

Special Publication No. 12-11

Instream Flow Protection in Alaska, 2011

by

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Alaska Department of Fish and Game

Divisions of Sport Fish and Commercial Fisheries



Symbols and Abbreviations

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Weights and measures (metric)		General		Mathematics, statistics	
centimeter	cm	Alaska Administrative Code	AAC	<i>all standard mathematical signs, symbols and abbreviations</i>	
deciliter	dL	all commonly accepted abbreviations	e.g., Mr., Mrs., AM, PM, etc.	alternate hypothesis	H_A
gram	g	all commonly accepted professional titles	e.g., Dr., Ph.D., R.N., etc.	base of natural logarithm	e
hectare	ha	at	@	catch per unit effort	CPUE
kilogram	kg	compass directions:		coefficient of variation	CV
kilometer	km	east	E	common test statistics	(F, t, χ^2 , etc.)
liter	L	north	N	confidence interval	CI
meter	m	south	S	correlation coefficient (multiple)	R
milliliter	mL	west	W	correlation coefficient (simple)	r
millimeter	mm	copyright	©	covariance	cov
		corporate suffixes:		degree (angular)	$^\circ$
Weights and measures (English)		Company	Co.	degrees of freedom	df
cubic feet per second	ft ³ /s	Corporation	Corp.	expected value	E
foot	ft	Incorporated	Inc.	greater than	>
gallon	gal	Limited	Ltd.	greater than or equal to	\geq
inch	in	District of Columbia	D.C.	harvest per unit effort	HPUE
mile	mi	et alii (and others)	et al.	less than	<
nautical mile	nmi	et cetera (and so forth)	etc.	less than or equal to	\leq
ounce	oz	exempli gratia (for example)	e.g.	logarithm (natural)	ln
pound	lb	Federal Information Code	FIC	logarithm (base 10)	log
quart	qt	id est (that is)	i.e.	logarithm (specify base)	log ₂ , etc.
yard	yd	latitude or longitude	lat. or long.	minute (angular)	'
		monetary symbols (U.S.)	\$, ¢	not significant	NS
Time and temperature		months (tables and figures): first three letters	Jan,...,Dec	null hypothesis	H_0
day	d	registered trademark	®	percent	%
degrees Celsius	°C	trademark	™	probability	P
degrees Fahrenheit	°F	United States (adjective)	U.S.	probability of a type I error (rejection of the null hypothesis when true)	α
degrees kelvin	K	United States of America (noun)	USA	probability of a type II error (acceptance of the null hypothesis when false)	β
hour	h	U.S.C.	United States Code	second (angular)	"
minute	min	U.S. state	use two-letter abbreviations (e.g., AK, WA)	standard deviation	SD
second	s			standard error	SE
Physics and chemistry				variance	
all atomic symbols				population sample	Var
alternating current	AC			sample	var
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				

SPECIAL PUBLICATION NO. 12-11

INSTREAM FLOW PROTECTION IN ALASKA, 2011

by

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ABSTRACT

This report summarizes instream flow protection and related activities of the Alaska Department of Fish and Game (ADF&G) in 2011. The status of reservation of water applications by other agencies and the private sector in Alaska is also presented.

Alaska Department of Natural Resources (DNR) received 483 applications for reservations of water from ADF&G, federal agencies, and the private sector as of December 2011. Overall, ADF&G completed reservation of water applications on 165 river systems and one lake and was granted certificates of reservations for 45 applications for rivers and one lake. In 2011, ADF&G filed 15 reservation of water applications and received certificates of reservation of water for 11 river reaches.

In 2002, a Memorandum of Understanding (MOU) was signed between ADF&G and DNR to assist with the increasing backlog of reservation of water applications needing adjudication and to improve the overall process. ADF&G and DNR have continued to effectively implement the 2002 MOU and similarly, ADF&G has continued to meet and often exceed the program goal of filing 10 reservations annually. Since 2009, an average of 12 and 8 applications have been filed and granted, respectively. Whereas, from 1998 to 2008 an average of 3.7 and 1.5 applications have been filed and granted, respectively. Factors contributing to this improvement likely included: ADF&G leadership making this goal a priority, signing of the MOU which created the impetus for ADF&G and DNR to coordinate and work together to reduce the backlog, and work efficiencies gained by ADF&G and DNR staff from the skills and experience learned during implementation of the MOU.

Staff from the Statewide Aquatic Resources Coordination Unit (SARCU) performed hydrologic investigations on seven sites in 2011. Investigations were generally performed to provide the necessary data to complete reservation of water applications.

SARCU staff monitored 70 existing and proposed hydroelectric and hydrokinetic projects in 2011. Staff also served as ADF&G's representative for the Alaska Clean Waters Actions program, which directs a variety of funding sources toward the recovery and stewardship of Alaska's water bodies. In 2011, 14 projects were funded by the ACWA grant pool.

Key words: instream flow, reservation of water, water rights, Alaska Water Use Act, Sitkoh Creek, Chilkoot River, Cowee Creek, Lost River, Fish Creek, Meadow Creek, Stariski Creek, Eagle Lake, Orchard Lake, Turner Lake, Federal Energy Regulatory Commission, hydroelectric, hydrokinetic, Alaska Clean Water Actions, streamgaging, instream flow education, training, and outreach.

INTRODUCTION

The State of Alaska has abundant and diverse sport fisheries that are of considerable recreational importance to anglers and others. To date, 17,897 water bodies in Alaska have been identified as supporting anadromous fish species (personal communication, J. Johnson, Habitat Biologist, Alaska Department of Fish and Game, May 11, 2012).

In 2010, an estimated 442,098 anglers fished 2,000,167 days and harvested approximately 2,566,595 of the approximately 5,941,817 fish caught in Alaska (Jennings et al. 2011). The continued production of these fishery resources depends, in part, upon sufficient amounts of

good quality water to maintain seasonal fish habitat requirements in rivers, lakes, and related habitats. Fish and other aquatic and terrestrial organisms have adapted to natural hydrologic regimes that provide essential seasonal habitats utilized by the various life stages of each species. Varying seasonal quantities of flowing waters or lake volumes are needed by fish using freshwater and estuarine habitats for migration, spawning, incubation, and rearing (Hynes 1970; Estes 1984; Hill et al. 1991; Poff et al. 1997; Bovee et al. 1998; Annear et al. 2004).

The Fish and Game Act requires Alaska Department of Fish and Game (ADF&G) to "...manage, protect, maintain, improve, and extend the fish, game and aquatic plant resources of the state in the interest of the economy and general well-being of the state" (AS 16.05.020). The act also enables ADF&G to use a variety of legal, regulatory and administrative options to quantify and acquire water rights within lotic¹ and lentic² water bodies to sustain fish and wildlife resources (AS 16.05.050). Fish habitat permits (AS 16.05.841 and .871) issued by the department are one of the tools that can be used to retain sufficient amounts of water to protect fish habitat in lotic and lentic fish-bearing systems. For decisions that have the potential to impact a fish-bearing water body, ADF&G and the Alaska Department of Natural Resources (DNR) have agreed to coordinate water right and fish habitat permits to ensure permit conditions are consistent.³

Alaska's statutory tools pertaining to consideration and protection of instream flows in rivers and water levels in lakes were complimented by passage of an amendment to the Alaska's Water Act in 1980, commonly referred to as Alaska's instream flow law. Alaska's water law treats the term *instream flow* more broadly than most states' jurisdictions because the term may be used to refer to the rate or volume of flow in a river, the volume of water in a lake, or a related physical attribute such as water depth for identified resources and values. Water rights to retain water in lentic and lotic habitats can be acquired from DNR by a private individual, group, or government agency for one or a combination of four purposes:

- protection of fish and wildlife habitat, migration, and propagation;
- recreation and park purposes;
- navigation and transportation purposes; and
- sanitary and water quality purposes.

Alaska's water law follows the prior appropriation doctrine which assigns seniority of water rights in the order they are filed (Alaska Constitution, Article VIII, Section 13). Under Alaska water law, an appropriation to retain water within a water body for any of these purposes may also be defined as a "*reservation of water*" (AS 46.15.145). The term, "*reservation of water*" is often used to differentiate between retaining water within lotic or lentic water bodies versus out-of-stream withdrawals.⁴ It is important to note that passage of the instream flow law expanded the meaning of *appropriation* in Alaska to represent all water right uses, including retention of water in lotic and lentic water bodies. However, an *appropriation* is still more commonly associated with out-of-stream and diversionary uses/water rights while the term *reservation* typically refers to retention of water within a lotic and lentic water body. Further information

¹ Lotic refers to flowing waters such as rivers and streams.

² Lentic refers to still waters such as lakes and ponds.

³ Memorandum from F. Rue, ADF&G Director of Habitat Division to G. Gustafon, DNR Director of Division of Land and Water Management, August 10, 1989 reaffirmed by ADF&G and DNR on December 16, 2009.

⁴ Withdrawals can be from surface or subsurface water sources.

related to Alaska's instream flow law can be found in Curran and Dwight (1979), White (1982), Anderson (1991), Harle and Estes (1993), Spence (1995), and Burkhardt (2000).

The Statewide Aquatic Resources Coordination Unit (SARCU) was created within the Division of Sport Fish (SF) in 1986 to acquire water rights for the protection of sport fish resources and related instream uses⁵. Initially, the focus for SARCU was quantifying and acquiring reservations of water in priority fish-bearing water bodies to avoid over-appropriation of water resources. Over time, SARCU expanded to address other instream flow related issues such as hydroelectric licensing under the Federal Energy Regulatory Commission (FERC) and representation in the Alaska Clean Waters Action (ACWA) program. SARCU staff also developed the capacity to collect streamflow data for filing reservation of water applications. SARCU staff are supported with funding from the U.S. Fish and Wildlife Service (USFWS) Sport Fish Restoration Grant Program (Federal Aid) and the Alaska Sustainable Salmon Fund (AKSSF). This report summarizes instream flow protection activities by SARCU in 2011. The status of reservation of reservation of water activities by other agencies and the private sector is also provided.

