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Instream Flow Protection in Alaska, 2012

by

Joe Klein

May 2013

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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INSTREAM FLOW PROTECTION IN ALASKA, 2012

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 2012. The status of reservation of water applications by other agencies and the private sector in Alaska is also presented.

Of the 512 applications received by Alaska Department of Natural Resources (DNR) from 1980 to 2012, ADF&G filed 185 river reaches and 4 lake applications and was granted certificates of reservations for 54 river reaches and 1 lake. In 2012, ADF&G filed 23 applications for river reaches and was granted certificates for 4 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 exceed the program goal of filing 10 reservations annually. From 2009 to 2012, an average of 15 and 7 applications were filed and granted, respectively. This is up from the 1998 to 2008 average of 3.7 and 1.5 applications filed and granted, respectively. Factors contributing to this improvement include: ADF&G and DNR leadership making reservations a priority, signing of the MOU which created the vision and framework for reducing the backlog, and experience and efficiencies gained by ADF&G and DNR staff implementing the MOU.

In 1986, ADF&G created the Statewide Aquatic Resources Coordination Unit (SARCU) within the Division of Sport Fish to address instream flow related activities. SARCU staff performed hydrologic investigations on eight projects in 2012. Investigations were generally performed to provide the necessary data to complete reservation of water applications. SARCU staff monitored 80 hydroelectric and hydrokinetic projects and served as ADF&G's representative for the Alaska Clean Waters Actions (ACWA) program. ACWA funded 14 projects from July 1, 2011, through June 30, 2012.

Key words: instream flow, reservation of water, Alaska Water Use Act, Chilkoot River, Cowee Creek, Peterson Creek, Eagle Lake, Orchard Lake, Turner Lake, Meadow Creek, Fish Creek, Federal Energy Regulatory Commission, hydroelectric, hydrokinetic, Alaska Clean Water Actions

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 (J. Johnson, Habitat Biologist, Alaska Department of Fish and Game, May 11, 2012, personal communication).

In 2011, an estimated 443,904 anglers fished 1,919,313 days and harvested approximately 2,677,077 of the estimated 5,921,696 fish caught in Alaska (Jennings et al. *In prep*). The continued production of these fishery resources depends, in part, upon sufficient amounts of good quality water to maintain seasonal fish habitat in rivers and lakes. Fish and other aquatic and terrestrial organisms have adapted to natural streamflows that provide essential seasonal habitats utilized by the various life stages of each species. Varying seasonal quantities of flowing waters and lake elevations 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 lotic[1] and lentic[2] 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 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 Burkardt (2000).

In 1986, ADF&G created the Statewide Aquatic Resources Coordination Unit (SARCU) within the Division of Sport Fish (SF) to acquire reservations of water in priority fish-bearing water bodies. Over time, duties were 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 hydrologic data for filing reservation of water applications. This report summarizes instream flow protection activities by ADF&G in 2012 and the status of reservation of water activities conducted by other agencies and the private sector.

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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.

RESERVATIONS OF WATER

To file for a reservation of water, an application must be completed, signed and submitted to DNR with the appropriate application fee, if applicable.[5] 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. The following is an overview of the reservation of water process.

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 fishery resources, the likelihood for competing out-of-stream uses, the amount of existing hydrologic data, and the availability of other mechanisms[6] to provide instream flow protection.

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 biological 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 challenges[7] that may be filed.

Biological 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 periodicity[8] 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).

Hydrologic Data

DNR recommends a minimum of 5 years of continuous streamflow or lake level data to support water right decisions including reservation of water applications (Gary Prokosch, Chief Water Resources Section, Alaska Department of Natural Resources, April 26, 2005, personal

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[5] There is no charge to state agencies.

[6] 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.

[7] 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.

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

communication). 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 U.S. Geological Survey (USGS) National Water Information System website.[9] 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 errors 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 the streamflow record if a suitable, long-term streamgage 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.

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 biological 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 Inventory,[10] and USGS National Hydrography Database.[11] 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 is recorded in the State Recorders Office and includes a description of the water right, any conditions placed on it, and the priority date

[9] See http://waterdata.usgs.gov/ak/nwis/sw.
[10] See http://www.sf.adfg.state.ak.us/SARR/Surveys/index.cfm.
[11] See http://nhd.usgs.gov/data.html.

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

From 1980 to 2012, ADF&G filed reservation of water applications on 191 river systems[12] and 4 lakes from a total of 512 applications received by DNR (Figures 2 and 3; Table 1). Certificates of reservations were granted to ADF&G for 54 river reaches and 1 lake and for one river reach and lake under the water export provision[13] (Figures 4 and 5; Table 1). In 2012, ADF&G filed 20 applications for river reaches and 3 applications for lakes (Figures 2 and 3; Table 2) and were granted certificates for 4 river reaches (Figures 4 and 5; Table 3).

ADF&G has continued to exceed the program goal of filing 10 reservations annually (Figure 6). Similarly, ADF&G and DNR have continued to process the backlog of pending reservation of water applications. From 2009 to 2012, an average of 15 and 7 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 level of improvement included: ADF&G and DNR leadership making reservations of water a priority, signing of the MOU which created the vision and framework for reducing the backlog, and experience and efficiencies gained by ADF&G and DNR staff implementing 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. Investigations were performed on eight projects in 2012 (Figure 7). Summaries of each investigation by SF regions[14] are provided below.

Region I

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

Chilkoot River

The Chilkoot River located near the community of Haines (Figure 7) supports sockeye (*Oncorhynchus nerka*), coho (*O. kisutch*), chum (*O. keta*), and pink (*O. gorbuscha*) salmon,

[12] Includes seven reservation of water applications that were filed with project partners (see Table 1).

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

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

cutthroat trout (*O. clarki*), and eulachon (*Thaleichthys pacificus*). Chilkoot Lake and the Chilkoot River downstream of the lake are easily accessible by road and comprise one of the largest freshwater sport fisheries in Southeast Alaska. Chilkoot River sockeye salmon are also harvested in a subsistence fishery at Lutak Inlet near the mouth of the Chilkoot River. Since 1976 ADF&G has maintained a salmon counting weir on the Chilkoot River, between the Chilkoot Lake outlet and Chilkoot River Bridge, to monitor the strength of sockeye salmon run as they return to Chilkoot Lake.

ADF&G has operated streamgage station 11901 at the outlet of Chilkoot Lake since 2007. Site visits were made to the gage five times during 2012 to download data, take discharge measurements, and routine gage maintenance. The gage was discontinued on October 16, 2012, after five years of streamflow data were collected. A reservation of water application was filed in 2009 for one reach of the Chilkoot River. After the streamgage data has been analyzed, the application will be amended with the new information.

Cowee Creek

Cowee Creek is located in Southeast Alaska approximately 40 miles north of Juneau (Figure 7). It supports coho, chum, and pink salmon, cutthroat and steelhead trout (*O. mykiss*), and Dolly Varden (*Salvelinus malma*). The majority of Cowee Creek watershed is within the Tongass National Forest, with the lower portion located within Point Bridget Alaska State Park. Cowee Creek is a popular freshwater sport fishing destination among Juneau area anglers due to its productive fisheries, road system access, and three nearby public use cabins.

ADF&G has operated streamgage station 11401 on the mainstem of Cowee Creek since 2007. Site visits to the gage were made 11 times during 2012 to download data, take discharge measurements, and for routine gage maintenance. The gage was discontinued on October 1, 2012, after five years of streamflow data were collected.

A reservation of water application was filed in 2009 for one reach of Cowee Creek. After the streamgage data has been analyzed, an amendment will be filed to update the application.

