

**Regional Operational Plan SF.2A.2013.20**

---

---

# **Investigating Absence/Presence of Nonnative Crayfish in the Buskin Watershed, Kodiak**

by

**Tammy Davis**

---

---

November 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.

<b>Weights and measures (metric)</b>		<b>General</b>		<b>Mathematics, statistics</b>	
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, $\chi^2$ , etc.)
liter	L	north	N	confidence interval	CI
meter	m	south	S	correlation coefficient	
milliliter	mL	west	W	(multiple)	R
millimeter	mm	copyright	©	correlation coefficient (simple)	r
		corporate suffixes:		covariance	cov
<b>Weights and measures (English)</b>		Company	Co.	degree (angular)	$^\circ$
cubic feet per second	ft <sup>3</sup> /s	Corporation	Corp.	degrees of freedom	df
foot	ft	Incorporated	Inc.	expected value	$E$
gallon	gal	Limited	Ltd.	greater than	>
inch	in	District of Columbia	D.C.	greater than or equal to	≥
mile	mi	et alii (and others)	et al.	harvest per unit effort	HPUE
nautical mile	nmi	et cetera (and so forth)	etc.	less than	<
ounce	oz	exempli gratia	e.g.	less than or equal to	≤
pound	lb	(for example)		logarithm (natural)	ln
quart	qt	Federal Information Code	FIC	logarithm (base 10)	log
yard	yd	id est (that is)	i.e.	logarithm (specify base)	log <sub>2</sub> , etc.
		latitude or longitude	lat or long	minute (angular)	'
<b>Time and temperature</b>		monetary symbols (U.S.)	\$, ¢	not significant	NS
day	d	months (tables and figures): first three letters	Jan, ..., Dec	null hypothesis	$H_0$
degrees Celsius	°C	registered trademark	®	percent	%
degrees Fahrenheit	°F	trademark	™	probability	P
degrees kelvin	K	United States (adjective)	U.S.	probability of a type I error (rejection of the null hypothesis when true)	$\alpha$
hour	h	United States of America (noun)	USA	probability of a type II error (acceptance of the null hypothesis when false)	$\beta$
minute	min	U.S.C.	United States Code	second (angular)	"
second	s	U.S. state	use two-letter abbreviations (e.g., AK, WA)	standard deviation	SD
				standard error	SE
<b>Physics and chemistry</b>				variance	
all atomic symbols				population sample	Var var
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				

***REGIONAL OPERATIONAL PLAN SF.2A.2013.20***

**INVESTIGATING ABSENCE/PRESENCE OF NONNATIVE CRAYFISH  
IN THE BUSKIN WATERSHED, KODIAK**

by

Tammy Davis

Alaska Department of Fish and Game, Division of Sport Fish, Juneau

Alaska Department of Fish and Game  
Division of Sport Fish

November 2013

The Regional Operational Plan Series was established in 2012 to archive and provide public access to operational plans for fisheries projects of the Divisions of Commercial Fisheries and Sport Fish, as per joint-divisional Operational Planning Policy. Documents in this series are planning documents that may contain raw data, preliminary data analyses and results, and describe operational aspects of fisheries projects that may not actually be implemented. All documents in this series are subject to a technical review process and receive varying degrees of regional, divisional, and biometric approval, but do not generally receive editorial review. Results from the implementation of the operational plan described in this series may be subsequently finalized and published in a different department reporting series or in the formal literature. Please contact the author if you have any questions regarding the information provided in this plan. Regional Operational Plans are available on the Internet at: <http://www.adfg.alaska.gov/sf/publications/>

*Tammy Davis,  
Alaska Department of Fish and Game, Division of Sport Fish,  
PO Box 115526, Juneau, AK 99811, USA*

*This document should be cited as:*

*Davis, T. 2013. Investigating absence/presence of nonnative crayfish in the Buskin Watershed, Kodiak. Alaska Department of Fish and Game, Division of Sport Fish, Regional Operational Plan ROP.SF.2A.2013.20, Anchorage.*

The Alaska Department of Fish and Game (ADF&G) administers all programs and activities free from discrimination based on race, color, national origin, age, sex, religion, marital status, pregnancy, parenthood, or disability. The department administers all programs and activities in compliance with Title VI of the Civil Rights Act of 1964, Section 504 of the Rehabilitation Act of 1973, Title II of the Americans with Disabilities Act (ADA) of 1990, the Age Discrimination Act of 1975, and Title IX of the Education Amendments of 1972.

