was a high demand for the 100 permits; however, participation and harvest were low with only half the participants reported fishing. Brase and Baker (2012a-b; Table 20) reported the number of issued permits doubled to 200 in 2008, and then raised again to 225 permits in 2016. Based on past abundance estimates, a harvest level of 1,000 whitefish (humpback whitefish, round whitefish, and least cisco combined) was deemed sustainable. Factoring past abundance estimates, this ensures a very conservative annual exploitation of <5% for a given species. In 2017, only 237 humpback whitefish were harvested compared to the most recent abundance estimates of 22,290 in 2008 Wuttig (2009), and 12,755 fish in 2012 (Gryska 2014).

Recent Fishery Performance

When the BOF prohibited the use of spears in the sport fishery, it also 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) that 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)). Permits for this fishery are available at the ADF&G office in Fairbanks.

In general, the results from the personal use spear fishery seem to be relatively stable with regards to participation and success (Table 20). Participation and success is dependent on water conditions and weather, greater when the river is clear. In 2017, total reported harvests were 962 fish composed of 237 humpback whitefish, 481 least cisco, 181 round whitefish, and 63 unknowns (Table 20). Several fishers (n = 24) or 10.6% failed to report after one mailing, a phone call, and 2 email reminders.

From 2007–2013, the ratio of least cisco to humpback whitefish harvested in the Chatanika River was 0:4, and from 2015–2017 it changed to 2:4. This may indicate strong recruitment of least cisco into the fishery.

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 1 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 by 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
- There will be a 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. People report enjoying the opportunity to participate in the fishery and are satisfied with the 10-fish household limit. In 2009 and 2010, all permits were issued in 3 days or less. In 2017 and 2018, it took 5 days to issue 225 permits, indicating there was a sufficient supply of permits.

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

There have been no actions taken by the BOF with regards to the Chatanika River whitefish fishery since 2010 when the BOF adopted an ADF&G proposal that repealed the exceptions to the general sport bag and possession limits and seasonal closures for whitefish in the Chatanika River. During 2016, the BOF permanently set into regulation a seasonal household limit of 10 whitefish for all species combined.

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 19; Wuttig 2009). The humpback whitefish estimate was 22,490 fish (SE = 2,777) ≥360 mm FL; the estimate of least cisco was 15,345 fish ≥10 in (≥250 mm; SE = 1,350). These results suggest that the humpback whitefish population was slightly below the historical average, whereas the least cisco population remains below the historical average. 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.

In 2012, the estimated abundance of humpback whitefish was 12,755 fish ≥360 mm FL (SE = 1,405; Table 19). The abundance of humpback whitefish was within the range of most previous estimates. The percentage of the whitefish population composed of large fish (≥440 mm FL [~18 in]) increased from 60% (2008) to 72%. Correspondingly, few smaller-sized fish (i.e., 360-439 mm FL [~15-18 in]) were present in the sample, indicating short-term recruitment may be relatively small in subsequent years (Gryska 2014).

The population dynamics of least cisco can be highly variable because they are relatively short lived (5–7 years) and more responsive to changing environmental factors. The last abundance

estimate was in 2008 and a more recent stock assessment is recommended. The increasing ratio in harvests of least cisco to humpback whitefish since 2013 suggests a growing least cisco population (Table 20).

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 spawning in nonconsecutive years); combined with the short growing season at higher altitudes, increase the vulnerability of the species to overharvest (Burr 1987, 2006). The effect of even modest fishing pressure can be significant.

Lakes containing wild lake trout in the TRMA include Harding, Fielding, Monte, 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 2 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 $\geq$26 in in length), and Harding Lake (bag and possession limit of 1 fish $\geq$30 in in length).

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, for these fish were spawned in years when no stocking of lake trout occurred (Doxey 1985). In 1998, an artificial spawning substrate was placed in Harding Lake to enhance 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 (2009c).

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, Donnelly, Four Mile, Fourteen Mile, Moose, Crystal #1, Kenna, Lost, Rapids, Coal Mine #5, Paul's Pond, Chet, Ghost, Nickel, and North Twin lakes. 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.

In Fourteen Mile Lake, a self-sustaining population of rainbow trout was established from stocking that occurred in 1961. Lake trout were stocked in 1991 and are also self-reproducing. Based on sampling in June of 2017, rainbow trout appear to have been extirpated (4 captured), and lake trout ranging from 400-500 mm FL were common. In addition, one 28 mm fish was captured.

Recent Fishery Performance

In 2017, there was a harvest of 284 lake trout in the TRMA (Table 21). The Tangle Lakes system has consistently produced the highest wild lake trout harvest in the TRMA. In 2017, the number of lake trout harvested from this system was 205 fish with a catch of 851 fish (Table 21). Lake trout harvest and catch in Harding Lake are generally low. However, continued harvests in

Harding lake indicate some proportion of the population are still growing above 30 in and the catches indicate that a sustainable fishery exists.

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 toward lake trout fisheries. The lake area model (LA model) is the primary tool for determining whether 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 3 consecutive years.

Harding Lake is managed under the special management categories of both 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, which factors in a 10% hooking mortality (Burr 2006). The status of the population is unknown. Regular requests from the public indicate a desire to supplement the number of lake trout to improve catch rates and ensure future production of harvestable fish. Supplemental stockings are a priority and have been added to the regions stocking plan.

The sustainable yield estimate for the Tangle Lakes system is 731 lake trout per year based on the LA model (Burr 2006). Harvests remain well below this threshold (Table 21).

In Fielding Lake the sustainable yield is set at 78 lake trout ≥26 in. Accounting for 10% hooking mortality, the 5-year average of total fishing mortality was 80 fish (Table 21). Removal of the 26-inch length limit would increase the sustainable yield to 203 lake trout. The benefits of this action would be to simplify the regulations and provide more opportunity for anglers to harvest fish. Based on fishing effort and the tendency for anglers to not harvest fish, it is believed that this would only slightly raise total harvests (e.g. ~30 fish).

Recent Board of Fisheries Actions

There have been no proposals adopted regarding lake trout in the TRMA since 2007.

Current or Recommended Research and Management Activities

A multiyear mark-recapture population study was initiated in 2010 for lake trout in Fielding Lake (Schwanke 2013). Abundance was estimated to be 299 (SE = 25; 95% CI = 250–347) mature male lake trout (≥20 in). Information gathered from this study suggest that the prior estimate of 193 (SE = 35; 95% CI = 124–262) mature male lake trout from 1999 (Parker et al. 2001) was biased low.

Harding Lake is the only local lake that provides a highly valued and popular lake trout fishery near Fairbanks. These fish are difficult to catch likely due to their relatively low densities and/or restricted productivity related to their limited spawning areas. The public demand for lake trout

fishing in Harding Lake is high and consideration should be given to the periodic supplementation of hatchery reared fish on a 2-4 year rotation. This could serve to increase catch rates, and hopefully angler participation and satisfaction.

STOCKED WATERS

Background and Historical 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.

Initial stocking events were often "bucket-biology" experiments when 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 science-based policies in place that 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 out stocked into any water bodies.

At present, over 90 lakes are 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 rainbow trout (sterile); 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. These lakes function to provide diverse angling opportunities, shift pressure from wild stocks, and provide harvest alternatives. These stocked lakes also provide increased opportunities for winter fishing.

A variety of fish are stocked in the TRMA, including rainbow trout, Arctic grayling, Arctic char, king and coho salmon. These fish are produced at the Ruth Burnett Sport Fish Hatchery in Fairbanks and then transported by truck to Fairbanks and/or Delta Junction area lakes in the early summer and late fall. Some brood stock or eggs (e.g. rainbow trout) are provided by the William Jack Hernandez Sport Fish Hatchery in Anchorage. Occasionally, lakes are stocked in the winter.

Fish are stocked at 4 size categories: 1) fingerling (2 grams, ~3 in); 2) subcatchables (20–60 grams, ~ 5 in); 3) catchables (100–200 grams, ~9–10 in); and 4) surplus broodstock (up to 1,500 grams, ~15 in). Size-at-stocking depends on management needs at a particular stocking location, lake characteristics (e.g., productivity, prone to winterkill), 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, and it is too expensive to transport the same numbers of 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 in or larger), catch rates can be high, and most of

the lakes/ponds are easily accessible. Approximately 40% of all effort and 60%–70% of all harvest within the TRMA between 2007–2016 were supported by stocked lakes (Table 22).

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 the department should meet public demand for diverse fishing opportunities. The plan defines 3 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. Dune, Koole, and Rainbow 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 hatchery and management staff. The stocking plan is a comprehensive list of species, life stage, stocking frequencies, and 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 Statewide Stocking Plan, including the Region III stocking component, may be accessed via the department's website at http://www.adfg.alaska.gov/index.cfm?adfg=fishingSportStockingHatcheries.stockingPlan.