Peterson Creek near Amalga Harbor

Peterson Creek is located in Southeast Alaska approximately 20 miles north of Juneau (Figure 7). The creek supports coho, chum, and pink salmon, cutthroat and steelhead trout, and Dolly Varden. It is the most popular steelhead sport fishery accessible from the Juneau road system.

ADF&G installed streamgage station 13601 at Peterson Creek on September 27th, 2012. This gage will continue to operate until October 1, 2017, or until five years of streamflow data has been collected. A reservation of water application will be filed after one year of streamgage data has been collected and analyzed.

Turner, Eagle and Orchard Lakes

ADF&G received funding provided by the National Fish Habitat Action Plan through a grant from the Western Native Trout Initiative to collect hydrologic data and prepare reservation of water applications on three 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, Orchard Lake is 35 miles and Eagle Lake is 60 miles north of Ketchikan, respectively.

ADF&G operated lake level gages on these lakes since the fall of 2010. In 2012, Turner Lake was visited three times in March, June, and October. Eagle and Orchard lakes were each visited twice, in May and October. These site visits included downloading transducer data, measuring lake levels relative to an established benchmark, taking pictures of site conditions, and performing routine maintenance. During the spring site visits, thalweg elevations were surveyed on three inlet tributary on each lake.

This project was originally funded through December 2013. In June 2012, additional funding was received from the Western Native Trout Initiative for two more years of data collection. The lake gages will now remain in operation until October 2015 or until five years of lake level data has been collected.

In the fall of 2012, reservation of water applications were filed with DNR for each lake. After five years of hydrologic data collection has been completed and analyzed, the applications will be amended, if necessary.

Thorne River

The Thorne River is located in Southeast Alaska on Prince of Wales Island. With approximately 113 anadromous river miles, the Thorne River is the largest stream system on Prince and Wales Island and supports populations of coho, chum, sockeye and pink salmon, cutthroat, and steelhead trout and Dolly Varden. The Thorne River is a popular sport fishery as well as an important subsistence fishery for Prince of Wales residents.

ADF&G installed streamgage 13501 on the mainstem of the Thorne River on August 23, 2012. Three discharge measurement stations were also established within the Thorne River watershed, on Goose Creek, North Thorne River, and on Rio Beaver. Following installation, a site visit was conducted on October 10, 2012, to the gage and each discharge station. Stream Gage 13501 will remain in operation until October 2017 or until five years of streamflow data have been collected. A reservation of water application is planned to be filed in 2014 after one complete water year of streamgage data has been collected and analyzed.

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 Creek and Fish Creek 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. These creeks are predominately lake influenced and ground-water fed; therefore seasonal variation in streamflows is relatively low. Inter-annual variation in streamflows may also be low for the same reasons. This drainage is a major wild sockeye salmon producing system that has been supplemented with hatchery fish in the past. 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.

Meadow Creek, Fish Creek, and Big Lake 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.

In 1988, ADF&G filed reservation of water applications on Meadow Creek (called lower) and two reaches on Fish Creek (called "upper" and "lower"). Streamflows requested in these applications were based on regional regression analyses and were supported by a few instantaneous discharge measurements. Seasonal flow variability was based on nearby Cottonwood Creek. To complete adjudication of these applications, DNR requested that 5-years of continuous stream flow data be obtained.

In 2008, an Alaska Sustainable Salmon Fund (AKSSF) grant was received to collect and analyze the hydrological and biological data necessary to quantify and protect instream flows in Meadow Creek and Fish Creek. ADF&G installed gages on lower Fish Creek and lower Meadow Creek, and established discharge measurement sites on upper Fish Creek and "upper" Meadow Creek (also known as Little Meadow Creek). ADF&G contracted the Wasilla Soil and Water Conservation District to measure discharge, and collect water quality information (dissolved oxygen, specific conductivity, pH, nitrates, phosphorus, and fecal coliform). Waterwalkers Streamflow Monitoring was contracted to analyze the streamflow data from the gaging stations. ADF&G will use the gage data to determine flows on the ungaged reaches on Meadow Creek and Fish Creek. The MatSu Instream Flow Protection project has received continued funding from AKSSF and will be completed in November 2013. In 2012, a reservation of water application was filed on Little Meadow Creek. This application will be amended after 5 years of streamgage data have been collected. Field work for this project continued through 2012.

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 licenses[15] that specify how projects will be constructed and operated including any protection, mitigation, and/or enhancement requirements. FERC licenses 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. 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. 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

[15] A FERC license has a term of 30 to 50 years, subject to renewal.

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 for project review. 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.

In 2012, SARCU monitored 80 FERC 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 bodies.[16] 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.[17] 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 each nomination 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 nomination. To date, there are 375 waters in the ACWA database and 69 of these water bodies are ranked as high priority for habitat concerns.

After reviewing each nomination, WEG staff assign water bodies 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 state fiscal year 2012 (July 1, 2011, through June 30, 2012), 14 projects were funded by ACWA (Appendix A). ADF&G and DNR did not contribute funding to the ACWA grant pool during this time. Stakeholders interested in receiving funding for specific projects can apply directly to AKSSF. Proposals for waters identified by ACWA as high priority will benefit when being evaluated for AKSSF funding.

[16] For more information on ACWA go to www.state.ak.us/dec/water/acwa/acwa_index.htm.
[17] For information on ACWA's plan see http://www.dec.state.ak.us/water/acwa/acwa_ranking.htm.

DISCUSSION

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 outflow,[18] only 519 USGS continuous streamgages have been established in Alaska (J. Conaway, USGS Hydrologist, Anchorage, Alaska, January 28, 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 federal Water Year 2012 (October 1, 2011 through September 30, 2012), USGS operated 128 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 2012, 26 were in Southeast, 46 were in Southcentral, and 56 were throughout the remainder of the state. (J. Conaway, USGS Hydrologist, Anchorage, Alaska, January 28, 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 lake elevations are needed for project designs and to manage and enforce water rights. Obtaining these data can be difficult and expensive; challenges include: Alaska's limited road systems, extreme weather conditions, and the loss of equipment to bears and other wildlife.

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 long-term or seasonal flow characteristics is difficult and often produces estimates with high uncertainty. Furthermore, it is more time consuming to estimate streamflow characteristics for streams having limited or no data than it is to summarize 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 data.[19] Also, ADF&G, DNR, and USGS collaborated to implement a StreamStats[20] 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. After completion of the pilot project, USGS will evaluate the feasibility of statewide implementation.

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[18] Alaska Hydrologic Survey website checked May 3, 2012, http://dnr.alaska.gov/mlw/water/hydro/components/surface-water.cfm

[19] 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.

[20] See http://water.usgs.gov/osw/streamstats/.

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 relationship between instream flows and fish productivity needs to be more extensively investigated. Ideally, investigations should be conducted over multiple years in areas not significantly influenced by human activities so results will reflect conditions needed to sustain natural fish populations. The amount of available habitat, utilized habitat, and naturally occurring fish populations should be monitored to better understand fish habitat preferences. Research on the natural variability of key environmental parameters (e.g. ground water, water temperatures, turbidity, etc.) and how variation in these parameters influences fish productivity 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 studying fish population dynamics. If results indicate additional water should be reserved, a supplemental reservation of water application should be completed and filed.
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) The purpose and benefits of instream flow education, training, and outreach should be re-evaluated. Program results during the brief period of operation achieved success in the short-term and are expected to provide long-term benefits for participation and support of sport fishing activities. A fundamental goal commonly identified by educators is to achieve public recognition of the importance of maintaining instream flows and lake levels in Alaska to sustain healthy fish populations. A key step toward achieving this goal is comprehensive outreach and incorporation of instream flow concepts and activities into other department education programs and the school system.
6) Dedicated funding to the ACWA grant pool is needed to continue to meet ACWA's goal to address stewardship of Alaska's water bodies. 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 written documentation.