**If you believe you have been discriminated against in any program, activity, or facility please write:**

ADF&G ADA Coordinator, P.O. Box 115526, Juneau, AK 99811-5526

U.S. Fish and Wildlife Service, 4401 N. Fairfax Drive, MS 2042, Arlington, VA 22203

Office of Equal Opportunity, U.S. Department of the Interior, 1849 C Street NW MS 5230, Washington DC 20240

**The department's ADA Coordinator can be reached via phone at the following numbers:**

(VOICE) 907-465-6077, (Statewide Telecommunication Device for the Deaf) 1-800-478-3648,

(Juneau TDD) 907-465-3646, or (FAX) 907-465-6078

**For information on alternative formats and questions on this publication, please contact:**

ADF&G, Division of Sport Fish, Research and Technical Services, 333 Raspberry Rd, Anchorage AK 99518 (907) 267-2375

**OPERATIONAL PLAN FY13**

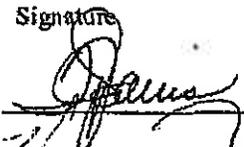
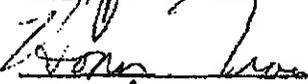
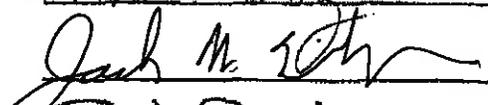
**INVESTIGATING ABSENCE/PRESENCE OF NONNATIVE CRAYFISH  
IN THE BUSKIN WATERSHED, KODIAK**

Principal Investigators: Tammy Davis, Fisheries Biologist IV

Assisting Personnel: Daniel Reed, Project Biometrician III  
Donn Tracy, Fishery Biologist III  
Tyler Polum, Fishery Biologist I

Date Submitted: July 10, 2013

**APPROVED**

	Signature	Date
Project Biologist		07/10/13
Area Manager		07/10/13
Research Supervisor		
Consulting Biometrician		7/10/2013

# TABLE OF CONTENTS

	<b>Page</b>
LIST OF APPENDICES .....	ii
ABSTRACT .....	1
PURPOSE.....	1
Background.....	1
OBJECTIVES.....	2
Secondary Objectives .....	2
METHODS.....	3
SCHEDULE AND DELIVERABLES .....	4
RESPONSIBILITIES .....	4
REFERENCES CITED .....	4
APPENDIX A. DATA FORM .....	5

## LIST OF APPENDICES

<b>Appendix</b>	<b>Page</b>
Appendix A1.–Example form used to record crayfish survey data. ....	6

## **ABSTRACT**

The objectives of this study are to a) confirm presence/absence of nonnative crayfish in Buskin Lake and if present, b) identify the species of crayfish. Methods to achieve these goals include deploying minnow traps at the inflow to Buskin Lake and at the outflow (the Buskin River), where nonnative crayfish have been observed in the last five years. Collected specimens will be sent to experts at the University of Washington, School of Aquatic and Fisheries Science to confirm species identification. This will be the second year of sampling in Buskin Lake. The Alaska Department of Fish and Game (ADF&G), Division of Sport Fish (DSF) will use data to develop management actions regarding nonnative crayfish populations in the area.