Current Issues and Fishery Outlook

The William Jack Hernandez (Anchorage) and Ruth Burnett (Fairbanks) Sport Fish hatcheries began producing catchable-sized fish in 2012. The increase harvest of stocked fish observed since 2013 is attributed to this production. Greater production is desired and possible but neither hatchery is producing at capacity due to lack of funding for additional production.

A major issue in the TRMA is a lack of public access to many small ponds/gravel pits in the Fairbanks area. Without guaranteed public access, the department is unable to stock a water body; therefore, the ability to provide fishing opportunity within the Fairbanks city limits and surrounding area is lost until legal access to these water bodies is provided.

Recent Board of Fisheries Actions

At the 2016 BOF meeting, the BOF adopted the updated *Tanana River Area Stocked Waters Management Plan* (5 AAC 74.065). Stocked waters are removed from the stocking plan when there is a loss of public access, poor fish growth or survival, or insufficient effort. Lakes are added if new opportunities arise.

Current or Recommended Research and Management Activities

The ongoing strategy is to stock species most suited to a particular lake's physical characteristics at a size to account for lake productivity and 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 (≥18 in), which makes them attractive to anglers; however, they generally need deeper, cooler lakes to survive. In some lakes, more than 1 species are stocked to provide diversity and to take advantage of different seasonal behavior of the fish. The most popular combination is rainbow trout and coho salmon.

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TABLES AND FIGURES

Table 1.–Estimates of effort (angler-days) for select areas of the Tanana River drainage, 2007–2017.

	Year											5-year Average	10-year Average
	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2012–2016	2007–2016
Chena Total [a]	24,026	14,802	16,804	15,408	10,401	8,296	19,219	20,293	11,210	8,021	8,442	13,408	14,848
Upper Chena	9,507	5,688	6,017	8,007	3,921	4,047	6,206	5,666	4,294	3,024	3,807	4,647	5,638
Lower Chena	14,519	9,114	10,787	7,401	6,480	4,249	13,013	14,627	6,916	4,997	4,635	8,760	9,210
Piledriver Slough [b]	1,519	1,900	4,695	2,338	1,768	1,585	2,119	1,167	644	250	1,004	1,153	1,799
Chatanika Total	5,312	3,558	3,526	4,137	3,401	6,200	6,665	5,144	4,060	4,168	6,439	5,247	4,617
Upper Chatanika	2,352	1,966	1,897	2,438	1,796	3,199	4,767	2,903	1,532	1,344	3,559	2,749	2,419
Lower Chatanika	2,960	1,592	1,629	1,699	1,605	3,001	1,898	2,241	2,528	2,824	2,880	2,498	2,198
Salcha River	5,656	3,394	6,124	6,567	2,821	3,264	3,492	1,406	2,042	2,629	1,371	2,567	3,740
Minto Flats	2,595	887	2,984	1,424	1,460	964	1,197	1,996	1,074	400	2,570	1,126	1,498
Nenana Drainage [c]	979	1,721	2,699	2,401	5,947	5,494	3,369	2,373	5,916	6,359	4,291	4,702	3,726
Delta Clearwater River	5,149	2,248	5,018	4,193	5,048	3,870	3,158	5,366	4,330	6,191	5,263	4,583	4,457
Tangle Lakes Drainage	5,463	3,443	4,065	7,050	4,478	4,326	6,199	5,519	3,999	4,619	4,696	4,932	4,916
George Lake	705	526	1,645	1,256	249	1,553	474	641	289	256	148	643	759
Fielding Lake	1,139	1,203	788	1,548	422	1,163	1,545	714	1,732	992	1,108	1,229	1,125
Volkmar Lake	57	145	134	184	50	143	0	53	360	0	36	111	113
Goodpaster River	1,305	823	1,949	1,132	993	879	694	1,169	789	996	266	905	1,073
Stocked Lakes Total	37,303	34,091	38,870	43,513	24,776	25,885	29,722	43,082	30,819	28,949	20,815	31,691	33,701
Quartz Lake	5,522	4,860	6,905	8,214	4,532	3,988	1,347	4,114	4,593	5,865	4,203	3,981	4,994
Coal Mine Rd Lakes	503	971	586	872	929	153	221	695	1,102	641	313	562	667
Harding Lake	749	1,504	1,068	2,336	1,540	1,309	1,961	1,096	1,323	843	590	1,306	1,373
Other stocked lakes	30,529	26,756	30,311	32,091	17,775	20,435	26,193	16,081	12,069	21,600	15,709	25,841	26,667
Other Tanana	9,748	3,594	3,196	5,708	5,564	6,069	7,448	7,217	8,977	7,225	10,448	7,387	6,475
Total Tanana	100,956	72,335	92,497	96,859	67,378	69,691	85,301	96,140	76,241	71,055	66,897	79,686	82,845

Source: Alaska Sport Fishing Survey database [Internet]. 1996– . Anchorage, AK: Alaska Department of Fish and Game, Division of Sport Fish (cited October 30, 2018). Available from: http://www.adfg.alaska.gov/sf/sportfishingsurvey/

[a] Includes unspecified reaches.

[b] Includes Brushkana Creek.

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

Table 2.–Number of fish harvested and caught by recreational anglers fishing in the Tanana River drainage (includes stocked waters), 2007–2017.

	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														
	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
	2011	372	77	284	1,227	7,663	1,189	443	5,179	1,209	1,024	16	641	24
	2012	114	63	84	800	6,069	539	319	4,971	2,300	1,128	7	369	84
	2013	11	8	139	1,179	9,067	835	799	5,952	2,087	1,436	7	810	21
	2014	0	54	216	4,126	10,254	1,015	418	8,010	1,867	1,745	37	1,165	0
	2015	13	0	180	1,753	22,119	610	484	5,591	1,838	1,877	0	193	261
	2016	20	0	641	7,980	18,834	3,038	480	6,680	1,707	1,689	20	370	0
	2017	18	23	236	3,655	11,286	942	375	4,449	1,096	1,032	7	745	189
5-year Average	2012–2016	32	25	252	3,168	13,269	1,207	500	6,241	1,960	1,575	14	581	73
10-year Average	2007–2016	248	44	254	3,208	12,353	1,695	638	6,768	2,196	1,764	23	583	51
Catch														
	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
	2011	1,432	620	3,761	2,980	35,547	4,806	2,296	87,411	13,672	1,224	158	1,023	47
	2012	1,142	411	2,623	5,189	31,385	3,731	1,773	91,019	19,524	1,299	36	523	84
	2013	129	580	1,952	3,947	31,462	5,050	1,472	148,797	15,293	1,693	79	1,647	99
	2014	10	171	6,655	14,589	37,250	3,249	1,752	109,152	14,651	1,932	186	1,744	48
	2015	48	189	4,393	3,323	60,475	4,937	4,330	108,078	14,743	2,929	69	422	586
	2016	1,532	117	4,853	19,280	46,584	8,880	1,829	91,319	12,450	3,385	49	612	202
	2017	138	627	3,218	8,642	30,366	1,971	4,924	99,450	11,807	1,200	7	822	436
5-year Average	2012–2016	572	294	4,095	9,266	41,431	5,169	2,225	109,673	15,332	2,248	84	990	204
10-year Average	2007–2016	1,216	371	3,733	8,842	42,998	5,693	2,750	117,161	17,120	2,690	115	1,187	146

Source: Alaska Sport Fishing Survey database [Internet]. 1996– . Anchorage, AK: Alaska Department of Fish and Game, Division of Sport Fish (cited October 30, 2018). Available from: http://www.adfg.alaska.gov/sf/sportfishingsurvey/

Table 3.–Abundance estimates and methods of estimation for king salmon in the Chena and Salcha rivers, 2005–2018.

	Chena		Salcha	
Year	Abundance	Method	Abundance	Method
2005	no estimate [b]	Tower	5,988	Tower
2006	2,936	Tower	10,400	Tower
2007	3,564	Tower	5,631 [a]	Tower
2008	3,212	Tower	5,300 [a]	Tower
2009	5,253	Tower	12,788	Tower
2010	2,382	Tower	6,135	Tower
2011	no estimate[b]	Tower	7,200	Tower &Aerial
2012	2,220	Tower	7,165	Tower
2013	1,859	Tower	5,465	Tower
2014	7,192	Sonar	no estimate [b]	Tower
2015	6,291	Tower	9,000	Tower
2016	6,665	Sonar	2,675	Tower & Sonar
2017	4,949	Sonar	4,195	Tower
2018[c]	4,227	Sonar	4,053	Sonar
BEG Range	2,800–5,700		3,300–6,500	
10-year average (2008–2017)	4,447		6,422	
5-year average (2013–2017)	5,391		4,804	

Source: Brase and Doxey 2006; Brase 2012; Savereide 2012a-b, 2014, Stuby and Tyers 2016

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

[b] No estimates were produced due to extreme high-water events throughout the run. Chena River king salmon escapement was likely within the BEG range, based on results from the Salcha River escapement estimate.