The experience of other states shows that it is prudent to protect instream flows as early as possible; otherwise, in the future water may be more scare and opportunities for protection more costly and contentious.

ACKNOWLEDGMENTS

To Bob Clark for his insights and assistance with the Unit and this report. To Monte Miller, Shawn Johnson, Jarrod Sowa, Tom Cappiello, Jason Mouw, Jason Hass, Jeff Conaway, and Kim Sager for their contributions. To Allen Bingham, Adam Craig, and Anton Antonvich for biometric support. To the Division of Sport Fish biologist who responded to countless requests for information; to April Behr for peer review; and to Joanne MacClellan for her expertise and patience throughout the writing process.

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FIGURES AND TABLES

Figure 1.–Map of ADF&G, Division of Sport Fish regions in Alaska.

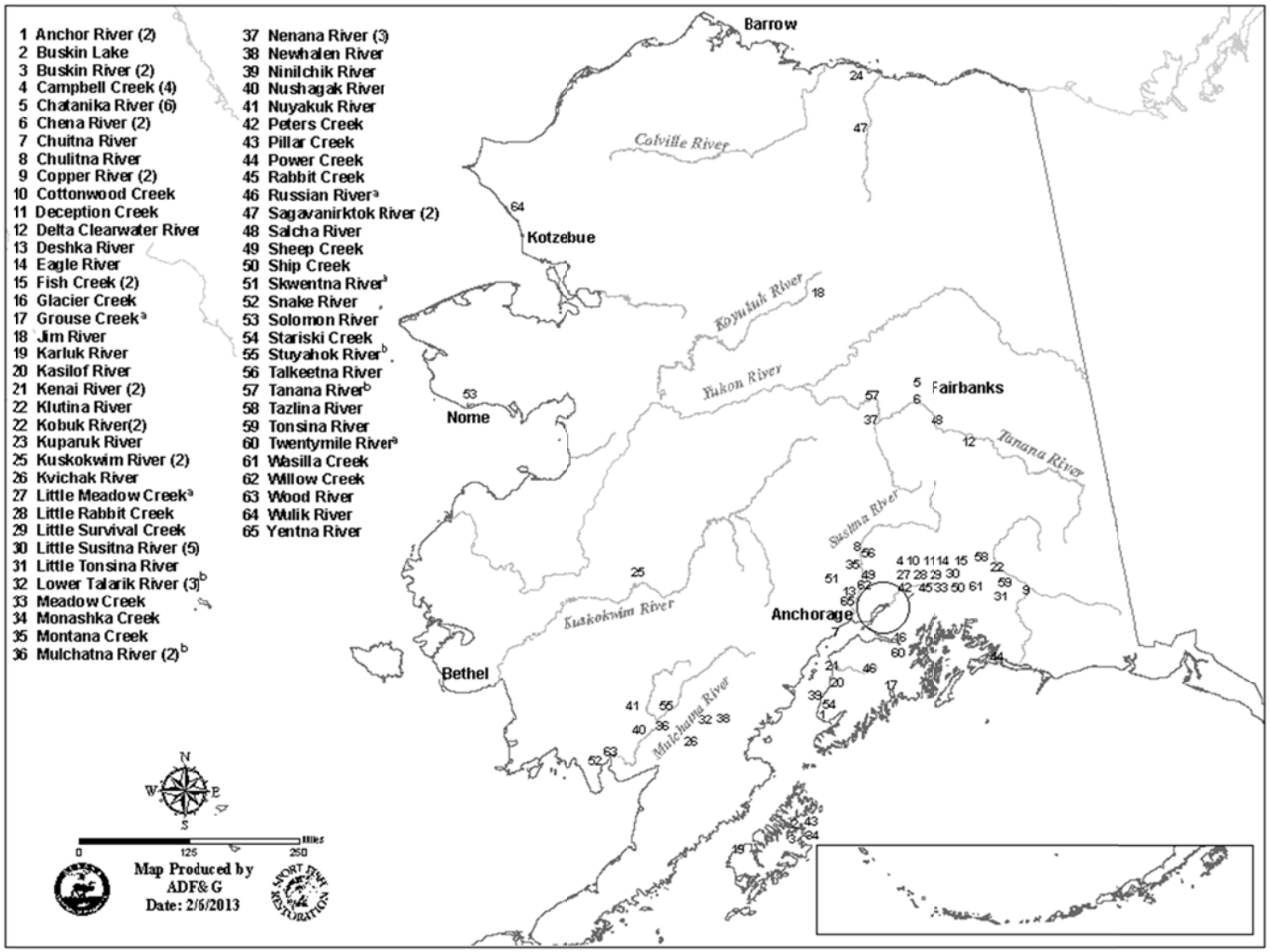

Figure 2.–Location of ADF&G reservation of water applications filed in Alaska except Southeast.

[a] = reservation of water sites filed in 2012

[b] = reservation of water sites filed by ADF&G in cooperation with a private partner

( ) = number of multiple applications filed for the site.

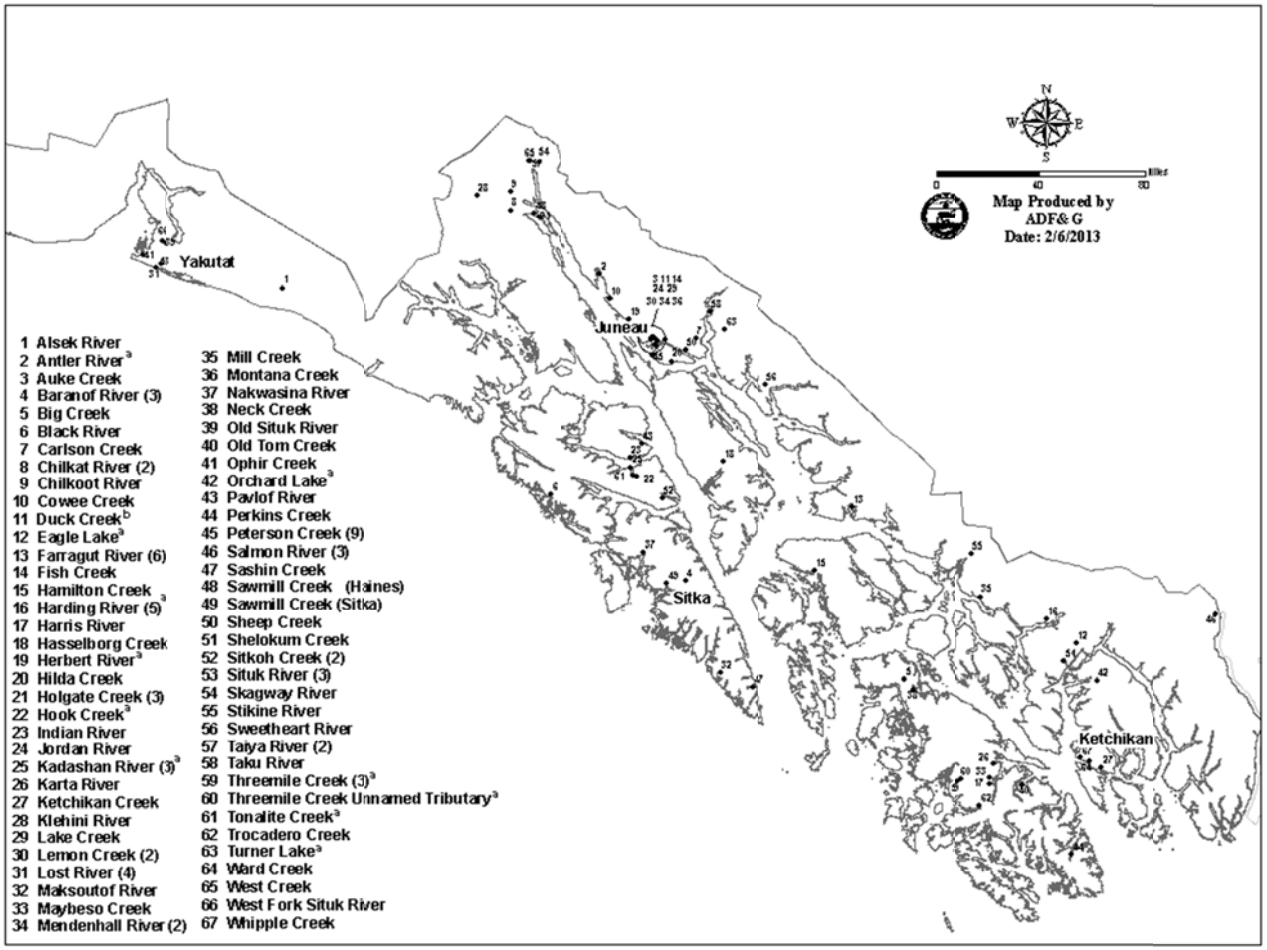

Figure 3.–Location of ADF&G reservation of water applications filed in Southeast Alaska.