RESERVATIONS OF WATER

To reserve water, a DNR Reservation of Water application must be completed, signed and submitted to DNR with the appropriate application fee, if applicable.⁶ Applications are prepared to comply with requirements established by state law (AS 46.15.145), state regulations (11 AAC 93.141-147), reservation of water application form instructions, and the *State of Alaska Instream Flow Handbook* (DNR 1985) when applicable. Following is an overview of the reservation of water process used by ADF&G.

Nominations

ADF&G developed nomination work plans for SF Regions 1, 2, and 3 (Figure 1; Klein 2011). These work plans served as the basis for coordinating with regional management and research staff to nominate water bodies for instream flow protection. Nomination reviews were coordinated by SF regional research coordinators and included input from other staff or agencies that had information on fish resources and/or future water uses in the region.

Final selection of water bodies to be reserved was made by the SARCU supervisor in consultation with SF regional supervisors or their designees. In general, final selections were based on the importance of a water body to the sport fishery resources for Federal Aid supported projects or salmon and steelhead species for AKSSF funded projects, the likelihood for competing out-of-stream uses, the amount of existing hydrologic data, and the ability for other mechanisms⁷ to provide instream flow protection.

⁵ This report focuses on activities associated with reservations of water for fish since funding sources for staff activities are related to this objective. Nonetheless, commercial, subsistence and other fish and wildlife resources and habitats benefit from this program.

⁶ There is no charge to state agencies.

⁷ Other mechanisms may include fish habitat permits, water right permits, Clean Water Act permits (Section 401 Water Quality Certification, Section 402 National Pollution Discharge Elimination System, and Section 404 Dredge and Fill permits), permits from land management agencies, and the Federal Power Act.

Data Compilation, Collection, and Analysis

A reservation of water application needs to include information that substantiates the amount of streamflow or level of water being requested for the selected purpose(s). Applications prepared by ADF&G included biologic and hydrologic data to support reservations of water for the protection of fish habitat, migration, and propagation. ADF&G strives to collect and analyze all data according to accepted scientific methods and procedures that would meet evidentiary standards and any challenges⁸ that may be filed.

Biologic Data

A variety of sources were used to obtain information needed to document fish use in the selected water body. This information typically included fish distribution and life history periodicity⁹ data that were summarized from ADF&G biologists, scientific literature, and the *Catalog of Waters Important for the Spawning, Rearing or Migration of Anadromous Fishes* (Johnson and Blanche 2011). SARCU staff worked with ADF&G and other biologists as needed to compile fish use information.

Hydrologic Data

DNR recommends a minimum of 5 years of continuous streamflow or lake level data to support reservation of water applications. This 5 year recommendation is intended to reduce potential bias that may be associated with intra- and inter-annual hydrologic variability.

When available, streamflow data for describing seasonal and long-term hydrologic characteristics and quantifying instream flow needs were obtained from the USGS National Water Information System (NWIS) website.¹⁰ When hydrologic data were limited or not available, SARCU collected streamflow data in accordance with USGS standards (Rantz and others 1982). Streamflow records were computed using the Water Information System Kisters Incorporated (WISKI)[®] hydrologic data management software after they were proofed for nonsensical data and transformed into a WISKI[®] compliant format. WISKI[®] is a Windows-based professional time series hydrologic management system that meets USGS standards for data computation. Streamflow records obtained from USGS or collected by SARCU were analyzed using the most current version of SAS[®] with support from SF biometricians.

Where less than 5 years of data were available, simple linear regression was used to extend or estimate streamflow data. Simple linear regression was used if a suitable, long term streamgage with a concurrent period of record was available.

Instream Flow Analysis

Under Alaska law, applicants are not required to use a specific method for quantifying instream flow needs (11 AAC 93.142; DNR 1985). The burden is on the applicant to choose and defend the approach used.

⁸ Challenges may be filed by an aggrieved party to contest the validity of the data set, analyses, and rationale for the requested amount of water the department considers necessary.

⁹ Seasonal use of habitat by species and life stage for passage, spawning, incubation, and rearing.

¹⁰ See <http://waterdata.usgs.gov/ak/nwis/sw>.

ADF&G used hydrologically based approaches combined with fish use information to quantify instream flow needs for fish. These included analyses based on historic streamflow data (Annear et al. 2004) and modification of the Tennant Method (Estes 1998; Tennant 1976) to account for local hydrologic and biologic conditions. ADF&G recommended streamflow regimes similar to the magnitude and timing of the natural flow regime to maintain seasonal use of fish habitat.

Hydrologic characteristics of a river were used as the primary basis to delineate reaches. This information came from various sources including: USGS topographic maps, ADF&G Anadromous Waters Catalog for the appropriate region (e.g. Arctic Region; Johnson and Blanche 2011), ADF&G Freshwater Fish Inventory¹¹, and USGS National Hydrography Database¹². Reach boundaries were based on documented fish use and selected to minimize differences in streamflow accretion. Major tributaries upstream and downstream of the chosen reach were generally selected as reach boundaries.

Adjudication

Adjudication is the legal process of determining the validity and amount of a water right and includes the settlement of conflicting claims among competing appropriators of record [11 AAC 93.970(1)]. Once DNR makes a determination on the amount of water to reserve, the public is provided 15 days to comment. After reviewing all public comments and if no further administrative actions are needed, DNR prepares a “Finding of Fact, Conclusion of Law and Decision” document that describes the information and rationale used for the decision and issues a Certificate of Reservation of Water. The certificate will be recorded in the State Records Office and will include a description of the water right, any conditions placed on it, and the priority date which establishes the seniority of the water right. If DNR’s decision is challenged, there is an administrative appeal process with the option to seek further remedy through Alaska’s court system.

In 2002, a Memorandum of Understanding (MOU) was signed between DNR and ADF&G to assist with the increasing backlog of reservation of water applications needing adjudication and to improve the overall process. As part of the agreement, ADF&G partially funds a position at DNR to adjudicate applications. This position also provides assistance with preparing applications and other instream flow related needs. DNR and ADF&G also meet annually to prepare a work plan that prioritizes applications to adjudicate in the coming year and discuss any instream flow related issues.

ACTIVITIES

RESERVATIONS OF WATER

Overall, ADF&G completed reservation of water applications on 165 river systems¹³ and one lake from a total of 483 applications received by DNR as of December 2011 (Figures 2 and 3 and Table 1). Certificates of reservations of water were issued for 45 rivers and one lake application submitted by ADF&G for one river and one lake under the water export provision¹⁴ (Figures 3 and 4 and Table 1), one river application submitted by BLM, and two rivers and two lakes to DNR under the water export provision (Table 1).

¹¹ See <http://www.sf.adfg.state.ak.us/SARR/Surveys/index.cfm>

¹² See <http://nhd.usgs.gov/data.html>

¹³ Six reservation of water applications were filed with project partners (see Table 1).

¹⁴ Water exported out of one of the six defined hydrologic units requires a mandatory reservation to protect fish resources (AS 46.15.035).

In 2011, ADF&G filed 15 reservation of water applications (Figures 2 and 3 and Table 2) and received certificates of reservation of water for 11 applications (Figures 4 and 5 and Table 3). DNR also transferred to ADF&G certificates of reservations for Blue Lake and Sawmill Creek near Sitka, which were granted under the water export provision. It was agreed that ADF&G would be the proper steward of these certificates since the purpose for the reservation was to protect fish habitat, migration, and propagation and ADF&G is the State's principal manager of fish and wildlife resources and their habitats.

ADF&G has continued to meet and often exceed the program goal of filing 10 reservations annually (Figure 6). Similarly, ADF&G and DNR have continued to improve implementation of the 2002 MOU to process the backlog of pending reservation applications. Since 2009, an average of 12 and 8 applications have been filed and granted, respectively. Whereas, from 1998 to 2008 an average of 3.7 and 1.5 applications have been filed and granted, respectively. Factors contributing to this improvement likely included: ADF&G leadership making this goal a priority, signing of the MOU which created the impetus for ADF&G and DNR to coordinate and work together to reduce the backlog, and work efficiencies gained by ADF&G and DNR staff from the skills and experience learned during implementation of the MOU.

HYDROLOGIC INVESTIGATIONS

Hydrologic investigations were generally performed to obtain data to either support a new reservation of water application or amend a prior application. SARCU staff performed hydrologic investigations on seven projects in 2011 (Figure 7). Summaries of each investigation by SF regions¹⁵ are provided below.

Region I

SF Region I covers Southeast Alaska from Cape Suckling to Dixon Entrance (Figure 1).

Sitkoh Creek

Sitkoh Creek is located in Southeast Alaska on southeastern Chichagof Island across Chatham Strait from the community of Angoon (Figure 7). The creek supports coho (*Oncorhynchus kisutch*), sockeye (*O. nerka*), chum (*O. keta*), and pink salmon (*O. gorbuscha*), cutthroat trout (*O. clarki*), rainbow and steelhead trout (*O. mykiss*), and Dolly Varden (*Salvelinus malma*).

ADF&G operated Streamgage Station 10303 at the outlet of Sitkoh Lake since 2006. Site visits were made to the gage five times during the year to download data, take discharge measurements, and for routine gage maintenance. To establish the relationship between streamflow at the gage and streamflow at the downstream end of the creek, instantaneous discharge measurements were taken at Discharge Station 10309 four times during the year. This gage will continue to operate until October 1, 2011 at which time five water years of stream flow data will have been collected.

Reservation of water applications were filed for two reaches in 2010 based on two years of streamflow records. After 5 years of streamflow records have been collected, the existing application will be amended to include the additional information.

¹⁵ The state is divided into three SF administrative regions – Southeast, Southcentral and Southwest, the Arctic-Yukon-Kuskokwim regions. Each region roughly corresponds to the Alaska Board of Fisheries regulatory areas.

Chilkoot River

The Chilkoot River, located near the community of Haines, supports coho, sockeye, chum, and pink salmon, cutthroat trout, and eulachon (*Thaleichthys pacificus*)(Figure 7). The Chilkoot River drainage is one of the two largest contributors of wild sockeye salmon to the commercial drift gillnet fisheries in Lynn Canal. Chilkoot River sockeye salmon are also harvested in a subsistence fishery near the mouth in Lutak Inlet. Since 1976, ADF&G has maintained a salmon counting weir on the Chilkoot River, between the Chilkoot Lake outlet and the Chilkoot River Bridge, to monitor the strength of sockeye salmon runs in northern Lynn Canal as they return to Chilkoot Lake.