[c] Preliminary results.

Table 4.–Sport harvest of king, coho, and chum salmon in the Tanana River drainage, 2007–2017.

	Year											5-year Average	10-year Average
	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2012-16	2007-16
King Salmon													
Chena River	78	150	413	32	84	38	0	0	0	0	18	8	80
Salcha River	471	74	397	143	256	76	0	0	0	20	0	19	144
Chatanika River	0	30	0	16	0	0	0	0	0	0	0	0	5
Goodpaster River[a]	0	0	0	0	0	0	0	0	0	0	0	0	0
Other Tanana	0	0	26	122	32	0	11	0	0	0	0	2	19
Total	549	254	836	313	372	114	11	0	0	20	18	29	247
Coho Salmon													
Nenana River drainage	0	86	10	160	0	27	0	0	0	0	21	5	28
Delta Clearwater River	311	65	105	209	284	57	81	216	180	641	215	235	215
Other Tanana	28	19	0	0	0	0	58	0	0	0	0	12	11
Total	339	170	115	369	284	84	139	216	180	641	236	252	254
Chum Salmon													
Chena River	0	15	0	50	77	0	0	0	19	0	0	4	16
Minto Flats	0	0	53	0	0	0	0	0	0	0	0	0	5
Salcha River	32	46	0	12	0	0	0	0	118	0	0	24	21
Delta Clearwater River	0	0	0	0	0	0	0	0	52	0	23	10	5
Other Tanana	9	0	18	0	0	63	8	54	0	0	0	25	15
Total	41	61	71	62	77	63	8	54	189	0	23	63	63

Source: Alaska Sport Fishing Survey database [Internet]. 1996– . Anchorage, AK: Alaska Department of Fish and Game, Division of Sport Fish (cited October 30, 2018). Available from: http://www.adfg.alaska.gov/sf/sportfishingsurvey/

[a] Prior to 2007, the Goodpaster River was closed to salmon fishing. In 2007, the Goodpaster River was open to no retention of king salmon only.

Table 5.–Sport catch of king, coho, and chum salmon in the Tanana River drainage, 2007–2017.

	Year											5-year Average	10-year Average
	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2012-16	2007-16
King Salmon													
Chena River	824	530	1,506	515	599	245	95	10	0	0	57	70	432
Salcha River	1,575	299	982	1,108	769	682	23	0	0	1,425	20	426	686
Chatanika River	0	86	0	16	32	215	0	0	0	0	20	43	35
Goodpaster River[a]	0	0	104	0	0	0	0	0	0	0	0	0	10
Other Tanana	64	0	40	220	32	0	11	0	0	107	41	24	47
Total	2,463	915	2,632	1,859	1,432	1,142	129	10	0	1,532	138	563	1,211
Coho Salmon													
Nenana River drainage	15	298	19	410	0	212	130	357	0	0	258	140	144
Delta Clearwater R.	3,210	475	4,311	3,214	3,761	2,316	1,747	6,278	4,378	4,853	2,844	3,914	3,454
Other Tanana	118	966	0	55	0	95	75	20	15	0	179	41	134
Total	3,343	1,739	4,330	3,679	3,761	2,623	1,952	6,655	4,393	4,853	3,281	4,095	3,733
Chum Salmon													
Chena River	26	185	101	50	551	118	0	38	19	27	415	40	112
Minto Flats	0	0	70	0	0	0	0	0	0	0	0	0	7
Salcha River	165	46	35	24	44	42	290	0	118	0	18	90	76
Delta Clearwater R.	105	0	0	11	14	0	130	24	52	21	182	45	36
Other Tanana	9	405	320	73	11	251	29	109	0	69	12	118	141
Total	305	636	526	158	620	411	580	171	189	117	627	294	371

Source: Alaska Sport Fishing Survey database [Internet]. 1996– . Anchorage, AK: Alaska Department of Fish and Game, Division of Sport Fish (cited October 30, 2018). Available from: http://www.adfg.alaska.gov/sf/sportfishingsurvey/

[a] Prior to 2007, the Goodpaster River was closed to salmon fishing. In 2007, the Goodpaster River was open to no retention of king salmon only.

Table 6.–Coho salmon survey counts from the Tanana River drainage, 2007–2018.

Surveyed Stream	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018[a]	5-year Average 2013–2017	10-year Average 2008–2017
Delta Clearwater R.	14,650	7,500	16,850	5,867	6,180	5,230	6,222	4,285	19,553	6,767	9,616	2,884	9,289	8,807
Richardson Clearwater R.	553	265	155	1,002	575	515	647	1,941	3,742	1,350	ND	ND	1,920	1,132
Lost Slough	63	1,342	410	1,110	369	ND	721[d]	333	242	334	1,278	ND	547	677
Nenana River mainstem	ND	1,539	ND	280	ND	106	225	ND	1,789	1,680	862	ND	1,139	926
Otter Creek (17-mile Slough)	1,733	1,652	680	720	912	405	425	886	3,890	2,746	1,942	ND	1,978	1,426
Julius Creek	10	0	2	0	0	ND	0	0	ND	0	0	ND	0	0
*Wood Creek	605	578	470	340	0	0	55	649	1,419	1,327	2,025	ND	1,095	686
*Clear Creek	1,268	292	0 [b]	130	516	0	2	25	164	27	9	ND	45	129
*Glacier Creek	2	0[b]	0 [b]	0 [b]	156	0	30	0	6	20	0	ND	11	30
Lignite Creek	334	343	113	234	ND	ND	1	37	26	ND	ND	ND	21	126
June Creek	45	42 [c]	18	ND	ND	ND	ND	3	ND	ND	ND	ND	3	11

Source: A. Padilla, biologist, ADF&G – CFD, Fairbanks, personal communication.

ND = No data.

[a] Survey not conducted yet

[b] Silty; poor visibility.

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

[d] Incomplete survey (lack of daylight).

* Tributaries to Julius Creek.

Table 7.–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 (~6-12 in)	(SE)	Quality size ≥270mm (~12 in)	(SE)	Stock size 150–269 mm (~6-12 in)	(SE)	Quality size ≥270mm (~12 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: Holmes et al. 1986; Clark and Ridder 1987a, 1988; Clark 1989, 1990, 1991, 1993, 1994, 1995, 1996; Ridder and Fleming 1997; Ridder 1998b, 1999; 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 150–269 mm (~6-10.5 in).

Table 8.–Sport catch of Arctic grayling in the Tanana River drainage, 2007–2017.

	Year											5-year Average	10-year Average
Water Body	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2012-16	2007-16
Chatanika River Total	10,394	11,229	6,990	4,659	7,150	4,855	10,362	18,102	6,086	8,791	8,702	9,639	8,862
Upper Chatanika	6,642	9,243	2,253	3,428	4,210	2,958	5,338	11,611	4,302	1,916	6,694	5,225	5,190
Lower Chatanika	3,752	1,986	4,737	1,231	2,940	1,897	5,024	6,491	1,784	6,875	2,008	4,414	3,672
Nenana Drainage Total	3,120	10,159	9,494	8,679	12,543	8,987	9,099	6,519	13,720	14,475	12,212	12,317	10,558
Nenana River (excluding Brushkana and Fish Creek)	2,081	2,789	5,157	1,977	3,908	998	2,239	5,788	12,343	7,155	5,171	5,034	4,108
Brushkana Creek	1,039	7,370	4,337	2,574	3,674	1,236	3,167	731	1,377	1,013	1,226	1,505	2,652
Chena River Total	45,673	28,909	26,316	27,067	15,579	18,776	53,034	24,234	24,836	12,920	25,594	26,760	27,734
Upper Chena	31,366	20,315	14,356	18,274	9,820	13,722	22,262	16,303	11,006	7,905	11,228	14,240	16,533
Lower Chena	14,307	8,594	11,960	8,793	5,759	5,054	30,772	7,931	13,830	5,015	14,366	12,520	11,202
Piledriver Slough	3,316	5,030	5,295	6,717	3,475	2,291	3,202	2,939	1,395	451	381	2,056	3,411
Salcha River	11,759	4,531	14,811	5,670	3,775	6,182	8,276	2,360	5,268	3,555	4,668	5,128	6,619
Goodpaster River	2,947	3,116	3,417	1,574	1,444	1,274	236	1,895	1,041	2,576	338	1,404	1,952
Delta Clearwater River	22,112	8,912	20,714	12,081	9,758	11,063	11,551	10,778	14,066	12,065	14,717	11,905	13,310
Fielding Lake	5,199	4,589	3,605	14,095	424	2,445	2,027	903	1,910	1,683	7,618	1,794	3,688
Tangle Lakes	32,491	20,166	30,536	27,682	18,653	19,281	30,820	24,806	16,813	19,927	16,908	22,329	24,118
Other Tanana	7,160	12,104	14,814	7,769	7,273	8,059	11,548	11,299	22,943	9,351	12,056	9,668	9,746
Total	144,171	108,745	135,992	115,993	80,074	83,213	140,155	103,835	102,005	85,794	103,194	103,000	109,998

Source: Alaska Sport Fishing Survey database [Internet]. 1996– . Anchorage, AK: Alaska Department of Fish and Game, Division of Sport Fish (cited October 30, 2018). Available from: http://www.adfg.alaska.gov/sf/sportfishingsurvey/

Table 9.–Sport harvest of Arctic grayling in the Tanana River drainage, 2007–2017.