[a] = reservation of water sites filed in 2012

[b] = reservation of water sites filed by ADF&G in cooperation with a private partner

( ) = number of multiple applications filed for the site

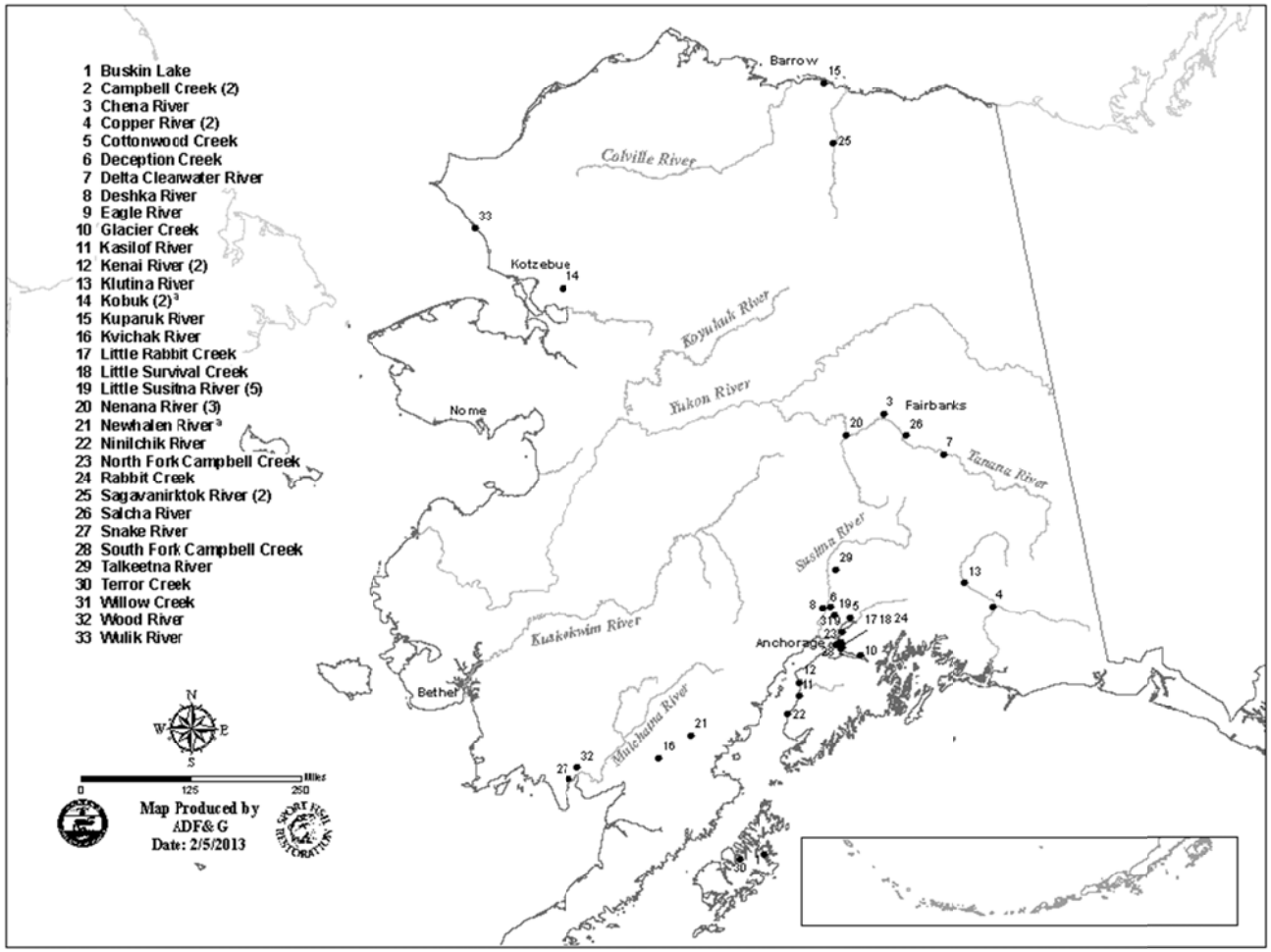

Figure 4.–Location of ADF&G certificates of reservation granted in Alaska except Southeast.