Keywords: Absence/presence, aquatic nuisance species, crayfish, Buskin Lake, Buskin River, invasive species, Kodiak, nonnative species

## **PURPOSE**

The first report of a nonnative crayfish to Kodiak occurred prior to 2002 and resulted in the confirmation of a Signal crayfish (*Pacifastacus leniusculus*) from the Buskin River (Fay 2002). In 2011, crayfish were reported at the inflow creek to Buskin Lake. With the goal of confirming absence or presence of crayfish in the Buskin drainage, the Alaska Department of Fish and Game (ADF&G) Division of Sport Fish, Kodiak weir staff set three (3) minnow traps on six (6) occasions in 2012 to detect presence of crayfish at two general locations of the Buskin River. Although no crayfish were successfully trapped during these events, on August 1, 2012 staff collected a single crayfish when they were removing a weir from the head of the Buskin River. Staff will again set traps in 2013, to collect absence or presence data for crayfish in Buskin Lake, and the Buskin River and/or other high-use water bodies as resources allow. Any crayfish collected will be sent to the University of Washington, School of Aquatic and Fisheries Science for species identification.

## **BACKGROUND**

Invasive species have been reported from various locations in Alaska. The Alaska Aquatic Nuisance Species Management Plan identifies nonnative crayfish as one of several highest potential threats to the state (Fay 2002). As early as 2001, two species of nonnative crayfish had been detected in freshwater locations on Kodiak Island and the Kenai Peninsula. In 2001, a signal crayfish (*Pacifastacus leniusculus*) was confirmed from the Buskin River, on Kodiak Island. A red swamp crayfish (*Procambarus clarkii*) was confirmed from the Kenai River in 2004. The Alaska Department of Fish and Game (ADF&G), Invasive Species Program learned about a number of crayfish that were observed in the Buskin Lake by a young angler in the fall of 2011. Based on that report, during the summer of 2012, ADF&G field technicians set three (3) traps on six (6) occasions to detect presence or absence of nonnative crayfish in Buskin Lake. Although no crayfish were trapped during the survey period, days later when staff removed a fish weir from the Buskin Lake outflow into the Buskin River, a single crayfish was detected. Based on photos of crayfish collected by the angler and ADF&G staff, these crayfish are suspected to be signal crayfish; however, the species has not been confirmed by genetic analysis.

The Pacific Northwest region has seen invasive crayfish introductions resulting in negative changes to food webs and displacement of native crayfish species. The key crayfish species of

concern to Alaska are the signal crayfish (*Pacifastacus leniusculus*), rusty crayfish (*Orconectes rusticus*), and red swamp crayfish (*Procambarus clarkii*). Signal crayfish are native to fresh water systems to the west of the Rocky Mountain range, including areas of Washington State, Oregon and Idaho and the Canadian province of British Columbia. Red swamp crayfish are native to the southern U.S. and northeastern Mexico and are considered the most invasive crayfish in the world. Rusty crayfish have been found in Oregon, far from their native range of the Ohio River Basin, which includes Ohio, Kentucky, Tennessee, Illinois and Indiana. Alaska has no record of native crayfish, introduced species can result in detrimental impacts to aquatic community structure and ecosystem processes. Crayfish often fill a keystone role in aquatic food webs as omnivorous consumers of plant matter, animal matter, and detritus, and serve as an important link between these energy sources and aquatic and terrestrial predators (Larson and Olden 2011a). Gaining an understanding of the potential distribution of nonnative crayfish in the Buskin system is a precursor to further investigation into possible impacts.

The Buskin River supports the most productive and popular sport fishery on the Kodiak Island road system. Sockeye, coho and pink salmon, steelhead and Dolly Varden are all found in the system. Nonnative crayfish may impact fish populations through competition, predation, or habitat modification. Fish eggs, small fish, aquatic invertebrates and plants are key food resources for crayfish.

## **OBJECTIVES**

1. To detect presence of nonnative crayfish within Buskin Lake, the Buskin River, and as resources allow, other water bodies in the area of the City of Kodiak.
2. Identify to species any collected crayfish specimens.
3. Ensure at least one sample collected is held at the University of Alaska museum invertebrate collection.

