Regional Operational Plan CF.2A.2013.05

Operational Plan: Bristol Bay Sockeye Salmon Inriver Test Fish, 2013

by

Fred West and Charles Brazil

July 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

REGIONAL OPERATIONAL PLAN CF.2A.2013.05

OPERATIONAL PLAN: BRISTOL BAY SOCKEYE SALMON INRIVER TEST FISH, 2013

by

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July 2013

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Signature Page

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Project leader(s):	*Fred West*
Division, Region and Area	Commercial Fisheries, Region 2, Anchorage
Project Nomenclature:	FM-20419-21
Period Covered	2013
Field Dates:	15 June-21 July
Plan Type:	Category I

Approval

Title	Name	Signature	Date
Project leader	Fred West		6/13/13
Research Coordinator	Lowell Fair		6/18/13

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PURPOSE

The Alaska Department of Fish and Game, Division of Commercial Fisheries, estimates the number of sockeye *Oncorhynchus nerka* salmon that have passed through the commercial fishery but, have not reached escapement counting tower projects in Bristol Bay, Alaska. Inriver gillnet test fisheries are used to develop indices of relative abundance of sockeye salmon in the Kvichak, Egegik, and Ugashik rivers. These indices in combination with catch and escapement data are used for inseason management of commercial fisheries in the Kvichak/Naknek, Egegik, and Ugashik districts. This report provides operational guidelines for Bristol Bay inriver test fisheries, and general camp policies.

Key words: Alaska Department of Fish and Game, Bristol Bay, Kvichak River, Egegik River, Ugashik River, Pacific salmon, sockeye salmon, test fishery, test fish indices, catch, escapement, fisheries management, operational plan.

BACKGROUND

The Bristol Bay Management Area supports the largest sockeye salmon *Oncorhynchus nerka* fishery in the world (Figure 1). Sockeye salmon return to Bristol Bay in large numbers over a brief period of time making it one of the most intense salmon fisheries in the world.

Sockeye salmon in Bristol Bay are managed on an escapement goal range policy, with escapement goal ranges set for individual rivers. Fishery managers control the commercial harvest to meet these goals by limiting time, area, and gear used by commercial fishermen. The most important information used by managers to meet escapement goals are estimates of total fish that have returned to date. This total return is composed of catch and escapement. Catch estimates are obtained from the processing companies. Estimating the number of fish that have passed upstream of the fishery is often difficult, especially once they have moved inriver but have not passed the counting tower, typically 1 to 3 days later.

Inriver gillnet test fish projects are used to estimate the number of fish that passed the commercial fishery but are still unaccounted for at the tower site. These unaccounted fish are known as estimated river fish (ERF). Inriver test fishery data are available approximately 1 day after sockeye salmon have passed through the commercial fishing district and several days earlier than estimates based on visual counts from observation towers located at the heads of the river systems. Inriver test fish data assists management biologists in regulating commercial fishing periods to maximize harvests and achieve escapement goals.

In 2000 and 2001, funding from the Western Alaska Disaster Grant (WADG) was used to evaluate all inriver test fish projects in Bristol Bay. Evaluation of these projects consisted of examining station location, optimal gillnet mesh sizes, and fishing times. In addition, seasonal factors (e.g., station bathymetry, water temperature, water turbidity, river discharge, crew experience, escapement abundance, escapement age composition, and average length of fish in the escapement) were examined to determine how they affect inriver fish abundance estimates and if they can be used to improve estimates. Accuracy and precision were compared for travel time analysis, maximum likelihood, and regression methods for estimating inriver abundance, using both daily and cumulative data.

Results suggested that alternate station locations did not produce noticeably better estimates, current mesh sizes were efficient, and drifting should occur 15 min sooner than traditional times at Ugashik River (Schwanke et al. 2003). Changes in river bathymetry, water turbidity, and crew experience were not quantified, and water temperature had no obvious effect on test fish results. River discharge, escapement abundance, and escapement composition (age and average length)

were significantly correlated with test fish results at some of the stations. Evaluation and experimentation with modeling procedures suggested that the travel time method using cumulative escapement information could be improved by using daily escapement numbers.