[a] = reservation of water sites filed in 2012

( ) = number of multiple applications filed for the site

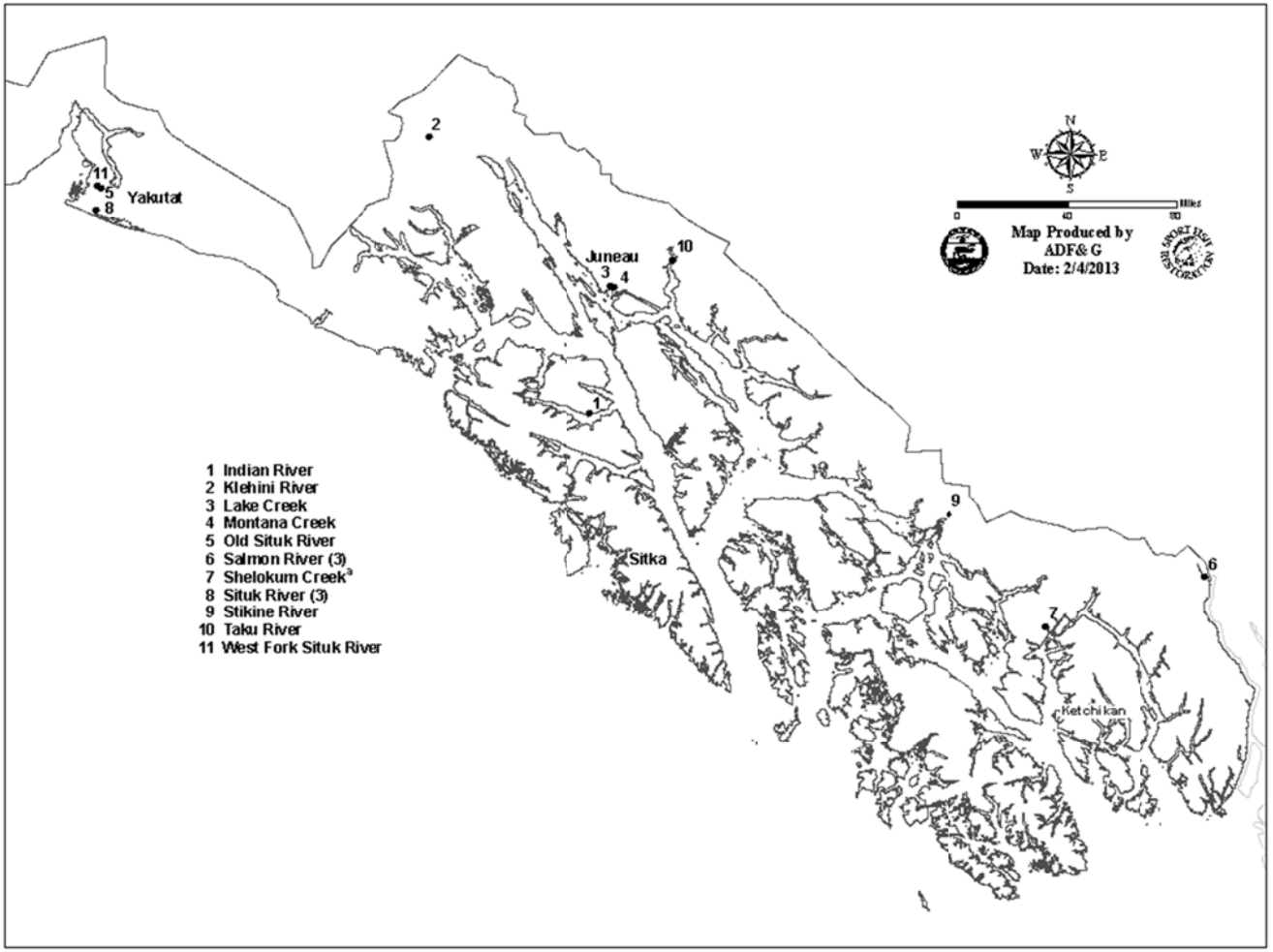

Figure 5.–Location of ADF&G certificates of reservation granted in Southeast Alaska.

[a] = reservation of water sites filed in 2012

( ) = number of multiple applications filed for the site

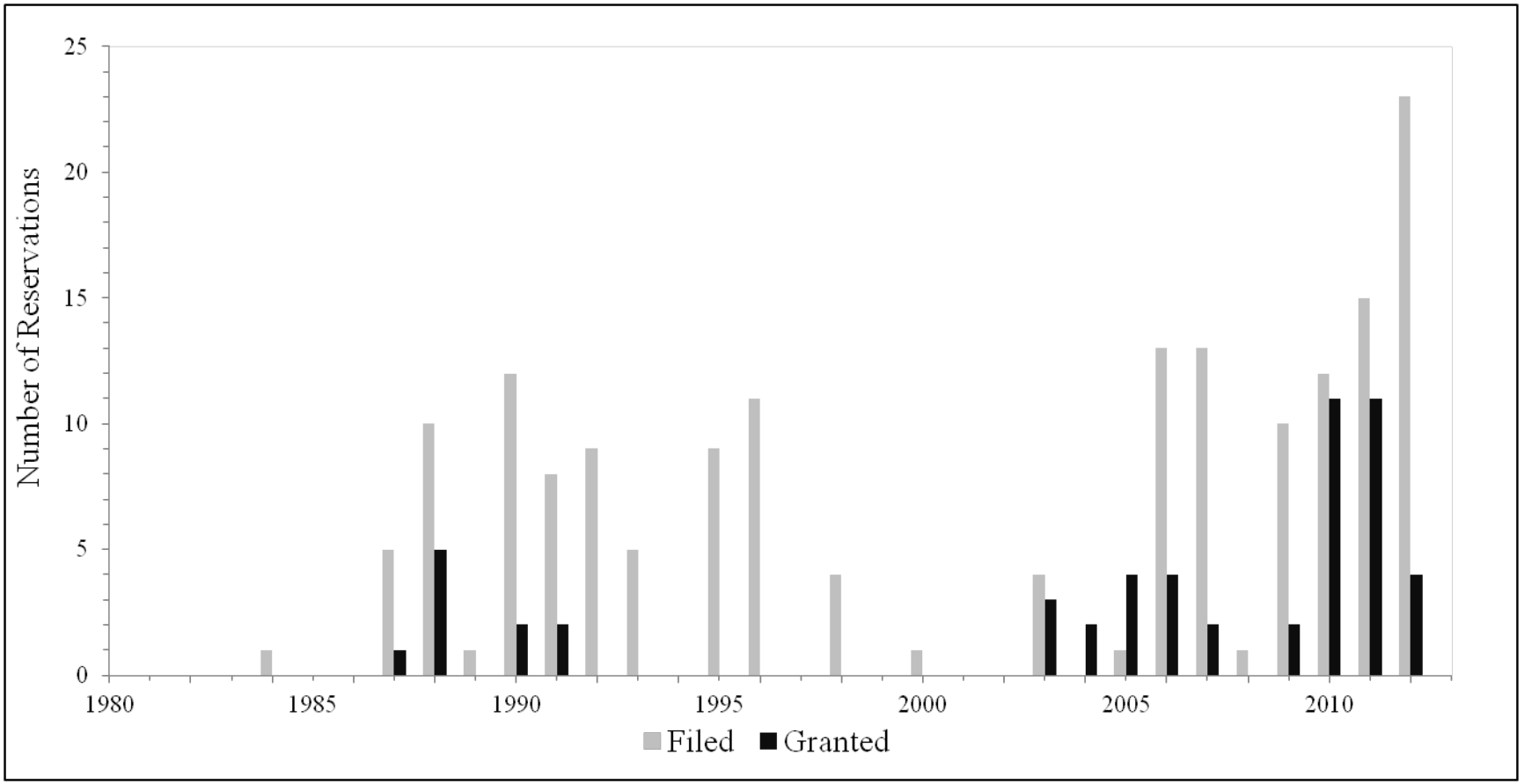

Figure 6.–Summary of ADF&G reservations filed and granted from 1980 to 2012.