ADF&G operated a streamgage (#11901) at the outlet of Chilkoot Lake since 2007. Site visits were made to the gage five times during 2010 to download data, take discharge measurements, and for routine maintenance. The gage will continue to operate until October 2012 to collect five years of streamflow records.

A reservation of water application was filed for the Chilkoot River in 2009 based on two years of streamflow records. After 5 years of streamflow records have been collected, the existing application will be amended to include the additional information.

Cowee Creek

Cowee Creek is located approximately 40 miles north of Juneau within the temperate coastal rainforest of Southeast Alaska (Figure 7). It supports coho, chum, and pink salmon, cutthroat and steelhead trout, and Dolly Varden. The majority of the Cowee Creek watershed is within the Tongass National Forest with the lower portion located within Point Bridget Alaska State Park.

The watershed has a drainage area of approximately 46 square miles and is bounded by snow and glacier covered mountains that reach up to 5,894 feet in elevation. Cowee Creek flows in a northwesterly direction approximately six miles into Berners Bay. Two main tributaries, South Fork Cowee Creek and Davies Creek, enter the mainstem from the south and north respectively. The lower portion of the Cowee Creek watershed consists of low gradient meadows, meandering streams, and rocky beach fringe. Cowee Creek is a popular freshwater sport fishing destination among Juneau area anglers due to its productive fisheries, road system access, and the three public use cabins that are nearby.

ADF&G operated a streamgage (#11401) just below the Glacier Highway Bridge since 2007. Site visits were made to the gage 11 times during 2010 to download data, take discharge measurements, and for routine maintenance. This gage will remain operational until October 2012 to collect five water years of streamflow data. A reservation of water application was submitted to DNR in 2009 and will be amended after streamgaging is completed to include the additional information.

Lost River

The Lost River is located near the community of Yakutat and supports coho, sockeye, and pink salmon, cutthroat and steelhead trout, Dolly Varden, and eulachon (Figure 7). ADF&G operated a streamgage (#11701) on the east fork of the Lost River from October 2006 until October 2011. ADF&G also established discharge measurement stations on the mainstem of the Lost River below the Lost River Bridge, East Fork of the Lost River, and Tawah Creek a tributary to the Lost River. During 2011, six instantaneous discharge measurements were taken at the streamgage. These discharge measurements were used to refine a rating curve and compute

mean daily flows for water year 2011. Three instantaneous discharge measurements were taken at each of the three discharge measurement stations. These discharge measurements have helped define the relationship of streamflows between their respective stream reaches and streamgage. Hydrologic data collection has been completed and the streamgage was decommissioned in October 2011. A reservation of water application was submitted to DNR for one reach of the Lost River. After all the hydrologic data has been processed, applications will be filed for three additional reaches of the Lost River and one reach of Tawah Creek. After data collection is completed, an amendment will be filed to include the additional information.

Turner, Eagle and Orchard Lakes

ADF&G received funding provided by the National Fish Habitat Action Plan via a grant from the Western Native Trout Initiative (WNTI) to collect hydrologic data and prepare reservation of water applications on three of trophy cutthroat trout lakes in Southeast Alaska. Turner, Eagle, and Orchard were the three lakes chosen for this project (Figure 7; Klein 2011). Turner Lake is located in the upper portion of the Taku inlet 16 miles east of Juneau, Eagle Lake is located 48 miles south of the town of Wrangell, and Orchard Lake is located 35 miles north of the town of Ketchikan.

ADF&G has operated lake level gages these three lakes since the fall of 2010. In 2011 each lake was visited twice, in early June and late October. These site visits included downloading transducer data, measuring current lake level relative an established benchmark, taking pictures of site conditions, and performing routine maintenance. An operational plan for this project was completed and reviewed by the biometric staff in the fall 2011.

This project is currently funded until December 2013. In September 2011, a grant to seek additional funding was submitted to WNTI. A reservation of water application will be filed for each lake using the available one year of data. After hydrologic data collection is completed, an amendment will be filed to include the additional information.

Region II

SF 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, Susitna River Drainage, West Cook Inlet, Kodiak, Bristol Bay, and the Alaska Peninsula and Aleutian Islands (Figure 1).

Meadow and Fish Creeks

Meadow Creek is the primary surface water source for Big Lake; Fish Creek flows out of Big Lake into Knik Arm (Figure 7). Meadow and Fish Creeks support salmon and resident fish populations and were deemed high priority for receiving instream flow protection by ADF&G and the MatSu Basin Salmon Conservation Partnership (MSCP). These creeks are predominately lake influenced and ground-water fed; therefore seasonal variation in streamflows is relatively low. Inter-annual variation may also be low for the same reasons. This drainage is a major wild sockeye salmon producing system that in the past was supplemented with hatchery fish. The Big Lake state hatchery operated on Meadow Creek from 1975 to 1993 and was closed due to years of mediocre success and increasing costs. Until 2007, Cook Inlet Aquaculture Association continued to collect eggs from sockeye at Meadow Creek and incubated them at the Trail Lakes Hatchery. Fry and smolts were then returned to Meadow Creek and Big Lake.

Fish Creek, Big Lake and Meadow Creek are on the Alaska Clean Water Actions (ACWA) list of high priority streams primarily due to poor water quality and concerns over fish habitat integrity. Big Lake is one of the most popular water-recreational destinations in the state.

ADF&G filed reservation of water applications for two reaches on Fish Creek and one reach on Meadow Creek in 1988. Streamflow data used in these applications were based on regional regression analyses and supported by a few instantaneous discharge measurements. Seasonal flow variability was based on nearby Cottonwood Creek. DNR requested and ADF&G agreed to obtain 5-years of continuous streamflow data on both Meadow and Fish Creek. In July 2008, ADF&G staff installed streamgages on lower Fish Creek (#12001) and lower Meadow Creek (#12101), and established discharge measurement sites on upper Fish Creek (#12002) and “upper” Meadow Creek (#12102, also known as Little Meadow Creek).

Waterwalkers Streamflow Monitoring was contracted to process the streamflow data from the gaging stations. ADF&G will use the gage data to apportion flows to the ungaged reaches on Meadow and Fish Creek. ADF&G contracted the Wasilla Soil and Water Conservation District (WSWCD) to measure discharge and collect water quality information on Fish and Meadow Creeks including dissolved oxygen, specific conductivity, pH, nitrates, phosphorus, and fecal coliform in 2011. ADF&G provided training and assisted WSWCD staff with streamflow data effort and gage maintenance.

Stariski Creek

Stariski Creek is located on the Kenai Peninsula approximately 15 miles north of Homer (Figure 7). It was nominated in 2006 by SF staff as a high priority stream for a reservation of water. Stariski Creek supports small to moderate runs of Chinook (*O. tshawytscha*) and coho salmon, and steelhead trout. In 2006, the non-profit organization Cook Inletkeeper (CIK) was awarded several grants to monitor an Alaska Department of Transportation and Public Facilities project to construct a bridge over Stariski Creek in place of a culvert that was damaged by floods in 2002. This work included measuring streamflow, which created an opportunity for ADF&G to work with CIK to obtain information needed to file a reservation of water application. ADF&G agreed to provide hydrologic supplies, manage and analyze the data, and assist with field work as needed. A streamgage (station #11601) was installed approximately one quarter-mile upstream from the new Sterling Highway Bridge in June 2006.

Since 2006, ADF&G and CIK have jointly operated the streamgage. In 2008, CIK was awarded a three-year grant from the Alaska Sustainable Salmon Fund to continue gaging Stariski Creek. Records collections prior to 2008 were limited to open water periods because of funding and staff limitations. The streamgage was discontinued in October 2011. A reservation of water application was jointly completed by ADF&G and CIK and filed in July 2011 and will be amended after all the gage records have been finalized.

HYDROELECTRIC PROJECT LICENSING

FERC administers the Federal Power Act (FPA), which governs the regulation of hydroelectric projects in the United States, among other duties. FERC issues licenses¹⁶ that specify how projects will be constructed and operated including any mitigation measures. FERC licenses

¹⁶ A FERC license has a term of 30 to 50 years, subject to renewal.

specify how streamflows will be allocated between energy generation and other beneficial uses recognized by the FPA and other applicable laws (Roos-Collins and Gantenbein 2005).

The FPA affords considerable weight and due deference to ADF&G, as the state's fish and wildlife agency. If FERC does not accept all of ADF&G's recommendations, they must attempt to resolve any such inconsistency, giving due weight to the department's authority and expertise. The FERC process is complex, lengthy, and deadline-driven. Each project is unique, requiring reviews and analyses specific to affected resources.

Prior to 1998, ADF&G's review of FERC hydroelectric projects was handled on a regional basis. To provide better consistency and interdepartmental coordination, a position was created in SARCU to oversee statewide coordination efforts for all FERC jurisdictional projects and to ensure all legal and administrative requirements are met. Most hydroelectric projects in Alaska are licensed by FERC; however, smaller and federally constructed projects may fall outside FERC's jurisdiction. Under the FERC process, applicants generally obtain a preliminary permit that gives them the exclusive right to study the project's feasibility for three years. If an applicant is still interested in pursuing the project, a license application is submitted before the end of the permit term. ADF&G plays an important role in assisting the applicant to obtain fish and wildlife information needed by regulatory agencies. The licensing process typically takes two years after a license application is filed with FERC and includes an environmental review in accordance with the National Environmental Policy Act.

SARCU currently monitors 70 existing FERC regulated hydroelectric and hydrokinetic projects (Table 4). Interest in hydroelectric power has increased recently and is expected to continue for the foreseeable future as energy prices remain high and the state seeks solutions for the railbelt's aging power generation infrastructure.