	Year											5-year Average	10-year Average
Water Body	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2012-2016	2007-2016
Chatanika River Total	461	989	208	774	616	291	690	3,491	231	1,202	1,288	1,181	895
Upper Chatanika	231	518	105	491	496	89	417	765	193	400	934	373	371
Lower Chatanika	230	471	103	283	120	202	273	2,726	38	802	354	808	525
Nenana Drainage Total	577	928	468	538	756	1,022	473	600	1,410	1,532	656	1,007	830
Nenana River (excluding Brushkana and Fish Creek)	440	587	203	120	473	298	116	352	1,105	511	272	476	421
Brushkana Creek	137	341	265	418	283	194	357	189	272	53	184	213	251
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	211	0	0	0	0	0	0	0	0	0	21
Salcha River	1,365	576	2,165	1,556	806	709	1,547	504	265	228	336	651	972
Goodpaster River	676	528	640	443	71	202	17	302	19	214	87	151	311
Delta Clearwater River	172	214	0	14	0	86	0	266	244	99	0	139	110
Fielding Lake	636	738	33	585	70	460	381	139	457	232	116	334	373
Tangle Lakes	1,131	1,897	2,125	2,656	2,031	1,245	1,482	1,271	1,502	1,309	1,274	1,362	1,665
Other Tanana	1,223	1,655	1,993	899	563	563	1,041	472	763	881	726	744	1,005
Total	6,241	7,525	7,843	7,465	4,913	4,578	5,631	7,045	4,891	5,697	4,483	5,568	6,183

Source: Alaska Sport Fishing Survey database [Internet]. 1996– . Anchorage, AK: Alaska Department of Fish and Game, Division of Sport Fish (cited October 30, 2018). Available from: http://www.adfg.alaska.gov/sf/sportfishingsurvey/

Table 10.–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	SE
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: Ridder 1998a, 1999; Ridder and Gryska 2000; Gryska 2001; Wuttig and Gryska 2010.

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

Table 11.–Abundance estimates (SE) of Arctic grayling within the Chatanika River.

		Length (mm FL)	
Year	Index area	≥270	≥330
1995	3.2 upstream of Elliot Br to Any Cr (29.6 km)	3,027 (ND)	267 (ND)
2002	Sourdough Cr. to Perhaps Cr (18.3 km)	205 (36)	ND
2007	Sourdough Cr. to Perhaps Cr (18.3 km)	775 (152)	91(37)
2007	Faith to Any Cr (122.6 km)	11,934 (1,881)	1,416 (1,076)
2007	3.2 upstream of Elliot Br to Any Cr (29.6 km)	2,132 (562)	407 (172)

Source: Fleming 1998; Wuttig 2004; Wuttig and Gryska 2011.

Table 12.–Abundance estimates of Arctic grayling (N) for the Lower Salcha River (Richardson Highway bridge to river mile 25) (~40 km), 1988–1994, 2004.

Year	N (SE)	Length (mm FL)	Date	N (SE) [a]	Length (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	–	–	June 29–July 15	2,042 (434)	≥270

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

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

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

Table 13.–Sport harvest and catch of northern pike in the Tanana River drainage, 2007–2017.

	Year											5-year Average	10-year Average
	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2012–2016	2007–2016
Harvest													
Minto Flats	1,712	258	765	569	396	303	350	485	360	75	523	315	527
Minto Flats complex [a]	1,809	386	873	609	422	412	382	597	372	196	589	392	606
George Lake	776	264	567	681	82	653	67	431	433	102	0	337	406
Healy Lake	0	0	88	0	0	0	142	0	0	60	16	40	29
Deadman Lake	0	72	13	0	0	23	0	0	0	0	0	5	11
Volkmar Lake	0	51	26	59	16	31	0	58	37	0	11	25	28
Mineral Lake (into Station Creek)	45	0	170	168	0	0	66	40	41	0	8	29	53
Other Tanana	1,270	608	1,279	1,135	689	1,181	1,430	741	955	1,349	472	1,131	1,064
Total Tanana Harvest	3,900	1,381	3,016	2,652	1,209	2,300	2,087	1,867	1,838	1,707	1,096	1,960	2,196
Catch													
Minto Flats	11,346	2,926	6,623	6,477	3,362	4,113	3,101	1,947	4,395	1,986	7,918	3,108	4,628
Minto Flats complex[a]	14,077	3,952	7,915	8,088	3,911	4,481	3,284	2,218	4,417	2,584	8,578	3,397	5,493
George Lake	6,889	1,442	3,152	4,010	1,574	8,463	1,255	4,830	470	2,606	494	3,525	3,469
Healy Lake	0	0	704	0	0	0	1,480	29	0	196	183	341	241
Deadman Lake	345	180	707	0	0	1,570	0	0	0	112	32	336	291
Volkmar Lake	174	51	244	381	244	188	0	145	817	0	11	230	224
Mineral Lake (into Station Creek)	465	0	440	309	0	0	196	259	104	145	49	141	192
Other Tanana	9,627	4,669	5,719	7,288	7,943	4,822	9,078	7,170	8,935	6,807	2,460	7,362	7,209
Total Tanana Catch	31,577	10,330	18,881	20,076	13,672	19,524	15,293	14,743	14,743	12,450	11,807	15,332	17,120

Source: Alaska Sport Fishing Survey database [Internet]. 1996– . Anchorage, AK: Alaska Department of Fish and Game, Division of Sport Fish (cited October 30, 2018). Available from: http://www.adfg.alaska.gov/sf/sportfishingsurvey/

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

Table 14.–Estimated northern pike abundance in the Minto Lakes Study Area during 1996–2018, and with the Chatanika River Overwintering Area in 2018.

		≥ 400mm (~16 in) [a]		≥ 600mm (~24 in)		≥ 720 mm (~30 in)	
Year	Area	Abundance	SE	Abundance	SE	Abundance	SE
1996	MSLA-B	23,850	7,799	7,616	883	-	-
1997		16,547	1,754	3,251	174	672	48
2000	MSLA-B	-	–	5,331	1,152	-	-
2003	MSLA-B	25,227	4,529	7,683	2,347	1,405	288
2008[a]	MSLA-A[b]	16,045	3,132	2,219	397	958	362
	MSLA-B	9,854	1,701	2,092	448	635	635
2018	CROA			19,943	2537	3,098	510
	MSLA-A			14,569	2034	2,380	432

Source: Roach 1997, 1998; Scanlon 2001, 2006; Joy 2009.

Note: SE = standard error.

[a] Estimated abundance of northern pike 400–600 mm FL are biased, and the magnitude of this is unknown.

[b] In 2008, the geographical size of the study area was expanded and is referred to as "Area A." "Area B" is the same study area that was used during 1996–2003.

Table 15.–Number of subsistence permits issued, returned, and reported fished, and total subsistence harvest of northern pike in the Tolovana River drainage, 1995–2018.

Year	Permits			Total Harvest
	Issued	Returned	Fished	
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	101	97	56	788
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
2012	73	68	35	525
2013	77	74	45	231
2014	106	105	57	478
2015	120	119	66	765
2016	201	196	129	1,020
2017	93	93	41	137
2018[a]	168	48	84	744
5-Year Average 2012–2016	113	111	66	604
10-Year Average[b] 2007–2016	111	107	59	697

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

[a] Preliminary data based on permits returned and telephone harvest reporting as of 10/31/18. Permits expire at the end of the calendar year.

[b] 2006–2017 is used as a 10-year average in order to make a comparison to the available SWHS estimates and averages.

Table 16.–Estimates of abundance of northern pike >18 in (~450 mm) in George and Volkmar lakes, 1985–2009.