An additional project, funded by the Alaska Sustainable Salmon Fund (AKSSF), began in 2010 assessing the feasibility of using sonar to replace the current inriver testfsh method. In 2010 a sonar deployment site was selected along one bank. The criteria used for selection included: a suitable river bottom profile for deploying sonar and a fish distribution that is concentrated in the nearshore regions. In 2011 and 2012, fixed location, side-looking sonars were deployed at the site to assess fish passage through the entire season. A mobile side-scanning sonar was used to determine fish distribution across the river during different tidal stages. In 2013, the fixed sonar systems will again be deployed. After three seasons of data collection, the sonar-generated estimates will be compared with salmon abundance estimates from the tower to determine if the dual-frequency identification sonar (DIDSON) provided a more accurate fish index than the test fishing project and if the sonar project was less labor intensive and more cost effective. A more accurate daily fish index will assist fishery managers in managing the fish stock and ensuring that upriver escapement goals are met and that the resource is available for subsistence users.

Inriver test fishing projects have operated at the Kvichak River since 1960, at the Egegik River since 1963, and at the Ugashik River since 1961 (Paulus 1965; West 2007). An inriver test fishing project was also operated on Igushik River from 1976-1989 and 1991-2000.

OBJECTIVES

1. The objectives for the Bristol Bay inriver test fish projects are toEstimate the number of sockeye salmon that have passed the commercial fishery but are still unaccounted for at the tower enumeration project.
2. Estimate the travel time of sockeye salmon between the inriver test fishing station and the tower site.

METHODS

INRIVER TEST FISHING

Kvichak River

The Kvichak River is located in Southwestern Alaska and flows approximately 88 km from Iliamna Lake to Bristol Bay (Figure 1). Current inriver test fish sites are located on the lower Kvichak River, approximately 16 km upstream from the terminus of the Naknek/Kvichak commercial fishing district and near the village of Levelock (Figure 2). The tower sites are approximately an additional 64 km upriver of the test fish sites near the mouth of Iliamna Lake. GPS (Global Positioning System) coordinates for each drift site are presented in Table 1. The test fish camp is located in the village of Levelock. Project dates are from 18 June to approximately 18 July. This is a continuing project that began in 1960 with the same general sites fished since 1985.

A change in channel characteristics at the drift sites and an increase in sockeye salmon abundance on the Alagnak River in recent years prompted a change to the Kvichak inriver drift sites in 2006. Drift Station 1 slowly moved downstream because of changes in channel characteristics and was almost directly across from the mouth of the Alagnak River. This

combined with the large return of sockeye salmon on the Alagnak River greatly increased the likelihood of catching Alagnak bound fish at the traditional Kvichak River test fish sites. Drift Site 1 is 2 km downstream of Levelock and Site 2 is 1.5 km upstream of Levelock.

Egegik River

The Egegik River is located in Southwestern Alaska and flows approximately 48 km from Becharof Lake to Bristol Bay (Figure 1). The inriver test fish sites are located on the lower Egegik River, approximately 6 km upstream from the terminus of the Egegik commercial fishing district and 9 km upstream from the village of Egegik (Figure 3). The tower sites are approximately an additional 22 km upriver near the mouth of Becharof Lake. GPS coordinates for each drift site are presented in Table 1. The test fish camp is located at Wolverine Creek next to drift Site 1. Project dates are from 12 June to approximately 15 July. This is a continuing project that began in 1963 with the same sites fished since 1979.

Ugashik River

The Ugashik River is located in Southwestern Alaska and flows approximately 48 km from lower Ugashik Lake to Bristol Bay (Figure 1). The inriver test fish sites are located on the lower Ugashik River, approximately 19 km upstream from the terminus of the Ugashik commercial fishing district and 7 km upstream from the village of Ugashik (Figure 4). The tower sites are approximately an additional 21 km upriver at the mouth of Lower Ugashik Lake. GPS coordinates for each drift site are presented in Table 1. The test fish camp is located in the village of Ugashik. Project dates are from 20 June to approximately 21 July. This is a continuing project that began in 1961 with the same sites fished since 1987.

Equipment

Custom designed setnet skiffs will be used to fish drift gillnets of 45.7 m (150 ft or 25 fathoms) in length and 29 meshes deep. Monotwist web, hung evenly with #50 twine and dyed Momoi shade #1, will be used for test fishing on all rivers. A stretched mesh size of 12.70 cm (5 in) will be used at the Kvichak River and 13.02 cm (5-1/8 in) will be used at the Egegik and Ugashik rivers because of differences in average fish size. Specific equipment design and setup is outlined in Stratton and Crawford Unpublished. Additional site and equipment specific information is also found in each project's "Field Camp Manual" 3-ring binder that is taken to the field camps each season.

Climatological Data

Weather observations of cloud cover, precipitation, air temperature, water temperature, wind direction and velocity, and water clarity will be recorded twice daily at consistent times.