ALASKA CLEAN WATER ACTIONS PROGRAM

The ACWA program is a collaboration of Department of Environmental Conservation (DEC), ADF&G, and DNR to provide stewardship of Alaska's water bodies¹⁷. The goal of ACWA is to collect information, identify problems and areas needing protection or restoration, and direct resources toward the highest priority issues to achieve waters that are drinkable, fishable, swimmable, and workable across the State. Each agency is responsible for participating in the ACWA water experts group (WEG) to assess information related to its expertise: ADF&G—aquatic habitat, DEC—water quality, and DNR—water quantity. SARCU is ADF&G's representative for the WEG.

The WEG developed a plan and decision tree for implementing ACWA objectives.¹⁸ The first step is to nominate a water body with specified concerns, which any agency personnel or a member of the public can perform. WEG staff evaluate the information and assign a priority ranking based on specified criteria. To assist with this process, an inter-agency database was developed and is used to track each water body. To date, there are 375 waters nominated into the ACWA program with 69 of these water bodies rank as high priority for habitat concerns.

¹⁷ For more information on ACWA go to www.state.ak.us/dec/water/acwa/acwa_index.htm.

¹⁸ For information on ACWA's plan see http://www.dec.state.ak.us/water/acwa/acwa_ranking.htm.

Based on the review by WEG staff, the nominated water body is assigned to one of the following categories:

- Data Collection
- Recovery
- Protect and Maintain Water bodies at Risk
- Adequately Protected Water bodies

ACWA staff rank each water body as high, medium, or lower priority based on the information provided with the nomination and any additional data that is available. High priority water bodies may be eligible for project funding through the annual ACWA grant solicitation process.

In 2011, 14 projects were funded by the ACWA grant pool (Appendix A)¹⁹. However, ADF&G and DNR were not able to contribute funding to the ACWA grant pool in 2011. Interested stakeholders may apply directly to AKSSF for specific projects. Proposals to AKSSF for waters identified by ACWA as high priority will benefit under the scoring criterion “Strategic Importance to Alaska”, when being evaluated for AKSSF funding. Without dedicated, long-term funding commitments to the ACWA grant pool, the ability to meet ACWA’s goal to address stewardship Alaska’s water bodies in a holistic manner becomes diminished and risks sustainability of the program.

HYDROLOGIC DATA NEEDS

The paucity of hydrologic data throughout most of Alaska limits ADF&G’s ability to acquire reservations of water (Estes 1998; Brabets 1996). Although Alaska has approximately 40 percent of the nation’s surface water outflow²⁰, only 513 USGS continuous streamgages have been established in Alaska (D. Meyer, USGS Hydrologist, Anchorage, Alaska, February 23, 2012, personal communication; Table 5). This equates to flow measurements for less than 1 percent of Alaska’s water bodies; less than half of these could meet the USGS’s 10 year-minimum historical record standard for supporting a statistically reliable regional flow analysis.

In Water Year 2011 (from October 1, 2010 to September 30, 2011), USGS operated 127 continuous streamgages in Alaska. This represents approximately one streamgage per 5,000 square miles, which contrasts significantly with the western United States where there is approximately one gage site per 400 square miles. Of the streamgages operating in Water Year 2011, 28 operated in Southeast and 42 and 57 operated in Southcentral and the remainder of the state, respectively (D. Meyer, USGS Hydrologist, Anchorage, Alaska, February 23, 2012, personal communication; Table 5).

Baseline hydrologic data are needed by water resource agencies and water users for planning and management. Accurate estimates of available streamflows and water volumes are important information needed to meet these needs. Continuous streamflow and stage data are also necessary to manage and enforce existing water rights. Adding to these challenges, Alaska’s limited road systems, extremes in weather conditions, and loss of equipment to bears and other wildlife can make data collection difficult and expensive.

¹⁹ Historical funding sources have included Clean Water Act-Nonpoint Source Pollution, Coastal Zone Management Act-Coastal Nonpoint Source Pollution, DEC Beach Grant, and AKSSF programs.

²⁰ Alaska Hydrologic Survey website checked May 3, 2012 <http://dnr.alaska.gov/mlw/water/hydro/components/surface-water.cfm>

Without baseline hydrologic data, models must be used to estimate seasonal and long-term streamflow characteristics. On streams with limited or no streamflow data, using hydrologic models to predict naturally occurring streamflows is difficult at best and often produces estimates with high uncertainty. Furthermore, it is more time consuming to estimate streamflow characteristics for streams having limited or no data as opposed to summarizing data for a stream having an adequate hydrologic record.

To address the need for streamflow data, ADF&G is pursuing several actions. Since 2007, SF has provided annual funding for stream gaging efforts. These funds have been leveraged with USGS and other partners when possible, to maximize the collection of streamflow data²¹. Also, ADF&G, DNR, and USGS collaborated to implement a StreamStats²² pilot project for the Cook Inlet region. StreamStats is a web-based, geographic information system (GIS) application developed by USGS in cooperation with Environmental Systems Research Institute, Inc. StreamStats allows users to obtain streamflow statistics and drainage-basin information for USGS data-collection stations and user-selected stream sites by incorporating a GIS program that delineates drainage basins and measures basin characteristics and a GIS database that contains land elevation models, historic weather data, and other data. After completion of the pilot project, USGS will evaluate the feasibility of statewide implementation.

ADJUDICATIONS

Since the 2002 MOU was signed between DNR and ADF&G, significant progress has been made toward adjudicating reservation of water applications. However, DNR only has one position performing reservation of water related tasks and the backlog continues to grow, albeit more slowly, as more reservation of water applications are filed than adjudicated. Additional workloads or administrative challenges that arise can take substantial time, further reducing DNR's ability to perform adjudications.

RECOMMENDATIONS

- 1) More streamgages are needed in Alaska to increase hydrologic baseline data across the state, especially in southwest, northwest and arctic regions.
- 2) The linkage between instream flows/water volumes and fish productivity needs to be more extensively investigated. Ideally, investigations should be conducted over multiple years on fish populations not significantly influenced by human activities so results will reflect conditions needed to sustain natural fish productivity. The amount of habitat available versus utilized in consideration of fish population dynamics should be monitored to better understand habitat preference and selection. Research on the effects and variability of key environmental parameters to fish productivity (e.g. ground water, stream temperatures, turbidity, etc.) is also needed.
- 3) The adequacy of ADF&G reservations of water certificates should be re-analyzed using state-of-the-art methods for the most important sport fisheries. These investigations should also include monitoring fish population dynamics. If results indicate additional water should be reserved, a supplemental reservation of water application should be completed and filed.

²¹ Water bodies gaged include: Indian River, Situk River, Chatanika River, Mulchatna River, Stuyahok River, Ophir Creek, Wasilla Creek, Montana Creek, Stariski Creek, and Goldstream Creek.

²² See <http://water.usgs.gov/osw/streamstats/>.

- 4) Out-of-stream appropriations should be automatically reviewed by DNR once every 10 years, similar to reservations of water. This would allow DNR to better manage Alaska's water resources and potentially avoid water use conflicts.
- 5) ADF&G should review the status and adequacy of all water rights held by the department. The department should also evaluate whether all water uses are in compliance with existing permits and water rights. Out-of-stream water rights that are not being used may be transferred to reservation of water certificates with DNR's approval.
- 6) The Instream Flow Education, Training, and Outreach program should be re-started. Due to budget cutbacks, funding for the position was eliminated after the position became vacant. This program has achieved success in the short-term and it is expected will provide long-term benefits for participation in sport fishing activities. A fundamental goal commonly identified by educators is to achieve public recognition of the purpose and values for maintaining instream flows and lake volumes in Alaska to sustain healthy fish populations. A key step toward achieving comprehensive outreach is the incorporation of instream flow concepts and activities into other department education programs and the school system. A survey of current public knowledge and opinion on instream flow values and perceptions in Alaska would help guide program development and communication tools.
- 7) For ACWA to be more effective within ADF&G, a full-time position and an alternative funding source for contributions to the ACWA grant pool is needed. This position would enhance ADF&G's capacity to address fish habitat issues related to water quality and quantity concerns. Information about aquatic habitat issues is also needed to improve the ACWA database. This information can range from fish habitat concerns to documented habitat degradation and can include monitoring data, reports, photographs, and observations.

The experience of other states shows that it is prudent to protect instream flows as early as possible in order that these flows and the uses that depend upon them do not have to be protected later, when available water may be scarce and opportunities for protection may be more costly and contentious.

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FIGURES AND TABLES



Figure 1.—Alaska Department of Fish and Game Division of Sport Fish regions.