	Volkmar Lake		George Lake	
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	No Survey	

Source: Clark and Gregory 1988; Clark et al. 1988; Pearse 1990; Pearse 1991; Pearse and Burkholder 1993; Pearse 1994a; Hansen and Pearse 1995; Timmons and Pearse 1989; Scanlon 2001; Wuttig and Reed 2010; Wuttig 2010.

SE = standard error.

Table 17.–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; 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) and are usually ≥450 mm FL.

Table 18.–Sport harvest and catch of burbot in the Tanana River drainage, 2007–2017.

	Year											5-year Average	10-year Average
Harvest	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2012–2016	2007–2016
Lower Tanana River and tributaries	90	365	0	0	0	50	17	20	0	0	22	17	54
Middle Tanana River and tributaries	1,636	519	361	968	450	406	722	487	794	843	820	650	719
Chena River	960	202	262	125	26	84	12	884	58	27	110	213	264
Salcha River	60	0	361	110	0	0	44	61	0	0	0	21	64
Upper Tanana River and tributaries	495	0	658	82	0	243	382	32	501	388	0	309	278
Fielding Lake	0	0	0	0	0	67	0	0	0	0	0	13	7
Tangle Lakes	12	17	0	37	0	0	0	99	0	14	0	23	18
George Lake	0	17	52	220	12	217	97	162	312	37	0	165	113
Other Tanana	370	107	185	468	536	61	162	0	171	380	80	155	244
Total Tanana Harvest	3,623	1,227	1,879	2,010	1,024	1,128	1,436	1,745	1,877	1,689	1,032	1,575	1,764
Catch													
Lower Tanana River and tributaries	180	365	0	0	6	50	17	20	0	0	44	17	64
Middle Tanana River and tributaries	1,735	777	465	1,548	632	456	817	607	911	988	856	756	894
Chena River	1,290	227	287	157	38	84	36	891	117	27	141	231	315
Salcha River	60	0	361	110	0	0	62	61	0	0	0	25	65
Upper Tanana River and tributaries	1,695	0	2,859	330	0	340	415	32	1,338	1,939	46	813	895
Fielding Lake	0	0	34	0	0	67	0	0	0	0	0	13	10
Tangle Lakes	54	17	0	37	0	0	0	99	0	14	0	23	22
George Lake	0	84	52	220	12	217	130	182	312	37	0	176	125
Other Tanana	413	120	198	762	536	85	216	40	251	380	113	194	300
Total Tanana Catch	5,427	1,590	4,256	3,164	1,224	1,299	1,693	1,932	2,929	3,385	1,200	2,248	2,690

Source: Alaska Sport Fishing Survey database [Internet]. 1996– . Anchorage, AK: Alaska Department of Fish and Game, Division of Sport Fish (cited October 30, 2018). Available from: http://www.adfg.alaska.gov/sf/sportfishingsurvey/

Table 19.–Humpback whitefish and least cisco abundance estimates from the Chatanika River, 1988–1997, 2008, and 2012.

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	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	No Survey
1996	No Survey	No Survey
1997	16,107 (SE = 1,260)	22,811 (SE = 4,496)
1998–2007	No Survey	No Survey
2008	22,490 (SE = 2,777)	15,345 (SE = 1,350)[b]
2012	12,755 (SE = 1,405)	No Survey

Source: Hallberg 1989, Timmons 1990, 1991; Fleming 1993, 1994, 1996, 1997; Wuttig 2009, Gryska 2014.

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

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

Table 20.–Chatanika River personal use whitefish spear fishery permit results, 2007–2018.

Year	Permits		Number of Households that Fished	Whitefish Species				Total Whitefish Harvest	Average Harvest/ Permit
	Issued	Returned		Least Cisco	Humpback	Round	Unknown		
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
2012	200	198	123	318	372	136	41	867	7.05
2013	200	199	153	324	495	139	147	1,105	7.22
2014	200	198	141	220	206	141	23	590	4.18
2015	200	196	115	330	105	107	23	565	4.91
2016	224	219	148	403	198	177	77	855	5.78
2017	227	203	134	481	237	181	63	962	7.18
2018[a]	225	101	81	251	59	103	24	437	5.39

Source: ADF&G, Sport Fish Division, Fairbanks, unpublished data.

[a] Preliminary data

Table 21.–Sport harvest and catch of wild lake trout in the Tanana River drainage, 2007–2017.

	Year											5-year Average	10-year Average
	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2012–2016	2007–2016
Harvest													
Harding Lake	28	23	0	192	28	32	0	0	20	21	13	15	34
Fielding Lake	40	7	18	48	2	64	161	0	32	21	29	56	39
Tangle Lakes	383	190	333	640	300	161	401	206	72	374	205	243	306
Other Tanana	113	72	433	68	113	62	171	187	360	43	37	149	154
Total Tanana Harvest	564	292	784	948	443	319	733	393	484	459	284	462	534
Catch													
Harding Lake	263	104	303	845	255	79	171	109	531	343	104	247	300
Fielding Lake	227	103	552	309	12	299	335	145	291	117	286	237	239
Tangle Lakes	1,580	541	1,140	3,266	1,216	1,222	590	801	1,121	1,049	851	957	1253
Other Tanana	369	808	1,444	152	153	94	310	672	2,387	172	3,275	667	626
Total Tanana Catch	2,439	1,556	3,439	4,572	1,636	1,694	1,406	1,727	4,030	1,681	4,516	2,108	2,418

Source: Alaska Sport Fishing Survey database [Internet]. 1996–. Anchorage, AK: Alaska Department of Fish and Game, Division of Sport Fish (cited October 30, 2018). Available from: http://www.adfg.alaska.gov/sf/sportfishingsurvey/

Table 22.–Contribution of stocked fish to the Tanana River drainage total effort, harvest, and catch, 2007–2017.

	Year											5-year Average	10-year Average
	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2012–2016	2007–2016
Effort													
Effort on Stocked Waters	37,303	34,091	38,870	43,513	24,776	25,885	29,722	44,830	32,125	29,465	25,474	32,277	33,994
Total TRMA Effort (stocked + wild)	100,956	72,335	92,497	96,859	67,378	69,691	85,301	96,140	76,241	71,055	66,897	79,686	82,845
Percent Stocked Waters Effort	37%	47%	42%	45%	37%	37%	35%	47%	42%	41%	38%	41%	41%
Harvest													
Rainbow trout	17,841	10,576	9,909	10,910	7,663	6,069	9,067	10,254	22,086	18,834	11,082	13,262	12,321
Landlocked salmon	4,289	5,352	2,540	2,832	1,227	800	1,179	4,126	1,753	7,980	3,655	3,168	3,208
Arctic grayling	498	546	292	786	181	243	182	955	538	983	82	580	520
Arctic char	1,967	2,780	2,721	1,667	1,178	528	620	846	473	2,373	927	968	1,515
Lake trout	84	214	413	138	0	32	43	25	80	0	0	36	103
Other	0	0	0	19	0	84	0	0	213	0	30	59	32
Total stocked fish harvest	24,679	19,468	15,875	16,352	10,249	7,756	11,091	16,206	25,143	30,170	15,776	18,073	17,699
Total TRMA Harvest (stocked + wild)	40,717	30,949	30,689	32,152	19,348	16,847	22,351	28,907	34,919	41,459	24,053	28,897	29,834
Percent Stocked Waters Harvest	61%	63%	52%	51%	53%	46%	50%	56%	72%	73%	66%	63%	59%
Catch													
Rainbow trout	53,744	41,522	42,612	48,609	35,547	31,385	31,462	37,250	60,442	45,812	29,218	41,270	42,839
Landlocked salmon	13,450	9,593	8,795	7,276	2,980	5,189	3,947	14,589	3,323	19,280	8,642	9,266	8,842
Arctic grayling	5,095	11,312	10,583	6,720	6,938	7,042	7,415	8,211	4,662	5,498	3,934	6,566	7,319
Arctic char	6,968	6,130	5,695	4,714	4,000	3,010	3,839	2,570	2,325	5,745	1,482	3,498	4,500
Lake trout	84	444	1,123	343	497	79	43	25	300	0	0	89	294
Other	6	0	0	31	0	84	0	48	384	0	30	103	55
Total stocked fish catch	79,347	69,001	68,808	67,693	49,962	46,789	46,706	62,693	71,436	76,335	43,306	60,792	63,848
Total TRMA Catch (stocked + wild)	270,784	194,083	240,966	221,497	154,977	158,739	212,200	191,389	204,522	191,092	163,608	191,582	204,022
Percent Stocked Waters Catch	29%	36%	29%	31%	32%	29%	22%	33%	35%	40%	26%	32%	31%