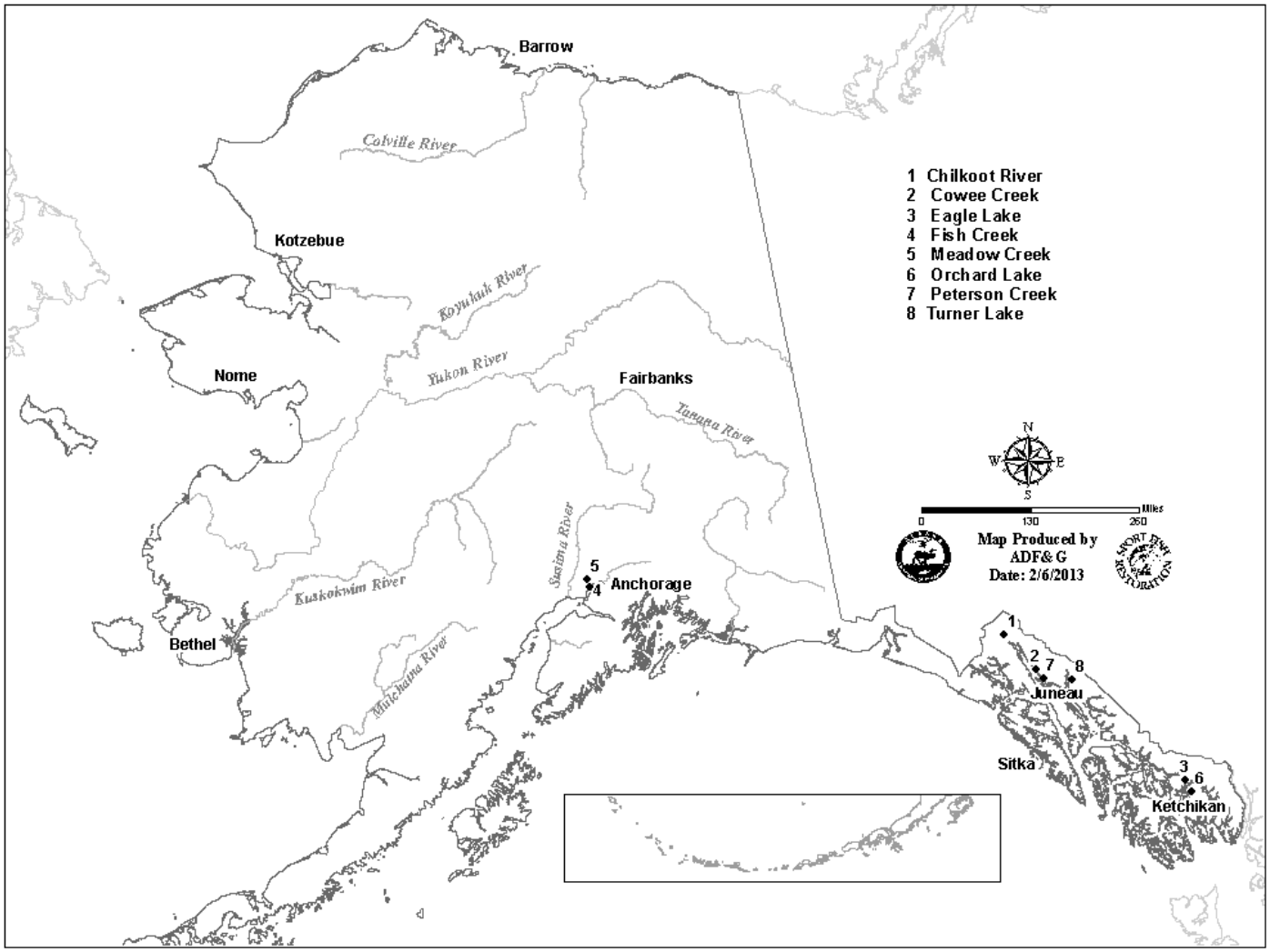

Figure 7.–Location of hydrologic investigations performed by ADF&G, Statewide Aquatic Resources Coordination Unit staff in 2012.

Table 1.–Summary of all reservation of water applications filed and granted as of December 2012.

Organization	Rivers/streams Filed	Lakes Filed	Granted
ADF&G	185	4	55
U.S. Fish and Wildlife Service	58	140	
Bureau of Land Management	19		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		
Copper River Watershed Council		1	
ADF&G (per AS 46.15.035)	1	1	2
DNR (per AS 46.15.035)	2	2	4

Table 2.–Summary of ADF&G reservation of water applications filed in 2012.

Map ID	DNR LAS No.	Name	Priority Date
1	28372	Kadashan River-Reach A	1/6/2012
2	28373	Kadashan River-Reach B	1/6/2012
3	28374	Kadashan River-Reach C	1/6/2012
4	28376	Tonalite Creek	1/6/2012
5	28375	Hook Creek	1/6/2012
6	28402	Threemile Creek Reach A	2/2/2012
7	28404	Threemile Creek Reach B	2/2/2012
8	28405	Threemile Creek Reach C	2/2/2012
9	28406	Threemile Creek Unnamed Tributary	2/2/2012
10	28418	Grouse Creek	2/10/2012
11	28417	Little Meadow Creek	2/12/2012
12	28484	Harding River Reach B	3/29/2007
13	28485	Harding River Reach C	3/29/2007
14	28486	Harding River Reach D	3/29/2007
15	28487	Harding River Reach E	3/29/2007
16	28656	Turner Lake	8/2/2012
17	28657	Antler River	8/2/2012
18	28658	Herbert River	8/7/2012
19	28727	Skwentna River	9/28/2012
20	28750	Twentymile	10/24/2012
21	28751	Russian River	10/24/2012
22	28771	Eagle Lake	11/19/2012
23	28772	Orchard Lake	11/19/2012

Note: See Figures 2 and 3 for site locations.

[a] The Land Administration System (LAS) is managed by DNR to provided 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 2012.

Map ID	DNR LAS No.	Name	Priority Date	Granted Date
1	21125	Kobuk River Reach A	12/31/1996	2/15/2012
2	21134	Kobuk River Reach B	12/31/1996	2/15/2012
3	25881	Shelokum Creek	10/12/2006	3/1/2012
4	24379	Newhalen River	7/28/2003	4/23/2012

Note: See Figures 4 and 5 for site locations.

Table 4.–Summary of FERC hydroelectric and hydrokinetic projects in Alaska monitored by ADF&G, Statewide Aquatic Resources Coordination Unit staff in 2012.

Project	FERC No.	Capacity (MW)	Status
Southeast			
Blue Lake	2230	7.5 - 16.9	Relicensed hydroelectric
Cascade Creek	12495	70	Proposed hydroelectric
Cascade Creek	14360	70	Proposed hydroelectric
Scenery Lake	12621/13365	30	Proposed hydroelectric
Ruth Lake	12619	20	Proposed hydroelectric
Connelly Lake	14229	12	Proposed hydroelectric
Gartina Falls	DI09-7 14066	0.6	Proposed hydroelectric
Baranof Warm Springs	DI09-14	Up to 2.28	Proposed hydroelectric
Neck Lake	DI10-5	0.124 - 0.4	Proposed hydroelectric
Soule River	12615	75	Proposed hydroelectric
Lake 3160	12661	4.995	Proposed hydroelectric
Takatz Lake	13234	5	Proposed hydroelectric
Lake Shelokum	13281	10	Proposed hydroelectric
Sweetheart Lake	13563	30 reduced to 20	Proposed hydroelectric
Schubee Lake	13645	4.9	Proposed hydroelectric
Salmon /AnnexCreek	2307	6.7/3.6	Licensed hydroelectric
Black Bear	10440	4.5	Licensed hydroelectric
Ketchikan Lakes	420	4.2	Licensed hydroelectric
Swan Lake	2911	22	Licensed hydroelectric
Lake Dorothy	12379	14.3	Licensed hydroelectric
Reynolds Creek	11480	5	Under construction hydroelectric
Whitman Lake	11841	4.6	Under construction hydroelectric
Tyee	3015	20	Licensed hydroelectric
Mahoney Lake	11393	9.6	Under construction hydroelectric
Jetty Lake	3017	0.249	Licensed hydroelectric
Burnett River Hatchery	10773	0.08	Licensed hydroelectric
Armstrong - Keta	8875	0.08	Licensed hydroelectric
Blind Slough/Crystal Lake	201	2	Licensed hydroelectric
Kasidaya	11588	3	Licensed hydroelectric
Goat Lake	11077	4	Licensed hydroelectric
Dewey Lakes	1051	0.943	Licensed hydroelectric
Falls Creek	11659	0.8	Licensed hydroelectric
Green Lake	2818	18.54	Licensed hydroelectric
Pelican	10198	0.7	Licensed hydroelectric
Beaver Falls	1922	7.1	Licensed hydroelectric
Port Fredrick	13512	0.4	Proposed hydokinetic-tidal
Icy Passage Tidal	13605	0.3	Proposed hydokinetic-tidal
Gastineau Channel Tidal	13606	0.4	Proposed hydokinetic-tidal
Killisnoo Tidal Energy	13823	0.25	Proposed hydokinetic-tidal
Yeldagalga Creek	14115	8	Proposed hydroelectric

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Table 4.–Page 2 of 2.