Housing

The Kvichak and Ugashik projects both stay in rented housing and Egegik stays at a remote field camp through a state land use permit. The current house in Levelock is rented through the Levelock Village Council from June 18-July 18 at a cost of $1,500. We also have an annual lease of a connex for storage through Hans Apokedak for $1,200. The Ugashik cabin is leased from the Courtney's from June 20-July 20 at a cost of $1,200 with a $300 cleaning deposit. The cabin is located behind the Courtney's house in the village of Ugashik. The use of a storage building is also leased for $400 annually from Art Wionowski. The Egegik project is housed on state land next to wolverine creek. Camp consists of two wall tent frames and an elevated bear

cache. Every five years the land use permit needs to be renewed in addition to an annual progress report submitted after each field season is over.

Catch Distribution

All three testfish projects catch a substantial amount of sockeye salmon during the season. Both Egegik and Ugashik projects sell their catch to processors in each of their respective districts while the Kvichak project distributes their catch to the village of Levelock to fill subsistence needs. Egegik and Ugashik combined sold 31,000 lbs in 2012. The Egegik crew travels downriver to the village of Egegik and sells to the various land based processors. The last two years, the crew in Ugashik has sold to a tender based in the village of Ugashik. Otherwise they will go downriver and sell to tenders in Pilot Point. It is not economically viable for the Kvicahk crew to sell their fish. A tender is not available unless the crew travels to Naknek and this would cost more in time and gas than it's worth.

DATA COLLECTION

INRIVER TEST FISHING

A two person crew will fish two stations on opposite riverbanks with drift gillnets in the lower sections of the Kvichak, Egegik, and Ugashik rivers (Table 1). Drifts will be made perpendicular and close to shore based on the assumption that sockeye salmon migrate parallel to and near the riverbank. Drifts at all stations will end when the inshore end of the net drifts about 25 m offshore or when it no longer is fishing efficiently. On each river 2 short drifts of <15 min duration will be made at each station. Drifts will start 1.5 h before each high slack tide on the Kvichak and Egegik rivers and 1.75 or 2.25 h before each high slack tide on the Ugashik River. High slack tide will be based on the Levelock tide schedule for Kvichak River and Nushagak Bay (Clarks Point) tide schedule for Egegik and Ugashik rivers. When catches increase to the point where 2 drifts per station per tide is difficult to process given time restraints, only one drift will be made at each station. Fishing times will be reduced at high sockeye salmon abundance levels to avoid net saturation and attempts will be made to only catch a maximum of 50 fish per drift.

Test fishing will start with station 1 and alternate between both stations until a total of four drifts have been completed per drift session. Once sockeye salmon arrive in larger quantity, drifts may have to be reduced to one drift per station per high tide. A handheld stopwatch will be used to time start out (SO), full out (FO), start in (SI), and full in (FI). Those times in addition to the date, drift number, station number, and number of sockeye salmon caught are recorded in a Rite-In-the Rain® notebook in the field and later transferred to the "River Test Fishing Project Worksheet" (Appendix A1) to calculate mean fishing time (MT) and catch per unit effort (CPUE). These data are then transferred to the "Test Fish Data Transmission Form" (Appendix A2) for calling into the King Salmon office. Conditions which may have affected test fishing such as high winds, heavy rains, unusually clear or turbid water, or equipment failures will be recorded in the comments section of the "Test Fish Data Transmission Form". Observations of salmon behavior (e.g., large number of jumpers, most of the catch at the top of the net, fish caught on the backside of the net, etc.) will also be recorded. In addition to sockeye salmon, catches of other fish species will be recorded on the "Test Fishery Bycatch Data form" (Appendix A3).

Each test fish project will report the following information to ADF&G Offices in King Salmon 2 times daily:

1. Mean fishing time, number of sockeye salmon caught, and index for each drift;
2. Number of drop outs from the net (still included in catch total);
3. Water temperature (measured prior to every drift session);
4. Number of other fish species caught; and
5. Factors influencing test fishing, e.g. high winds, rain, and fish behavior.

These data will be used daily for management decisions and should be called in prior to delivering fish or cleaning the boat. Each crewmember is responsible for keeping an accurate log and double checking daily calculations before reporting to the area field office.

CLIMATOLOGICAL DATA

Weather data will be collected twice daily, at approximately 0800 and 2000. These observations will be recorded on the standard climatological and stream observation form BB-00-02 (Appendix A4). Water temperature will also be collected prior to every drift session and recorded in Rite-In-the Rain® notebooks. It is the responsibility of the senior[LFF1][CEB2] crewmember to make sure the data are recorded daily and accurately.