Source: Alaska Sport Fishing Survey database [Internet]. 1996– . Anchorage, AK: Alaska Department of Fish and Game, Division of Sport Fish (cited October 30, 2018). Available from: http://www.adfg.alaska.gov/sf/sportfishingsurvey/

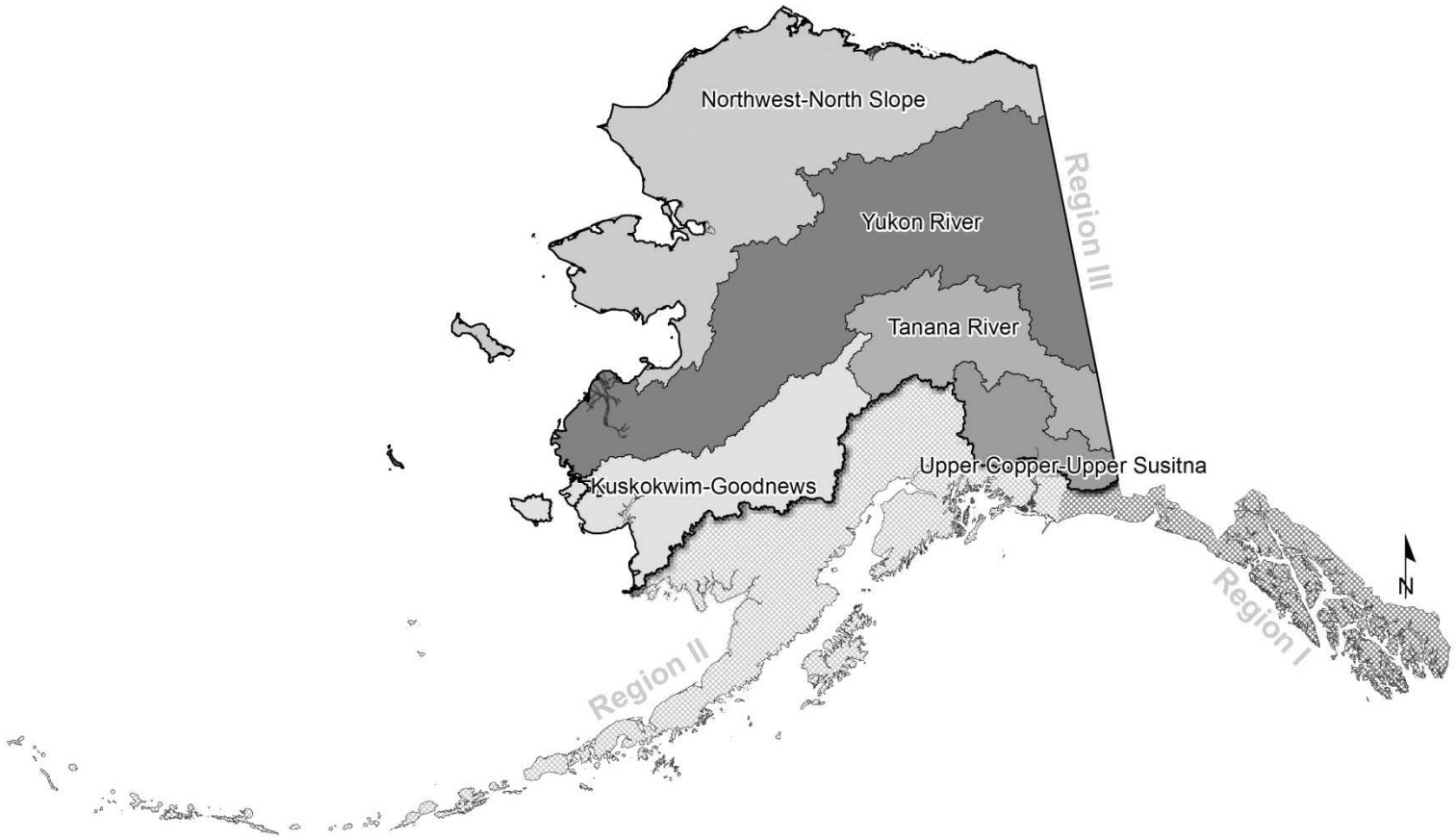

Figure 1.–The regional divisions (I-III) for ADF&G - Division of Sport Fish, and the 5 management areas within Region III.

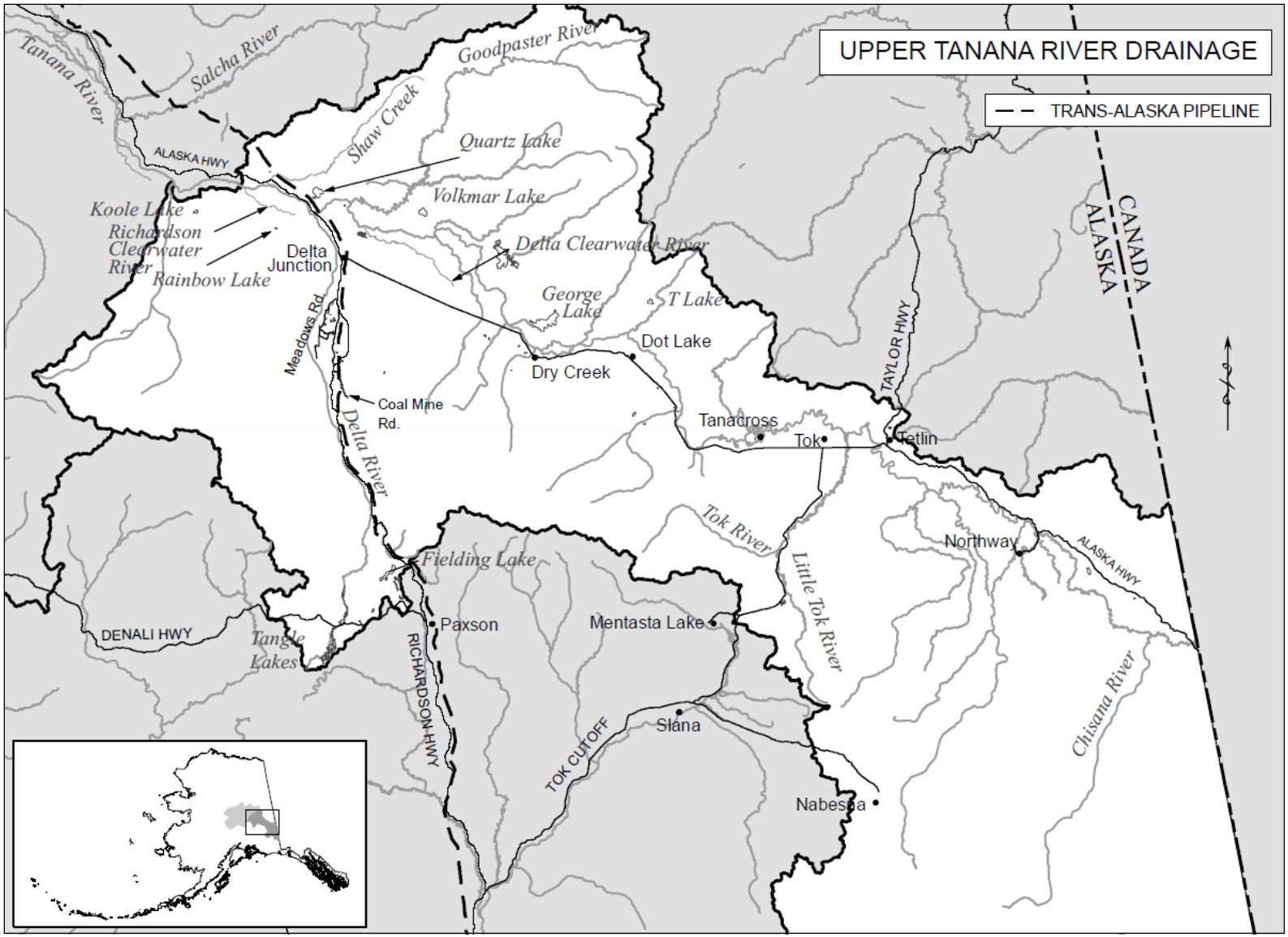

Figure 2.–The portion of the Tanana River drainage located upriver from the Salcha River.