Project	FERC No.	Capacity (MW)	Status
Sunrise Lake	14296	4	Proposed hydroelectric
Water Supply Creek	Not Determined	0.4	Proposed hydroelectric
Triangle Lake-Metlakatla	Not Determined	Unknown	Proposed hydroelectric
Walker Lake	14346	1	Proposed hydroelectric
Walker Lake	14424	1	Proposed hydroelectric
Yakutat Wave Energy Project	14438	0.5 - 0.75	Proposed hydokinetic-Tidal
Sheep Creek - Thane	14480	3.3	Proposed hydroelectric
Southcentral			
Allison Lake	13124	6.5	Proposed hydroelectric
Old Harbor	13272	0.525	Proposed hydroelectric
Glacier Fork	13327	75	Proposed hydroelectric
Falls Creek-Kenai Penninsula	13211	5	Proposed hydroelectric
Grant Lake Kenai Penninsula	13212	5	Proposed hydroelectric
Snyder Falls Creek	13328	3	Proposed hydroelectric
Chakachamna Lake	12660	300	Proposed hydroelectric
Power Creek	11243	6	Licensed hydroelectric
Dry Spruce	1432	0.075	Licensed hydroelectric
Bradley Lake	8221	119.7	Licensed hydroelectric
Solomon Gulch	2742	12	Licensed hydroelectric
Tiekel River	Not-Determined	Up to 44	Possible hydroelectric
Silver Lake	13717	15	Proposed hydroelectric
Chignik	620	0.06	Licensed hydroelectric
Terror Lake	2743	22.5 - 33.75	Licensed hydroelectric
Kvichak River-Igiugig	13511	4	Proposed hydrokinetic-river
Cooper Lake	2170	19.38	Relicensed hydroelectric
Humpback Creek	8889	1.25	Licensed hydroelectric
Cook Inlet, #12679	12679	1	Proposed hydrokinetic-tidal
Turnagain Arm #13509	13509	240	Proposed hydrokinetic-tidal
East Forelands Tidal Energy	13821	100	Proposed hydrokinetic-tidal
Pedro Bay	Not-Determined	Not-Determined	Proposed hydroelectric
Susitna-Watana	14241	600	Proposed hydroelectric
Chikuminuk	14369	13.4	Proposed hydroelectric
DAHP Grant/Elva	14356	1.7/1.5	Proposed hydroelectric
Interior			
Kogoluktuk River	13286	4	Proposed hydroelectric
Port Clarence	13298	0.3	Proposed Hydrokinetic-tidal
Shungnak River	13299	5	Proposed hydroelectric
Yukon River-Eagle	13600	0.025	Proposed hydrokinetic-river
Yukon River-Ruby	Not Determined	10	Proposed hydrokinetic-river
Tanana River-Nenana	13233	0.4	Proposed hydrokinetic-river
Tanana River-Nenana	13883	0.3	Proposed hydrokinetic-river
Tanana River-Whitestone	13305	0.1	Proposed hydrokinetic-river

Table 5.–Summary of USGS streamgage sites in Alaska as of September 30, 2012.

Number of streamgages	Period of Record (Years)
21	0 < 1[a]
149	1 to < 5
96	5 to < 10
131	10 to < 20
109	20 to < 50
13	≥ 50
Total	519
Total active in Water Year 2012	128
Total active in Southeast	26
Total active in Southcentral	46
Total active in Southwest, Northwest, Yukon and Arctic	56

Source: J. Conaway, USGS Hydrologist, Anchorage, Alaska, January 28, 2013, 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 – FY12
PROJECT DESCRIPTIONS

Reproduced from Alaska Department of Environmental Conservation ACWA previously funded projects website: See http://www.dec.state.ak.us/water/acwa/acwagrantsproject.htm

Below are the summaries of the Alaska Clean Water Actions (AWCA) Grants for projects starting July 2011 and finishing June 2012. The summaries are arranged by region of the state and include contact information for the group conducting the project. Due to a decrease in available funding, a number of the awards originally announced were not granted and others were reduced in scope.

Southeast Region

Monitoring Bacteria Levels on Haines Beaches
Takshanuk Watershed Council (TWC), $24,511
This project addresses an ACWA Stewardship priority. Beaches in the Haines area are increasingly used for recreation during the summer months as the long days draw both local residents and tourists to the beach for a variety of activities. This project will conduct fecal bacteria monitoring at three recreational beaches in the Haines Borough – Portage Cove, Lutak Beach, and Letnikof Beach. These beaches were identified by DEC as high priority because they are commonly used for recreation activities where people come in contact with the water. Through this project, the TWC will monitor the bacteria in the waters, increase public awareness of potential bacterial sources and the health risks associated with bacterial contamination, and work with the Haines Borough to limit beach access in the event of significant bacterial exceedances to ensure public health is protected. Contact: Brad Ryan, (907) 766-3542.

Monitoring Juneau Beaches for Fecal Pollution
Juneau Watershed Partnership (JWP), $26,313
This project addresses an ACWA Stewardship priority. The JWP, in cooperation with the City and Borough of Juneau and U.S. Forest Service, Tongass Ranger District, will monitor Auke Lake Recreation Area, Lena Cove, and Ann Coleman Road beaches for fecal bacteria pollution to evaluate possible risk to recreational users and ensure public health and safety. These Juneau area beaches were identified by DEC as high priority because they are commonly used for contact recreation activities. Any events where bacterial levels exceed public health criteria will be evaluated for possible sources. If chronic bacterial exceedances are detected, further work may be necessary to confirm sources of pollution and prepare mitigation plans for affected areas, as appropriate. Contact: Beverly Schoonover, (907) 586-6853.

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Pullen Creek Stormwater Best Management Practices Manual & Outreach, Taiya Inlet Watershed Council (TIWC), $25,800

This project addresses an ACWA Waterbody Restoration priority. Pullen Creek was placed on the State's list of impaired (polluted) waters in 1990 due to contamination. A waterbody recovery plan called a Total Maximum Daily Load (TMDL) was approved by EPA in 2010. In this project, the TIWC will partner with the Municipality of Skagway to reduce metals and sediment from stormwater runoff to Pullen Creek. The project includes the development of a Stormwater Best Management Practices (BMP's) Manual targeting Pullen Creek, installation of storm drain guards and community outreach to reduce stormwater pollution in Pullen Creek. These tasks will address stormwater runoff from a wide range of sources and lead to improved water quality of Pullen Creek. Contact: Andrea Conley, (907) 983-2426.

Stormwater Master Plan and Management Guidelines
City and Borough of Sitka (CBS), $24,000
This project addresses an ACWA Stewardship priority. The CBS does not have a stormwater master plan or mapping program for protection of inland and coastal waters from stormwater runoff pollution. This project will fill that gap by mapping and inventorying existing stormwater facilities; identifying existing discharges, inadequate storm drains, and management measures to reduce polluted stormwater runoff; and determining various maintenance, repair and design alternatives to maximize the capabilities of the stormwater system. The project includes hydrologic modeling to estimate stormwater runoff quantities and provides for long-term environmental stewardship. Contact: Stephen Weatherman, (907) 747-4042.

South Central Region

Clean Boating on Big Lake
Cook Inletkeeper (CIK), $20,697
This project addresses an ACWA Waterbody Restoration priority. In 2006, Big Lake was listed as impaired (polluted) for petroleum hydrocarbons that exceeded state water quality standards. Monitoring in 2009 confirmed high levels of hydrocarbons in Big Lake, primarily during high use holiday weekends (Memorial Day, Fourth of July, and Labor Day weekends), and in the vicinity of high use areas (private marinas, public boat launches and traffic lanes). Big Lake is a popular recreational lake in the Mat-Su Borough and an important economic asset to the Big Lake community. During 2010 and early 2011, local community members and other stakeholders of Big Lake developed an Action Plan for reducing pollution in Big Lake through targeted outreach and education. Using the Big Lake Action Plan as a guide, this project will address the goals of meeting water quality standards and removing the impairment status of Big Lake through a comprehensive educational clean boating campaign. This project has three objectives: 1) Develop and implement an educational clean boating program to ensure that boaters have

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locally available resources, know how to practice clean boating skills, and have an understanding of the negative impacts of petroleum on human health and fish habitat; 2) Empower campground hosts and local business owners to encourage "Clean Boating on Big Lake"; and, 3) Implement best management practices to institutionalize pollution reduction practices under the Alaska Clean Harbors program at Big Lake marinas. Contact: Rachel Lord, (907) 235-4068 ext. 29.