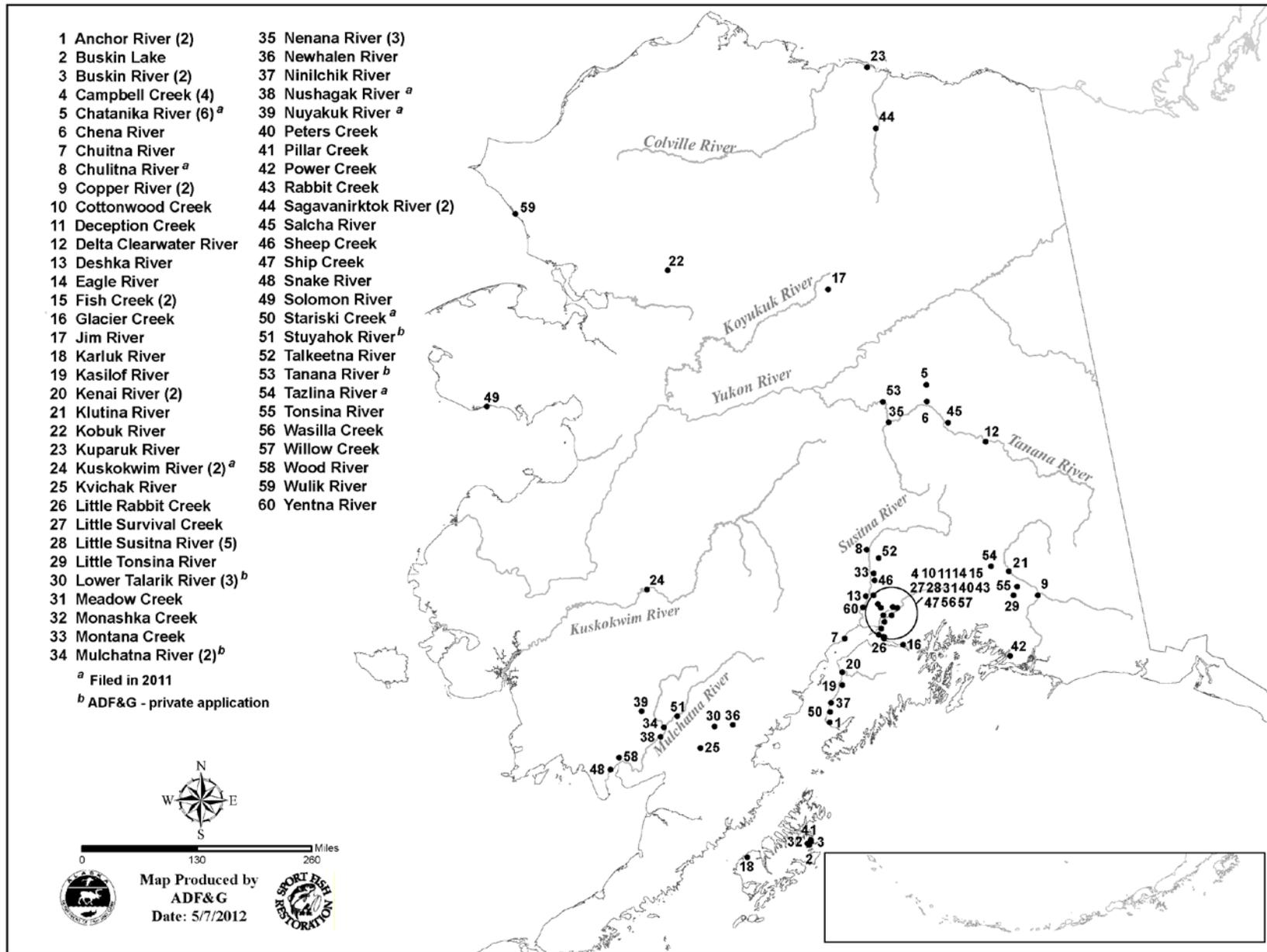


Figure 2.—Location of ADF&G reservation of water sites in Alaska except Southeast.

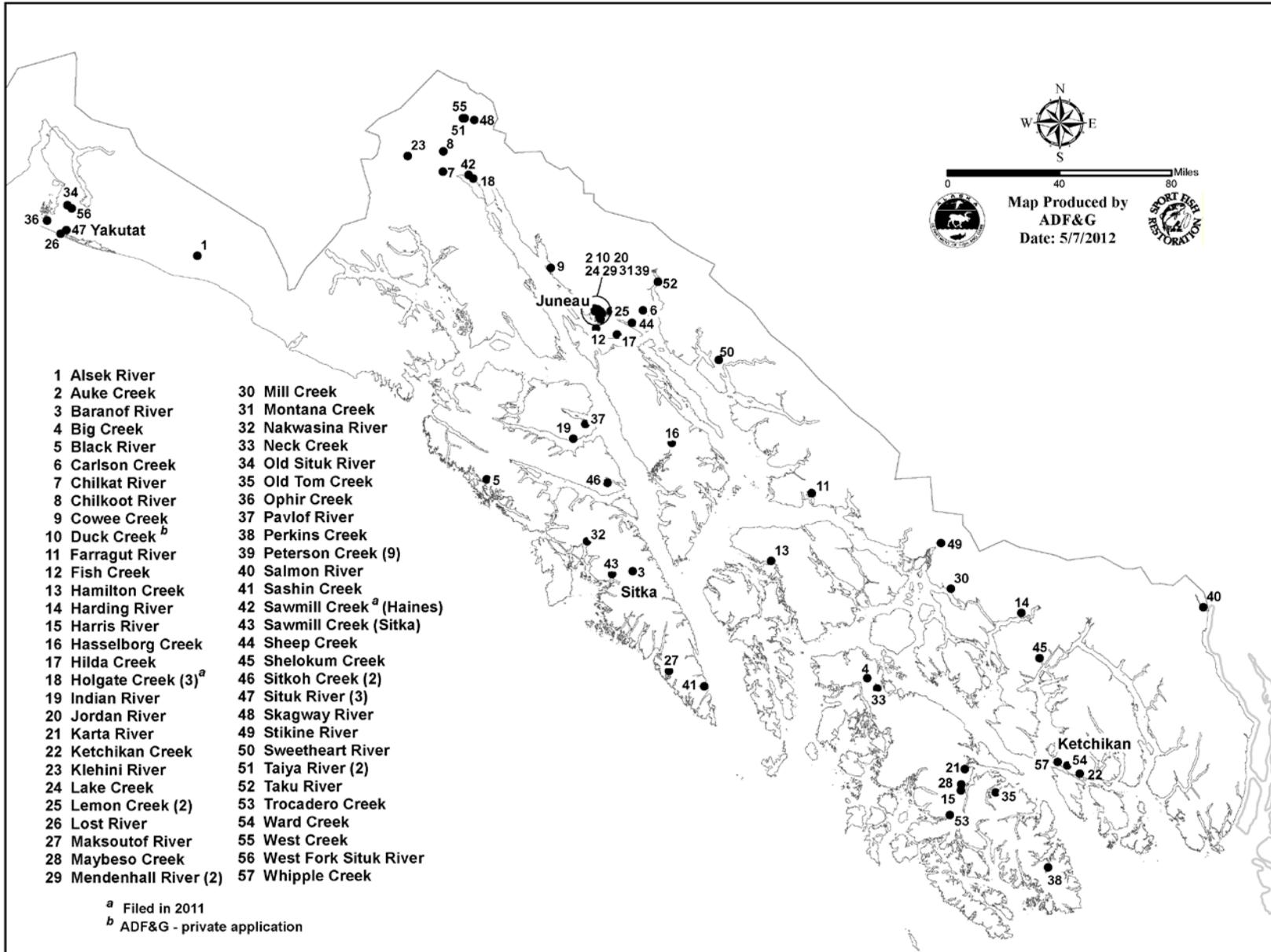


Figure 3.—Location of ADF&G reservation of water sites in Southeast Alaska.

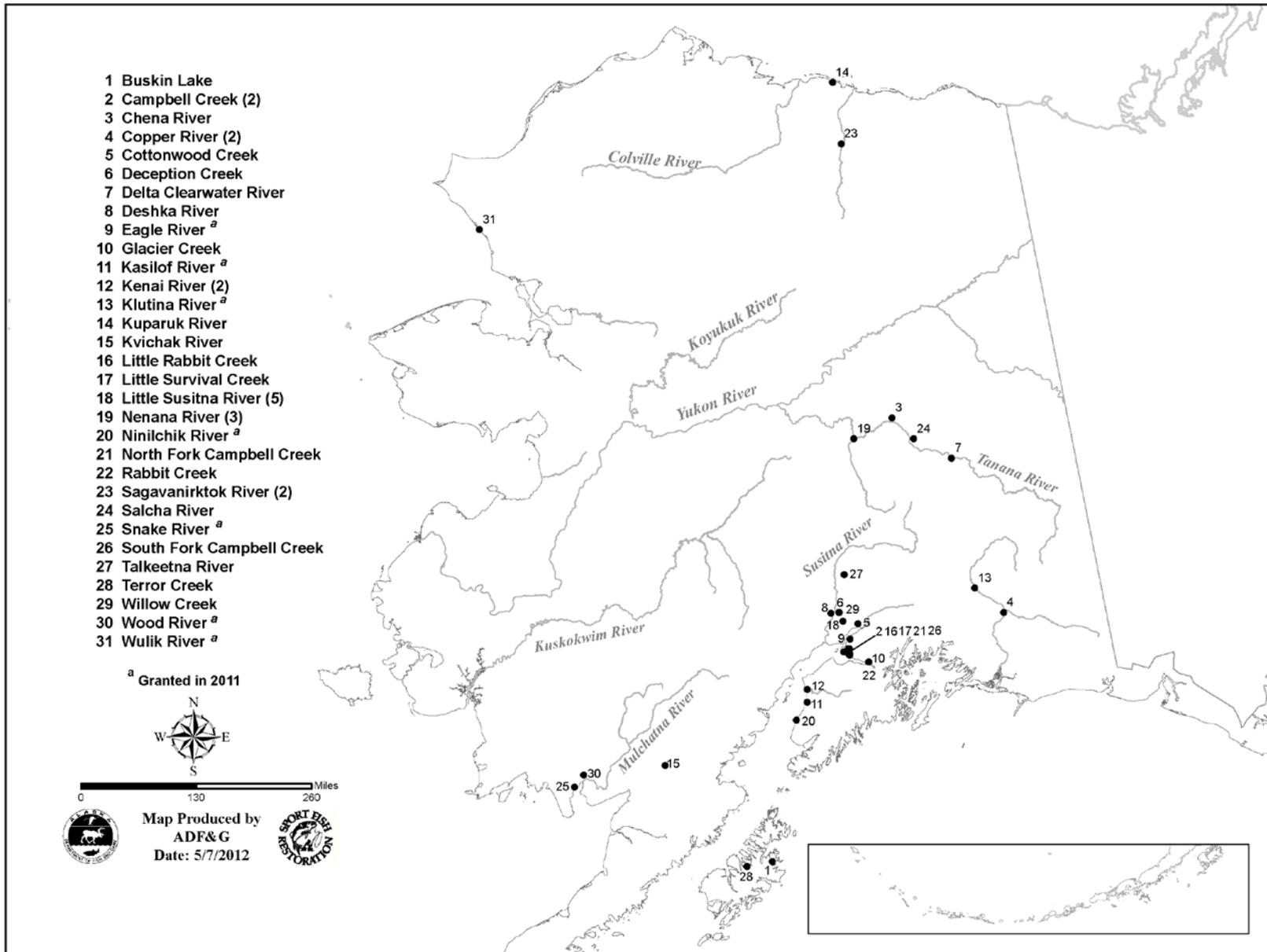


Figure 4.—Location of ADF&G certificates of reservation of water in Alaska except Southeast.