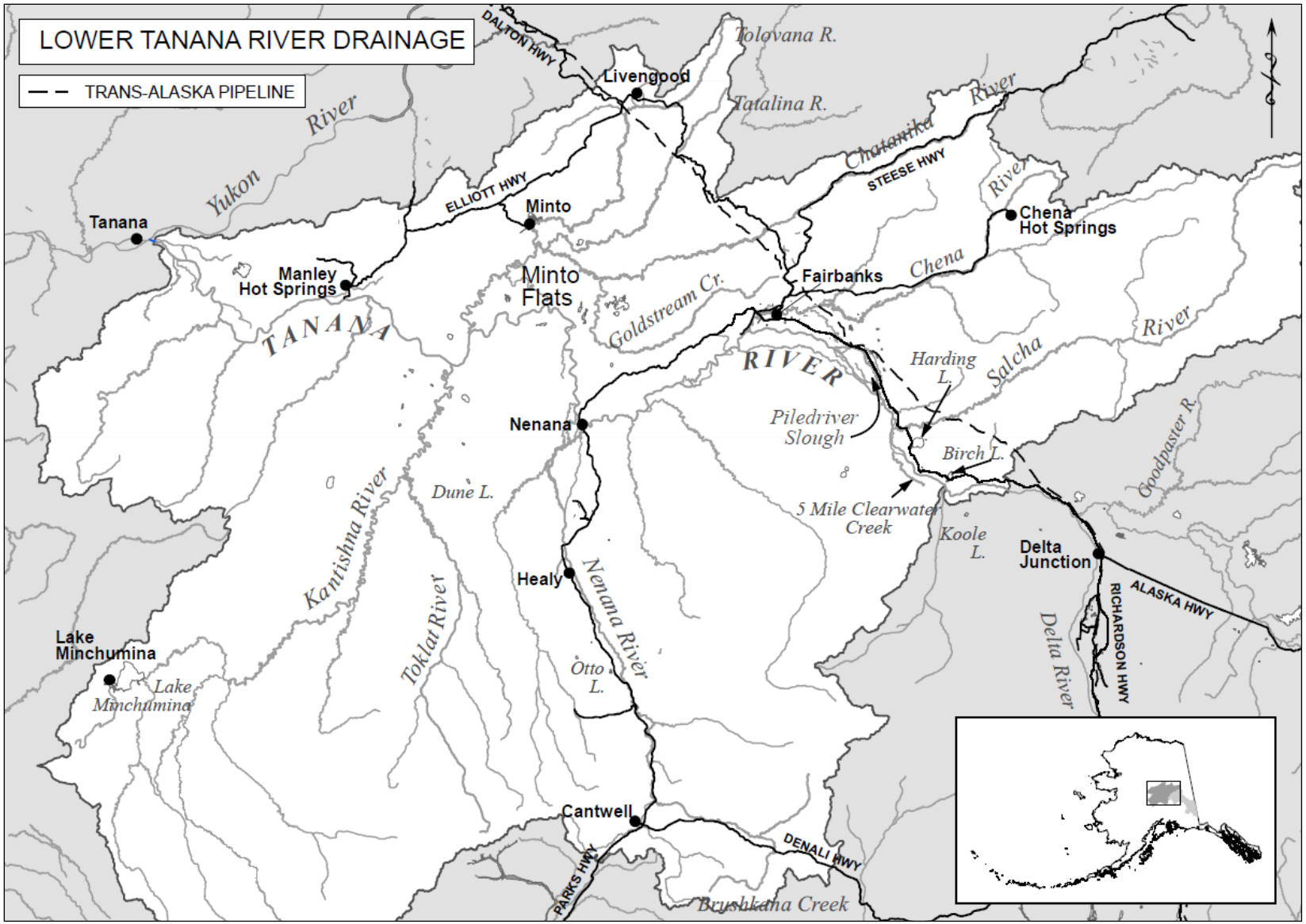

Figure 3.–The portion of the Tanana River drainage located downriver from Shaw Creek.

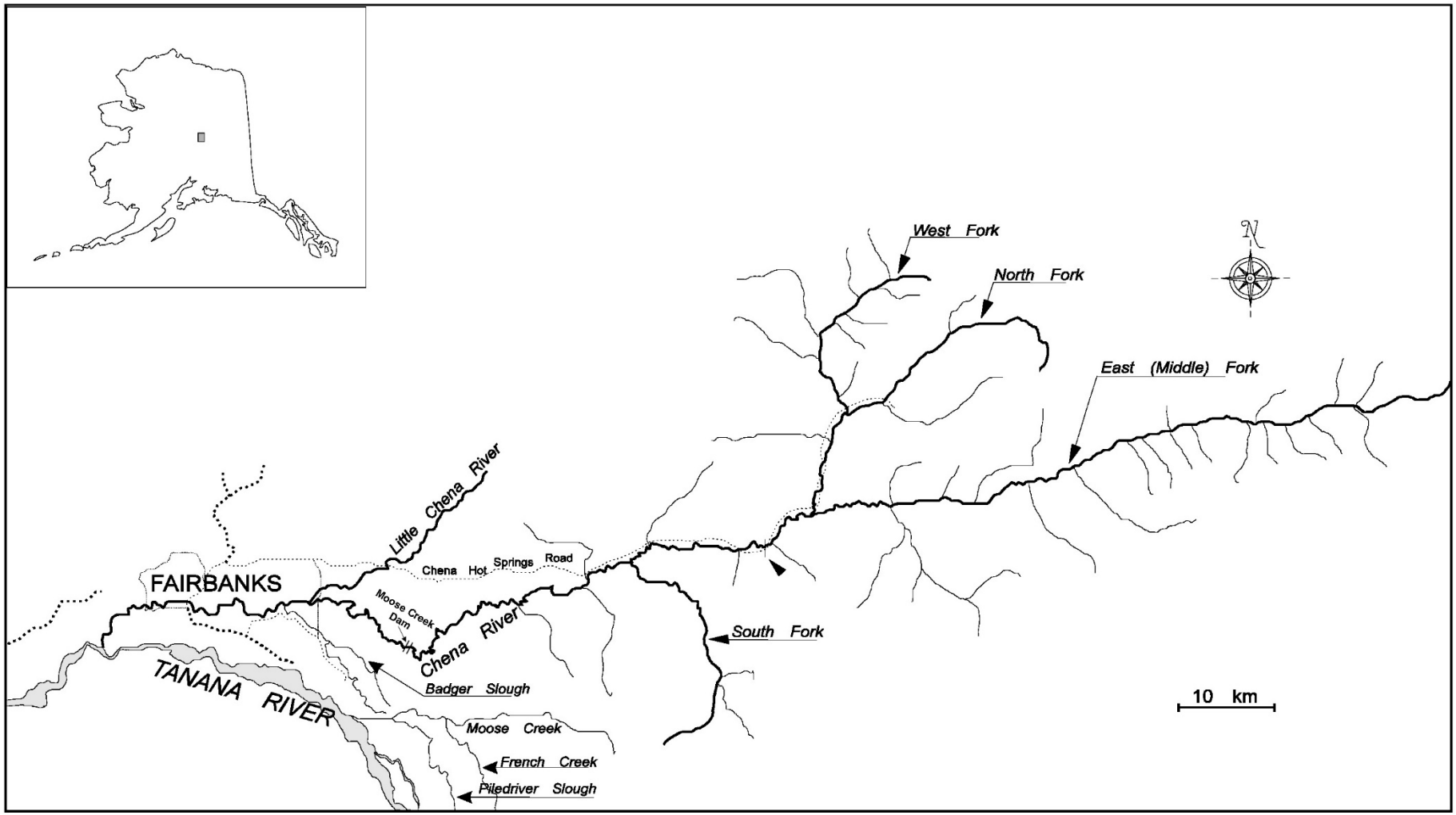

Figure 4.–The Chena River drainage.