DATA REDUCTION AND ANALYSIS

Inriver Test Fishing

Inseason, the field crew calculates CPUE and calls in MT, sockeye salmon catch, and the index into the King Salmon office. These data are entered into a Microsoft Excel workbook to estimate the daily estimated river fish (ERF) for each river. The daily fish per index (FPI), travel time, and ERF are presented to each area management biologist.

Postseason, the project biologist evaluates the bias and accuracy for the inseason ERF estimates and summarizes the results in a Fisheries Data Series report.

DATA ANALYSIS

Inseason Evaluation

Mean fishing time (MT) for each set, in minutes, is

$$MT = SI - FO + \frac{(FO - SO) + (FI - SI)}{2}, \quad (1)$$

where

SO = time the gillnet first entered water,

FO = time the gillnet was fully deployed,

SI = time the gillnet retrieval began, and

FI = time the gillnet retrieval completed.

The CPUE value, C_j, or the number of sockeye salmon caught per 100 fathom hours, for set *j* is

$$C_j = 6{,}000\frac{N}{G \times MT}, \quad (2)$$

where

N = number of sockeye salmon caught, and

G = gillnet length in fathoms.

The daily inriver test fish index, I_i, for day i is the mean of individual CPUE values obtained from sets made the same day, or

$$I_i = \frac{\sum_{j=1}^{s} C_j}{S}, \tag{3}$$

where

S = the number of sets made during day i.

Two methods will be used to estimate daily inriver abundance: (1) travel-time fish per index (FPI_d) and (2) mean FPI value (FPI_a).

Travel-time of inriver fish will be based on the number of days it took sockeye salmon to travel from test fish stations to counting tower sites. A range of travel-time estimates will be calculated by matching daily test fish indices to daily tower counts. The number of sockeye salmon represented by each index point is calculated by dividing the most recent cumulative tower count by cumulative test fish indices lagged back in time by daily increments such that

$$FPI_d = \frac{\sum_{i=1}^{t} E_i}{\sum_{i=1}^{t-d} I_i}, \tag{4}$$

where

FPI_d = number of sockeye salmon represented by each test fishing index point based on a travel-time of d days,

E_i = number of sockeye salmon traveling past the counting tower on day i, and

t = day of most recent inriver fish abundance estimate.

We choose lag d that minimizes the following sum of squares, SS, between the cumulative test fish indices and the tower counts where

$$SS = \sum_{j=1}^{t} (FPI \cdot \sum_{i=1}^{j} I_{i-d} - \sum_{i=1}^{j} E_i)^2 . \tag{5}$$

However, travel times that seem unrealistic based on results of past studies or produce unreasonable escapement estimates (e.g., less than observed escapement) are rejected even if they produce the best statistical fit to the data.

Total inriver fish abundance is

$$\hat{E}_{t+d} = FPI_d \sum_{i=1}^{t} I_i, \quad (6)$$

where

E_{t+d} = estimated number of sockeye salmon that would travel past counting tower on day $t+d$.

Inseason, the travel time model will be used to estimate the number of fish in the river between the test fishing station and the tower. In practice, however, the estimated number of inriver fish from the model is often modified with ancillary information provided by an area manager, which may include

- Fish abundance observed during recent aerial surveys;
- District test fish catch-per-unit effort; or
- Up-to-the-minute escapements not included in the daily model.

The direct output from the SS model is termed the travel time model and the negotiated inriver fish estimate released to the public is termed the Published Model.

Mean FPI values of inriver fish abundance are based on historical values. Mean FPI values for the Kvichak, Egegik, and Ugashik rivers, based on a 5-year mean of the most recent median FPIs, will be used until estimates of FPI based on travel time analysis proves more accurate. The mean FPI estimate of inriver fish abundance is the product of the mean FPI and the cumulative inriver test fish index.

Postseason Evaluation

Three statistics will be used to measure performance of the various inriver fish abundance estimators. Percent error (PE) measures daily performance:

$$PE = 100 \; x \; \frac{T_{t,a} - \sum_{i=1}^{t+d} E_i}{\sum_{i=1}^{t+d} E_i}, \quad (7)$$

where

$T_{t,a}$ = estimated daily inriver fish abundance on day t based on method a.

Mean percent error (MPE) measures bias:

$$MPE = \sum_{t=1}^{n} \left(\frac{100 \; x \; T_{t,a} - \sum_{i=1}^{t+d} E_i}{\sum_{i=1}^{t+d} E_i} \right), \quad (8)$$

where

n = the total number of days that inriver fish abundance estimates based on test fishing are available.