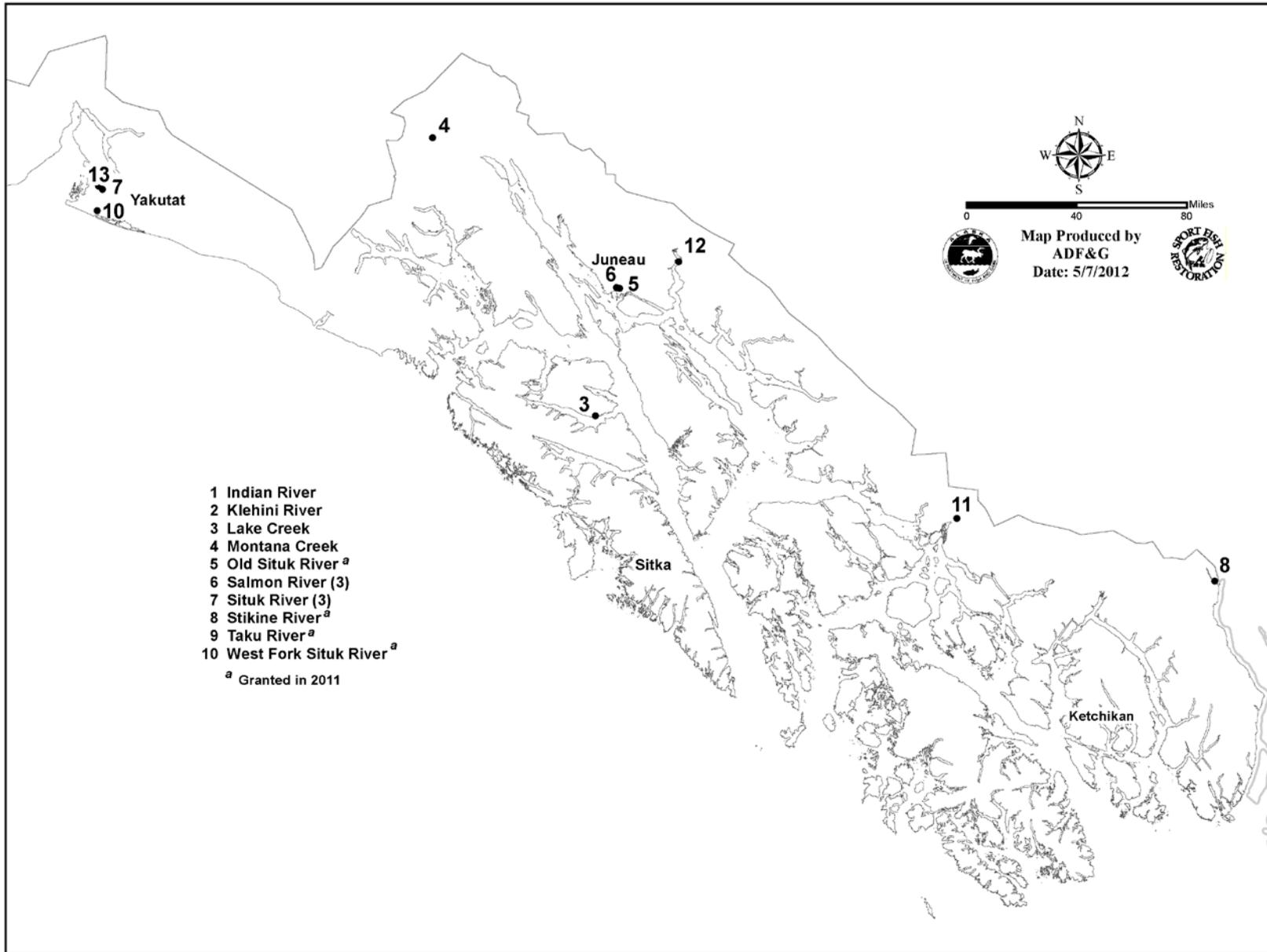


Figure 5.—Location of ADF&G certificates of reservation of water sites in Southeast Alaska.

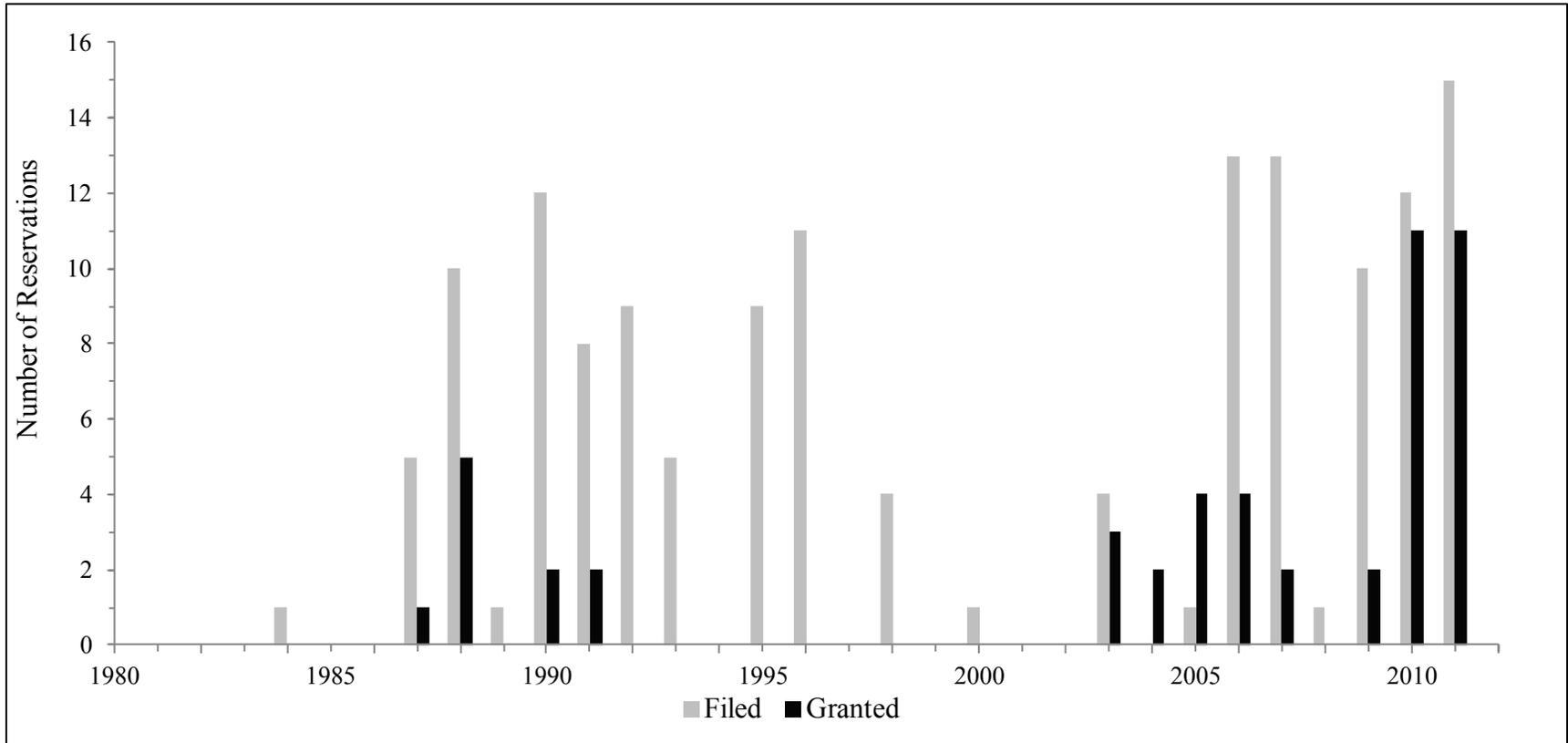


Figure 6.—Summary of ADF&G reservations filed and granted from 1980-2011.