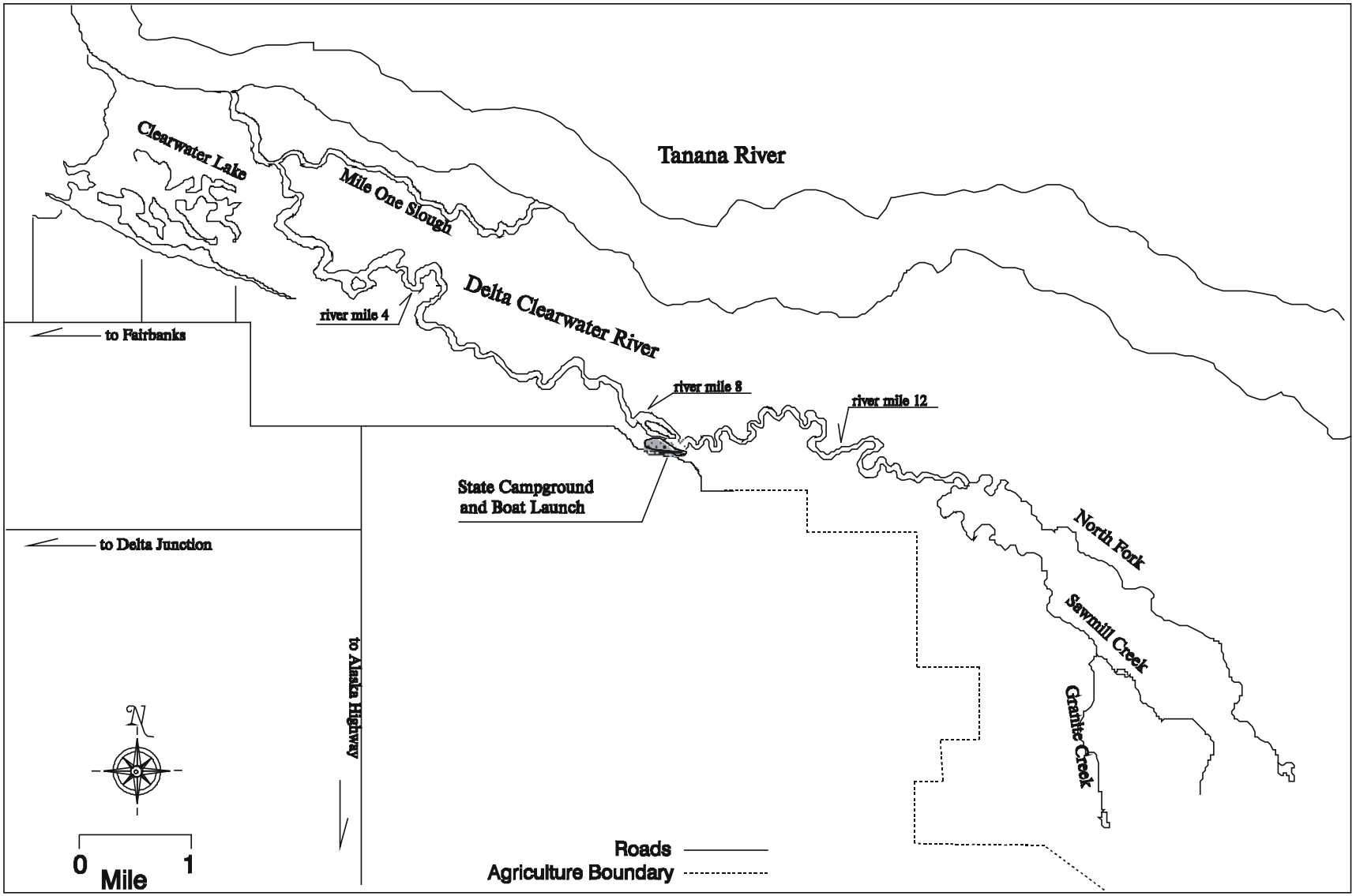

Figure 5.–The Delta Clearwater River.

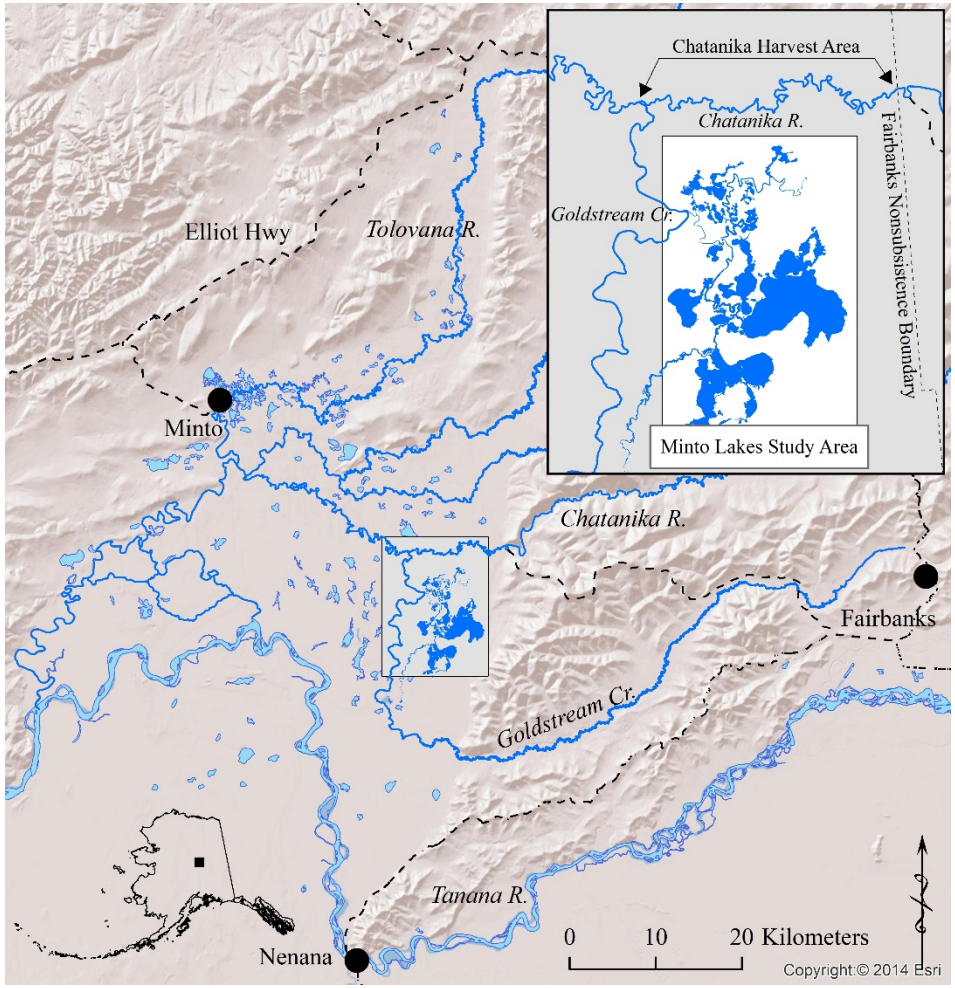

Figure 6.–Minto Flats wetland complex with demarcation of harvest reporting area and the northern pike population assessment area.

APPENDIX A

Appendix A1.–Emergency orders issued for Tanana River Management Area sport fisheries, 2013–2018.

Year	E. O. Number	Explanation
2013	3-KS-10-13	Prohibited the retention of sport caught king salmon in all flowing waters of the Tanana River drainage effective 12:01 a.m. Friday, July 12, 2013. The use of bait in all tributaries of the Tanana River drainage was also prohibited.
	3-KS-12-13	Closed the Chena River and the Tanana River within a half-mile radius of the mouth of the Chena River to king salmon fishing and the use of bait and reopened the Salcha River to king salmon retention and the use of bait. The retention of sport caught king salmon in all other flowing waters of the Tanana River drainage remained prohibited, and the use of bait in all tributaries of the Tanana River drainage (excluding the Salcha River) remained prohibited, effective 12:01 a.m. Monday, July 29, 2013.
	3-SS-01-13	Prohibited retention of coho salmon in all waters of the Delta Clearwater River, including the Clearwater Lake drainage, effective 12:01 a.m. Saturday, October 5, 2013.
2014	3-KS-03-14	Closed all waters of the Tanana River drainage to sport fishing for king salmon effective 12:01 a.m. Monday, May 12, 2014.
2015	3-KS-05-15	Closed all waters of the Tanana River drainage to sport fishing for king salmon effective 12:01 a.m. Monday, June 15, 2015.
2016	3-NP-04-16	Reduced the 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 in or greater in length, effective, 12:01 a.m. Wednesday, June 1, 2016.
2016	3-KS-08-16	Prohibited the use of bait while sport fishing in all tributaries of the Tanana River drainage effective 12:01 a.m. Saturday, July 2, 2016, and suspended August 10, 2016.
2017		No Emergency Orders issued.
2018	3-KS-U-4-18	Reduced the bag limit to one king salmon and prohibited the use of bait in the Tanana River Drainage.

APPENDIX B

Appendix B1.–Angler effort (angler-days) and fish species kept and released in the Tanana River Area, as reported in the freshwater guide logbooks, 2006–2017.

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
2011	1,683	2	85	30	0	115	34	133	0
2012	1,811	0	29	68	0	250	42	0	0
2013	2,135	0	10	41	0	612	83	51	0
2014	2,978	0	2	157	1	1,759	94	8	0
2015	3,628	1	39	98	0	2,453	85	20	0
2016	5,013	3	81	108	0	2,390	110	16	0
2017[a]	ND								
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
2011	1,683	4	65	42	1	103	8,758	406	0
2012	1,811	0	67	58	0	77	8,396	65	0
2013	2,135	1	63	139	0	312	10,125	176	0
2014	2,978	0	28	207	0	644	8,813	53	0
2015	3,628	21	101	232	0	680	12,581	17	0
2016	5,013	14	124	126	0	1,710	12,007	29	0
2017[a]	ND								

Source: Sigurdsson and Powers (2009–2017).

[a] No logbook data was available at time of publishing. ND = No data.