## **SECONDARY OBJECTIVES**

1. Request Buskin River and Buskin Lake anglers to report crayfish sightings to 1-877-INVASIV.
2. Deploy traps as time and resources allow;
  - a. Attempt to set crayfish traps at least six (6) times during summer field season in Buskin Lake, with some trapping event at the inflow, and some at the outflow near the salmon weir.
  - b. Data to be recorded on Rite-In-Rain datasheets (see Appendix). One datasheet will be used for each trap deployed and retrieval. Datasheets will include location, observers, date and time of deployment and retrieval, Global Positioning System (GPS) coordinates (in decimal degrees (NAD 83 datum)), depth of water at each trap, water temperature, and target or non-target species collected during trapping events.
3. Preserve all collected crayfish according to standards set by University of Washington;
  - a. Place crayfish in a Ziploc baggy or small container

- b. Fill container or baggy with 70% denatured ethanol- allowing for 3 parts ethanol, 1 part crayfish.
- c. Include a label in all crayfish collections using Rite-In-Rain paper;
  - i. Water body
  - ii. GPS coordinates
  - iii. Date
  - iv. Collectors name
  - v. Also label container or baggy with same information as above using permanent marker.
  - vi. Mail samples to Tammy Davis, DSF, HQ, Juneau

## **METHODS**

From mid-July, after the salmon weir has been installed in the Buskin River, to mid- to late-August when the weir is removed, deploy at least three (3) modified minnow traps per trapping event. A standard minnow trap must be modified by expanding the trap opening to 4-5cm (1.5 – 2 inches) in diameter. As resources allow, traps should be deployed in the afternoon and allowed to soak at least 24 hours but never more than three consecutive (3) days, before being retrieved and data collected. For each trap deployed, data will be recorded at the level of detail described in Task 2.b.

When possible traps will be set in a diversity of available habitats emphasizing those most likely to be suitable to crayfish (rocky substrates, woody debris, and aquatic macrophytes) within shallow near-shore (littoral) habitats between 2 and 4 meters depth, and should not exceed depths of 7 meters. Traps will be set with bait (herring or salmon roe) or as artificial refuge traps. Artificial refuge traps will not be baited, and where possible, should include small rocks and pebbles to secure them as well as conceal the trap. These traps can be set in locations where bears have a history of destroying baited traps.

As time allows, a manual search of the trapping area, up to approximately a 25 meter radius around trapping sites, should accompany trap deployment. Displacing and/or moving rocks and logs during manual search may result in crayfish movement. An attempt will be made to collect and preserve any crayfish observed during the manual search.

Any collected crayfish will be preserved following the methods described in Task 3 and sent to Tammy Davis. All preserved samples will be sent to Dr. Julian Olden, University of Washington for identification to species. After species identification, at least one voucher specimen will be sent to the University of Alaska, Fairbanks for entry into their collection of fishes, invertebrates, and reptiles and amphibians.

As time and resources allow, either manual surveys will occur or traps will be deployed in the lower Buskin River, tributaries and upper watershed of Buskin Lake, and in Lake Gertrude.

Data collected during trapping will be compiled and all datasheets and data spreadsheets should be sent to the project leader for archiving. Results from this survey, including species

identification of any collected crayfish, will be shared with state, federal, local, tribal and other interested stakeholders statewide and regionally.

## **SCHEDULE AND DELIVERABLES**

Kodiak field staff will begin setting crayfish traps, as time allows, as soon after the weir is placed in the Buskin River, no later than July 15, 2013, and will cease trapping by August 30, 2013. Data will be compiled by October 30, 2013, and a summary memo will be produced by December 15, 2013.

## **RESPONSIBILITIES**

1. The project leader will coordinate with Kodiak, Division of Sport Fish (DSF), Area Management biologists to convey objectives of sampling.
2. The project leader will supply data sheets to Kodiak, DSF staff.
3. Kodiak, DSF biologists and field technicians to set traps according to the protocol described above.
4. Data sheets to be forwarded to project leader.
5. Any crayfish collected to be preserved according to the protocol and then sent to the project leader.
6. Project leader to send out collected crayfish to University of Washington for identification.
7. Final paperwork to be completed by the project leader.

## **REFERENCES CITED**

Fay, Virginia. 2002. Alaska Aquatic Nuisance Species Management Plan. Alaska Department of Fish and Game, RIR 5J02-10, Juneau.

Larson, E.R. and J.D. Olden. 2011a. The state of crayfish in the Pacific Northwest. Fisheries. 36:60-73.

## **APPENDIX A. DATA FORM**