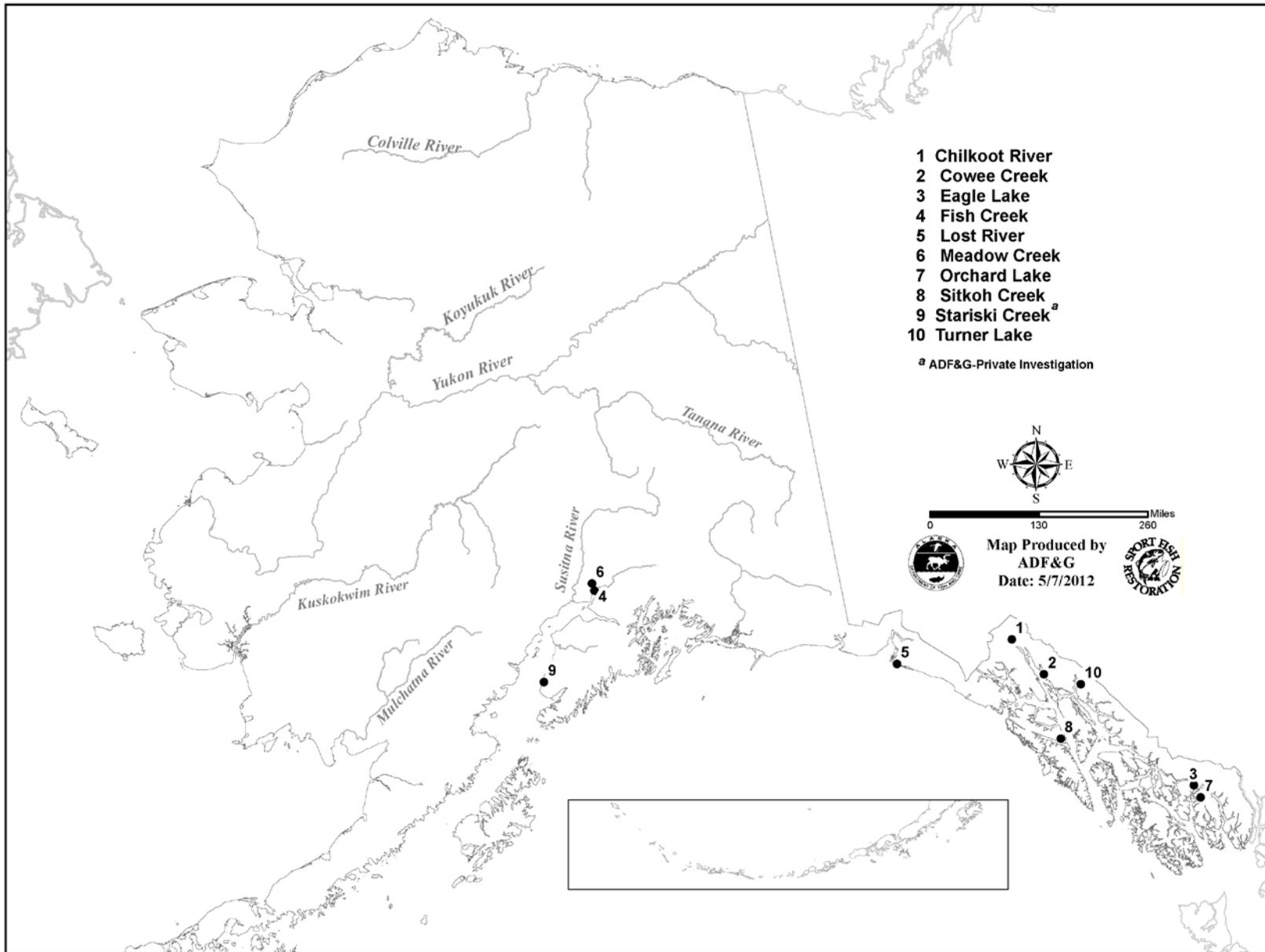


Figure 7.—Location of SARC hydrologic projects in 2011.

Table 1.–Summary of all reservation of water applications filed and granted as of December 2011.

Organization	Rivers/Streams Filed	Lakes Filed	Granted
ADF&G	165	1	51
U.S. Fish and Wildlife Service	58	140	
Bureau of Land Management	18		1
Trout Unlimited	12		
Curyong Tribal Council-Trout Unlimited	10		
Chuitna Citizens NO-COALition-Trustees for Alaska	3		
Eklutna Native Village	3		
Southwest Alaska Salmon Habitat Partnership-ADF&G	3		
The Nature Conservancy-ADF&G	1		
Arctic Unit of the Alaska Chapter of the American Fisheries Society-ADF&G	1		
Trout Unlimited-ADF&G	1		
Cook Inletkeeper-ADF&G	1		
Cheesh-na Tribal Council	1		
Chickaloon Native Village	1		
ADF&G (per AS 46.15.035) ^a	1	1	2
DNR (per AS 46.15.035)	2	2	4

Source: K. Sager, DNR Water Resources Section, Feb 28, 2012.

^a DNR transferred title for these reservations to ADF&G on November 29, 2011.

Table 2.–Summary of ADF&G reservation of water applications filed in 2011.

Map ID	DNR LAS No. ^a	Name	Priority Date
1	28059	Tazlina River	4/27/2011
2	28113	Chulitna River	6/16/2011
3	28162	Stariski Creek	7/6/2011
4	28241	Nushagak River	8/25/2011
5	28250	Nuyakuk River	8/29/2011
6	28275	Sawmill Creek near Haines	9/26/2011
7	28276	Holgate Creek Reach A	9/26/2011
8	28277	Holgate Creek Reach B	9/26/2011
9	28278	Holgate Creek Reach C	9/26/2011
10	28344	Kuskokwim-Reach A	12/7/2011
11	28345	Kuskokwim-Reach B	12/7/2011
12	28388	Chatanika-Reach B	12/19/2011
13	28389	Chatanika-Reach C	12/19/2011
14	28390	Chatanika-Reach D	12/19/2011
15	28391	Chatanika-Reach E	12/19/2011

Note: See figures 2 and 3 for site locations.

^a The Land Administration System (LAS) is managed by DNR to provide case file summaries and abstracts of information depicted on the State Status Plat.

Table 3.–Summary of ADF&G reservation of water applications granted in 2011.

Map ID	DNR LAS No.	Name	Priority Date	Granted Date
1	21292	Stikine River	12/27/1995	3/8/2011
2	27904	Old Situk River	12/15/2010	4/8/2011
3	14315	Eagle River	6/4/1993	8/16/2011
4	27488	West Fork Situk River	12/11/2009	9/1/2011
5	21275	Taku River	12/27/1995	9/6/2011
6	22408	Klutina River	12/28/1998	11/16/2011
7	20067	Ninilchik River	3/19/1991	11/16/2011
8	24381	Snake River	12/27/1995	11/18/2011
9	20068	Wulik River	12/27/1995	11/18/2011
10	21125	Kasilof River	5/9/1996	11/22/2011
11	20334	Wood River	7/28/2003	11/22/2011

Note: See figures 4 and 5 for site locations.

Table 4.–Summary of Federal Energy Regulatory Commission hydroelectric and hydrokinetic projects in Alaska monitored by ADF&G during 2011.

Project	FERC No.	Status
<i>Southeast</i>		
Blue Lake	2230	Relicensed hydroelectric-license amendment
Cascade Creek	12495	Proposed hydroelectric
Scenery Lake	12621/13365	Proposed hydroelectric
Ruth Lake	12619	Proposed hydroelectric
Gartina Falls	DI09-7	Proposed hydroelectric
Baranof Warm Springs	DI09-14	Proposed hydroelectric
Neck Lake	DI10-5	Proposed hydroelectric
Soule River	12615	Proposed hydroelectric
Lake 3160	12661	Proposed hydroelectric
Takatz Lake	13234	Proposed hydroelectric
Lake Shelokum	13281	Proposed hydroelectric
Sweetheart Lake	13563	Proposed hydroelectric
Schubee Lake	13645	Proposed hydroelectric
Dry Spruce	1432	Licensed hydroelectric
Salmon Creek	2307	Licensed hydroelectric
Black Bear	10440	Licensed hydroelectric
Ketchikan Lakes	420	Licensed hydroelectric
Swan Lake	2911	Licensed hydroelectric
Lake Dorothy	12379	Licensed hydroelectric
Reynolds Creek	11480	Under construction hydroelectric
Whitman Lake	11841	Under construction hydroelectric
Tyee	3015	Licensed hydroelectric
Mahoney Lake	11393	Under construction hydroelectric
Jetty Lake	3017	Licensed hydroelectric
Burnett River Hatchery	10773	Licensed hydroelectric
Blind Slough	201	Licensed hydroelectric
Kasidaya	11588	Licensed hydroelectric
Goat Lake	11077	Licensed hydroelectric
Dewey Lakes	1051	Licensed hydroelectric
Falls Creek	11659	Licensed hydroelectric
Green Lake	2818	Licensed hydroelectric
Pelican	10198	Licensed hydroelectric
Beaver Falls	1922	Licensed hydroelectric
Port Fredrick	13512	Proposed hydrokinetic-Tidal
Icy Passage Tidal	13605	Proposed hydrokinetic-Tidal

-continued-

Table 4.–Page 2 of 2.

Project	FERC No.	Status
Killisnoo Tidal Energy	13823	Proposed hydrokinetic-Tidal
Yeldagalga Creek	14115	Proposed hydroelectric
Moirra Sound Hydroelectric	14285	Proposed hydroelectric
Sunrise Lake	14296	Proposed hydroelectric
Water Supply Creek	Not Determined	Proposed hydroelectric
Triangle Lake-Metlakatla	Not Determined	Proposed hydroelectric
<i>Southcentral</i>		
Allison Lake	13124	Proposed hydroelectric
Old Harbor	13272	Proposed hydroelectric
Glacier Fork	13327	Proposed hydroelectric
Falls Creek	13211	Proposed hydroelectric
Grant Lake	13212	Proposed hydroelectric
Snyder Falls Creek	13328	Proposed hydroelectric
Chakachamna Lake	12660	Proposed hydroelectric
Power Creek	11243	Licensed hydroelectric
Bradley Lake	8221	Licensed hydroelectric
Solomon Gulch	2742	Licensed hydroelectric
Silver Lake	13717	Proposed hydroelectric
Chignik	620	Licensed hydroelectric
Terror Lake	2743	Licensed hydroelectric
Kvichak River-Igiugig	13511	Proposed hydrokinetic-river
Cooper Lake	2170	Relicensed
Humpback Creek	8889	Licensed-modifications under construction
Cook Inlet, #12679	12679	Proposed hydrokinetic-tidal
Turnagain Arm #13509	13509	Proposed hydrokinetic-tidal
East Forelands Tidal Energy	13821	Proposed hydrokinetic-tidal
Pedro Bay	Not-Determined	Proposed hydroelectric
Susitna-Watana	14241	Proposed hydroelectric
Chikuminuk	14369	Proposed hydroelectric
<i>Interior</i>		
Kogoluktuk River	13286	Proposed hydroelectric
Shungnak River	13299	Proposed hydroelectric
Yukon River-Eagle	13600	Proposed hydrokinetic-river
Yukon River-Ruby	Not Determined	Proposed hydrokinetic-river
Tanana River-Nenana	13233	Proposed hydrokinetic-river
Tanana River-Nenana	13883	Proposed hydrokinetic-river
Tanana River-Whitestone	13305	Proposed hydrokinetic-river

Table 5.–Summary of U.S. Geological Survey streamgage sites in Alaska as of September 30, 2011.

Number of streamgages	Period of Record (Years)
22	0 < 1 ^a
144	1 to < 5
96	5 to < 10
130	10 to < 20
108	20 to < 50
13	≥ 50
Total	513
Total active in Water Year 2011	127
Total active in Southeast	28
Total active in Southcentral	42
Total active in Southwest, Northwest, Yukon and Arctic	57

Source: D. Meyer, USGS Hydrologist, Anchorage, Alaska, February 23, 2012, personal communication.

^a The number of streamgages with less than one year of record are difficult to enumerate with existing database.

APPENDIX A
ALASKA CLEAN WATER ACTIONS GRANTS – FY11
PROJECT DESCRIPTIONS

Appendix A1.–Alaska Clean Water Actions Grants, FY11.