Kenai River Watershed Monitoring

Kenai Watershed Forum (KWF), $28,272

This project addresses an ACWA Waterbody Protection priority. The Kenai River is one of the premier commercial and sportfish rivers in south-central 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 11 sites on the mainstem of the Kenai River and from 11 tributaries just upstream from where they enter the Kenai River during peak power boat usage. This water quality monitoring effort will ensure the Kenai River Waterbody Recovery Plan continues to be effective and that water quality standards continue to be met. Contact: James Czarnezki, (907) 260-5478.

Kenai River Monitoring, Waste Management and Education

City of Kenai, $80,901

This project addresses an ACWA Stewardship priority. The Kenai River is one of the premier commercial and sportfish rivers in south-central Alaska. Elevated levels of enterococci and fecal coliform bacteria were measured in samples collected by DEC during the July 2010 dipnet salmon fishery at the mouth of the Kenai River. A large number of birds, primarily gulls, were observed on the beaches during the dipnet fishery. This project will monitor and test for bacteria at two locations at the mouth of the Kenai River (one site on the North Beach and one site on the South Beach) and at one location near the Warren Ames Bridge (River Mile 5). Bacteria monitoring will be used to determine if water quality meets the criteria to protect recreational beach users. Sampling will also seek to determine the source of the bacteria. Most of the samples will be collected during July and early August. Two sets of samples will be collected in October, after most of the gulls have left the area. The project will also install educational signs on the beach and produce and distribute educational material. Contact: Rick Koch, (907) 283-8222.

Little Susitna River Conservation

Palmer Soil and Water Conservation District (PSWCD), $11,170

This project addresses an ACWA Waterbody Protection priority. The lower Little Susitna River is at risk of water quality impairment from petroleum hydrocarbon pollution and turbidity. This project will develop and implement a year-long educational campaign on the impacts of petroleum and turbidity pollution to aquatic species and ways to reduce this pollution. The outreach campaign will build off of the DEC's current "*Fuel Out – Fish On!*" outreach message. The project will educate users of the lower Susitna River recreational fishery by conducting six

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outreach weekends at the State-operated public use facility and boat launch during the peak of the coho and Chinook salmon fisheries. The goals of the project include improved water quality through a more educated boating public. Contact: Kelly Strawn, (907) 745-1647.

Mat-Su Stormwater Assessment

Aquatic Restoration and Resources (ARRI), $46,050

This project addresses an ACWA Stewardship priority. It continues work needed to protect Wasilla Creek, Cottonwood Creek and Little Meadow Creek from the effects of urbanization on water quality and fish habitat. All three creeks are important for salmon spawning and rearing. Wasilla Creek supports coho, Chinook, and chum salmon, and both Cottonwood Creek and Little Meadow Creek are lake-stream systems important for the spawning and rearing of sockeye salmon, coho salmon and resident rainbow trout. The proposed project will investigate where polluted stormwater impacts are occurring in the target waters, the degree and extent of these impacts, what pollutants are of most concern and what the affects are to fish habitat. The information gained is critical to understanding the impacts of pollutants transported by urban stormwater runoff on these salmon streams and to assist resource managers in making effective and targeted decisions to protect these fisheries. Contact: Jeff Davis, (907) 733-5432.

Monitoring Bacteria on South Kenai Peninsula Beaches

Cook Inletkeeper (CIK), $32,724

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 provide the community with data on bacteria levels at Bishop's Beach in the City of Homer and on two beaches in Anchor Point, all of which have been identified as priority recreational beaches by the DEC. Through this project, CIK will increase public awareness of potential bacterial sources and the health risks associated with bacterial contamination and will work closely with the City of Homer and the DEC to limit beach access in the event of significant bacterial exceedances. The project will monitor bacteria during beach peak-use and institute a public notification system when bacteria levels raise public health concerns. Contact: Rachel Lord, (907) 235-4068, ext. 29.

Stream Temperature Monitoring Network – Cook Inlet

Cook Inletkeeper (CIK), $56,015

This project addresses an ACWA Stewardship priority. 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. 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—there is an urgent need to assess rising temperatures in Alaska salmon habitats. This project will 1) complete the fourth

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year of consistent data for the Stream Temperature Monitoring Network on Alexander Creek, Beaver Creek, Bishop Creek, Byers Creek, Cache Creek, Chenik Creek; Chester Creek, Chijuk Creek, Cottonwood Creek, Crooked Creek, Deception Creek, East Fork Chulitna River, English Bay River, Fish Creek, Fox Creek, Funny River, Hidden Creek, Jim Creek, Kroto (Deshka) Creek, Little Willow Creek, McNeil River, Meadow Creek, Montana Creek, Moose Creeks (Palmer & Talkeetna), Moose River, NF Campbell Creek, Nikolia Creek, Quartz Creek, Rabbit Creek, Resurrection Creek, Seldovia River, Shantatalik Creek, Ship Creek, Silver Salmon Creek, Slikok Creek, Soldotna Creek, Swanson River, Theodore River, Trapper Creek, Troublesome Creek, Wasilla Creek, and Willow Creek; 2) develop a Stream Temperature Action Plan which will identify future research needs, next steps for monitoring and habitat protection efforts, and recommendations to improve stream temperature data collection for fisheries management and hydrologic modeling; and 3) analyze 2011 temperature data to establish natural conditions and generate maps of Cook Inlet basin to illustrate temperature patterns. The Cook Inlet Stream Temperature Monitoring Network 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.

Interior Region

Green Infrastructure Solutions in Fairbanks
Cold Climate Housing Research Center (CCHRC), $11,310
This project addresses an ACWA Waterbody Stewardship priority. This project will identify areas and management measures for specific green-building technologies in the Fairbanks area and will build on work started to develop and implement Fairbanks-specific green infrastructure projects. An assessment of the success of prior projects will be conducted. Contact: Ryan Colgan, (907) 457-3454.

Surface Water Monitoring of Goldstream Creek,
University of Alaska Fairbanks, $36,000
This project addresses an ACWA Waterbody Recovery priority. Goldstream Creek is considered impaired (polluted) from turbidity. Through a previous ACWA grant, the first year of baseline water quality data is currently being collected on Goldstream Creek to establish natural background conditions and general water quality conditions. This project will continue that effort and provide the needed second year of data for DEC to characterize the overall health of the stream. The project will collect near-continuous measurements of turbidity data from base flow and storm flow conditions along with stream discharge measurements from summer to fall of 2011 and spring 2012. Monitoring results will be analyzed and a final report will be developed discussing the results in comparison to state water quality standards. The data allow DEC to

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determine what actions may be necessary to restore Goldstream Creek. Contact: Andrew Parkerson-Gray, (907) 474-1851.

Water Quality Sampling in Three Waterbodies

Tanana Valley Watershed Association, $7,549

This project addresses an ACWA Waterbody Recovery priority. The Chena River, Chena Slough and Noyes Slough are all currently impaired (polluted) waterbodies due to sediment pollution. Following a DEC approved Quality Assurance Project Plan (QAPP), this project will implement a sampling plan for settleable solids, pH, temperature, conductivity and flow in the Chena River, Chena Slough and Noyes Slough. The project will analyze and evaluate sampling results and prepare a report of findings, conclusions and recommendations based on a comparison to state water quality standards. In particular, sampling will measure sediments and discharges at reference sites upstream of potential sources of urban runoff as well as other locations previously identified in the QAPP. The data will provide a quantitative way for DEC to assess the current impairment status of these waters. Contact: Christy Everett, (907) 460-0941.