Below are summaries of the Alaska Clean Water Actions Grants for projects starting in July 2010 and finishing in June 2011. The summaries are arranged by region of the state and include the contact information for the group conducting the project.

Southeast Region

Granite Creek Recovery and TMDL Implementation, City and Borough of Sitka, \$ 21,050
This project addresses an ACWA Waterbody Recovery priority. Granite Creek is an impaired waterbody from turbidity and suspended sediment resulting from local roads, run-off pollution from recent watershed development and gravel mining operations. Plans for recovery were approved in September 2002 and ACWA funds have been supporting the city's effort in restoring Granite Creek. This project will focus on several activities designed to continue improving the water quality of Granite Creek and the North and South tributaries. The project will work on riparian buffer protection and revegetation and conduct water quality and fish counts to determine the effectiveness of the actions and overall health of the creek for attainment of water quality standards and removal of the impairment status. Contact: Mark Buggins, 907- 966-2256.

Onemile (Holgate) Creek Watershed Protection and Education Project (Haines), Takshanuk Watershed Council (TWC), \$13,000
This project addresses an ACWA Waterbody Protection priority. This project will protect and maintain anadromous fish and wildlife habitat through conducting stream gauging to establish an instream flow reservation with ADF&G's Sport Fish Division. TWC will continue to collect discharge measurements using USGS protocols to capture the flow characteristics at the range of flows during all seasons, download gauge data, and provide it to the ADF&G to be used for an instream flow reservation. This will insure enough information is collected for filing an instream flow reservation. Contact: Emily Seward, 907-766-3542.

Sawmill Creek Watershed Protection and Education (Haines), Takshanuk Watershed Council (TWC), \$20,000
This project addresses an ACWA Waterbody Restoration priority. This project will continue to work in partnership with ADF&G Sport Fish Division to conduct stream gauging to establish an instream flow reservation. TWC will continue to collect discharge measurements using USGS protocols to capture the flow characteristics at the range of flows during all seasons, download gauge data, and provide it to the ADF&G to be used for an instream flow reservation. This will be the final year required for filing an instream flow reservation. The project will also educate citizen science volunteers, educators and students by producing brochures encompassing a Watershed Map and points of interest. Contact: Emily Seward, 907-766-3542.

South Central Region

Cottonwood Creek Outreach, Snowshoe Water, \$5,000

This project will lead to the development of educational outreach material and a website for best management practices and community discussions boards (blogs) for the people who live in the Snowshoe Subdivision and nearby Cottonwood Creek. The Snowshoe Subdivision source of drinking water is groundwater from a well located in the subdivision. The water system is classified as a Community Water System. The outreach efforts will not only address strategies protect the groundwater from contamination as well as focus efforts on reducing contaminated runoff to nearby Cottonwood Creek , which is designated an impaired surface water body. Contact: Garyn Johnson, 907-376-9287

Kenai River Water Quality Monitoring, Kenai Watershed Forum (KWF), \$20,000

This project addresses an ACWA Waterbody Protection priority. The Kenai River is one of the premier commercial and sportfish rivers in southcentral Alaska. Water quality monitoring of the river led to actions to insure water quality is maintained. This project continues the multi-agency annual petroleum hydrocarbon sampling effort in the Kenai River watershed at 22 index sites during peak power boat usage. The project will produce a final report that analyzes the results, evaluates trends and compares to the water quality standards. This water quality monitoring effort will ensure the Kenai River Waterbody Recovery Plan continues to be effective and that water quality standards are met. Contact: James Czarnezki, (907) 260-5478.

Little Susitna River Hydrocarbon Evaluation, Aquatic Restoration & Research Institute (ARRI), \$75,428

This project addresses an ACWA Waterbody Protection priority. Located in the Matanuska-Susitna Borough, the Little Susitna River is an important recreational and sportfish river. Through previous ACWA grants, ARRI sampling in 2007- 2009 found elevated levels of petroleum hydrocarbon and possibly turbidity that exceeded state standards. Further study is needed to better understand the influence of boat motor type and operation to water quality. Project tasks include: (1) further quantifying the spatial and temporal distribution of total aromatic hydrocarbon (TAH) concentrations adjacent to the boat launch and campground (Public Use Facility) and to determine the relationship between 2-stroke motor use, stream flow, and TAH concentrations; (2) measuring stream water turbidity effects from boat use; (3) measuring the effects of water quality on the biotic community; and (4) collecting basic water quality data. A project report will be completed that analyzes, evaluates and makes recommendations based upon the data collected. Contact: Jeff Davis, (907) 733-5432.

Mat-Su Stormwater Assessment, Aquatic Restoration & Research Institute (ARRI), \$40,000

This project addresses an ACWA Stewardship priority. The objective of this project is to determine if urban stormwater runoff is negatively impacting water quality. Stormwater runoff from developed roads, parking areas, commercial lots, homes, urban farms, and more, can deliver heavy metals, fine sediments, excess nutrients and other pollutants to receiving waters. The Matanuska-Susitna Borough and the core areas of Palmer and Wasilla

have been the fastest growing regions in Alaska. As development increases, the concern for stormwater runoff pollution increases. This study will be conducted along three urban stream systems: Wasilla Creek, Cottonwood Creek, and Little Meadow Creek. These streams are important for salmon spawning and rearing but also receive urban stormwater runoff. The project will locate and map areas of stormwater discharge and will conduct water sampling for heavy metals, hydrocarbons, and sediment. A project report will be completed that analyzes and evaluates the data collected as compared to the water quality standards and will include GIS maps. Contact Jeff Davis, (907) 733-5432.

Monitoring Bacteria Levels on Homer Beaches, Cook Inlet Keeper (CIK), \$42,487

This project addresses an ACWA Stewardship priority. Beaches in the Homer area experience heavy recreation use during the summer months by local residents and tourists. This project will monitor the bacteria levels at two locations on the Homer Spit (Mariner Park and Land's End), and at Bishop's Beach. The project will monitor during its peak-use and institute a public notification system when bacteria levels raise public health concerns. This will ensure protection of public health by all Homer beach users. Contact: Rachel Lord, (907) 235-4068 ext, 29.

Stream Temperature Monitoring Network - Cook Inlet, Cook Inlet Keeper (CIK), \$70,558

This project addresses an ACWA Stewardship priority and will collect the third year of 5 years of data for this project. Water temperature is one of the most significant factors in the health of stream ecosystems. For salmon specifically, temperature affects survivorship of eggs and fry, rate of respiration and metabolism, timing of migration, and resistance to disease and pollution. There is an urgent need to assess rising temperatures in Alaska salmon habitats because temperature plays a critical role in salmonid habitat protection, reproduction and survivorship; and because wild, healthy salmon support vital sport, commercial, subsistence and personal use fisheries across Alaska. Recently, a partnership of state, federal and nonprofit organizations has developed recommended protocols for collecting stream temperature data as well as a system for selecting temperature monitoring sites. The main objectives of this project are to 1) continue implementing a Stream Temperature Monitoring Network to collect consistent, comparable temperature data for Cook Inlet's salmon streams; 2) analyze collected data to establish natural conditions and generate GIS maps of the Cook Inlet basin to illustrate temperature patterns; and 3) provide a user-friendly template to transfer water temperature protocols to other salmon-bearing systems across the state. The Stream Temperature Monitoring Network in Cook Inlet will allow fisheries managers and land-use planners to identify watershed characteristics with the greatest potential to buffer salmon habitats from rising air and water temperatures, and provide the knowledge and data needed to prioritize sites for future research, protection and restoration actions. Contact: Sue Mauger, (907) 235-4068 ext, 24.

Turbidity Monitoring on the lower Kenai River, Kenai Watershed Forum (KWF), \$34,826

This project addresses an ACWA Waterbody Protection priority. The Kenai River is one of the premier commercial and sportfish rivers in southcentral Alaska. KWF will collect turbidity data at three (3) locations to establish naturally occurring background levels and

anthropogenic sources. The data can then be used to help determine if water quality standards are being met. Contact: James Czarnecki, (907) 260-5478.

Interior Region

Goldstream Creek and Crooked Creek Turbidity, University of Alaska Fairbanks , \$33,000
This project addresses an ACWA Recovery priority. Goldstream Creek and Crooked Creek are impaired from turbidity. This project will update the current quality assurance project plan (QAPP) for Goldstream Creek and conduct the water quality monitoring described in the plan. The data allow DEC to determine what actions may be necessary to restore Goldstream Creek. The project will also provide information on site access and condition on Crooked Creek. The information will be used to finalize proposed sampling locations. Contact: Maggie Griscavage, 907-474-5506.

Gulkana Village Public Water System, Gulkana Village Council, \$10,000
This project identifies 18 unused wells in the village that will be decommissioned. Decommissioning unused wells has been identified as a protection strategy for the village's drinking water source. In addition, since their drinking water source is classified as Under the Direct Influence of Surface Water their source can be impacted by the Gulkana River. Outreach efforts will be developed and implemented that focus on reducing the impacts of public camping and residential areas up gradient from their well. Contact: Rick Young, 907-822-3172.

Western Region

Source Water Information Display, City of Sandpoint, \$2,000
This project, building an information kiosk for the public to view at the entry point to the Humboldt Creek watershed, is the first step of the long-range protection plan, Humboldt Creek feeds into the Humboldt Reservoir which serves as the primary water source for two public water systems: City of Sand Point and Trident Seafoods. Currently the dock to the water intake is used by the public for fishing. The long range drinking water protection plan for the water system is to relocate the intake and dock to a different part of the reservoir. The city plans to build a dock specifically for fishing, providing this access is meant to keep the public away from the intake dock. Contact: Allen Hill, 907-383-3435

Stormwater Collection-Sediment Separators, City of Unalaska, \$30,000
This project addresses an ACWA Stewardship priority. The project will complete the engineering and install three (3) sediment separators in the City's stormwater collection system. The purpose of the project is to protect a local salmon stream that runs through the City of Unalaska by reducing sediment laden stormwater from directly discharging to the stream. This is the first year of a two year project. This is the second year of this project where the actual installation of the sediment separators is completed. Contact: J.R. Pearson, 907-581-1260