Mean absolute percent error (MAPE) is used to measure overall accuracy because it treats under- and over-estimation errors similarly:

$$MAPE = \sum_{t=1}^{n} \left| \left(100 \; x \; \frac{T_{t,a} - \sum_{i=1}^{t+d} E_i}{\frac{\sum_{i=1}^{t+d} E_i}{n}} \right) \right| . \qquad (9)$$

To better understand if the use of ancillary information to negotiate the FPI in our published model is successful in hindsight, an analysis to compare the errors associated with each inriver forecast method will be used. Because the true number of fish between the test fishing station and tower is unknown, necessary assumptions are used to calculate an "actual" number of inriver fish. This is done for travel time and Published model forecasts by relating the respective inriver estimate to the corresponding lag time from the SS model output. For example, if a travel time of 2 applies, the actual number of inriver fish is calculated by subtracting escapement on day *t+2* minus escapement on day *t*. Taking the absolute difference of the actual escapement and forecasts estimated from travel time or using ancillary information determines model errors.

Climatological Data

Observations collected will be entered electronically and summarized in the annual Fishery Data Series report.

SCHEDULE AND DELIVERABLES

Each year inriver test fish projects operate from mid-June through late July. The annual budget is approximately $102,000 to operate the projects (Table 1). Inriver test fish information will be communicated to fishery management staff in the King Salmon ADF&G office daily. Postseason data analysis will be completed by December 15 and data will be archived by December 31. Data collected will be analyzed and reported in an ADF&G peer reviewed Fisheries Data Series Report every 3 years.

RESPONSIBILITIES

Fred West, Research Project Leader, ADF&G.

Duties: Oversees project and serves as budget manager. Provides daily ERF estimates to Area biologists. Assists in preparation of the project operational plan. Primary author of progress reports and final technical report.

Xinxian Zhang, Biometrician, ADF&G.

Duties: Provides statistical supervision and assists in project design. Reviews and provides statistical support for the data analysis. Provides biometric review of reports.

Chuck Brazil, Area Research Project Leader, ADF&G.

Duties: Assists in preparation of the project operational plan. Reviews and approves progress and final reports.

Slim Morstad, Area Management Biologist, ADF&G.
Duties: Conducts aerial surveys to document relative fish abundance and distribution above the test fish stations on the Kvichak River. Provides feedback for public release of the published ERF estimates.

Paul Salomone, Area Management Biologist, ADF&G.
Duties: Conducts aerial surveys to document relative fish abundance and distribution above the test fish stations on the Egegik and Ugashik rivers. Provides feedback for public release of the published ERF estimates.

Fish and Wildlife Technician II (2 Personnel), ADF&G,.
Duties: Conducts daily test fishing and data collection on the Kvichak River test fish project.

Fish and Wildlife Technician II (2 Personnel), ADF&G,.
Duties: Conducts daily test fishing and data collection on the Egegik River test fish project.

Fish and Wildlife Technician II (2 Personnel), ADF&G.
Duties: Conducts daily test fishing and data collection on the Ugashik River test fish project.

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Stratton, B., and D. Crawford. Unpublished. Bristol Bay Inriver test fish project manual, updated May 2004. Alaska Department of Fish and Game, Commercial Fisheries Division, Anchorage.

West, F. W. 2007 Bristol Bay sockeye salmon inriver test fishing, 2007. Alaska Department of Fish and Game, Division of Commercial Fisheries, Fishery Data Series No. 09-19, Anchorage.

Table 1 – Inriver Test Fish locations, Bristol Bay.

Project	Test Fishing Stations	Riverbank	GPS[a] Coordinates Latitude	Longitude
Kvichak River	1	West	N 59° 05.585'	W 156° 52.216'
	2	East	N 59° 07.108'	W 156° 48.704'
Egegik River	1	South	N 58° 11.993'	W 157° 11.087'
	2	North	N 58° 12.150'	W 157° 10.465'
Ugashik River	1	East	N 57° 33.244'	W 157° 25.365'
	2	West	N 57° 33.423'	W 157° 25.554'

[a] GPS = Global Positioning System. GPS coordinates are generally considered to be accurate within 17 meters.

Table 2 – Test Fish operating budgets.

Description	Approximate Dates of Operation	Budget Line Items (in thousands of dollars) 100	200	300	400	500	Total
1. Egegik Inriver Test	6/12-7/15	34.4		9.7	2.7		46.8
2. Kvichak Inriver Test	6/18-7/18	29.9		11.3	2.2		43.9
3. Ugashik Inriver Test	6/20-7/20	23.3		12.2	2.9		38.4
Total		87.6		33.2	7.8		129.1

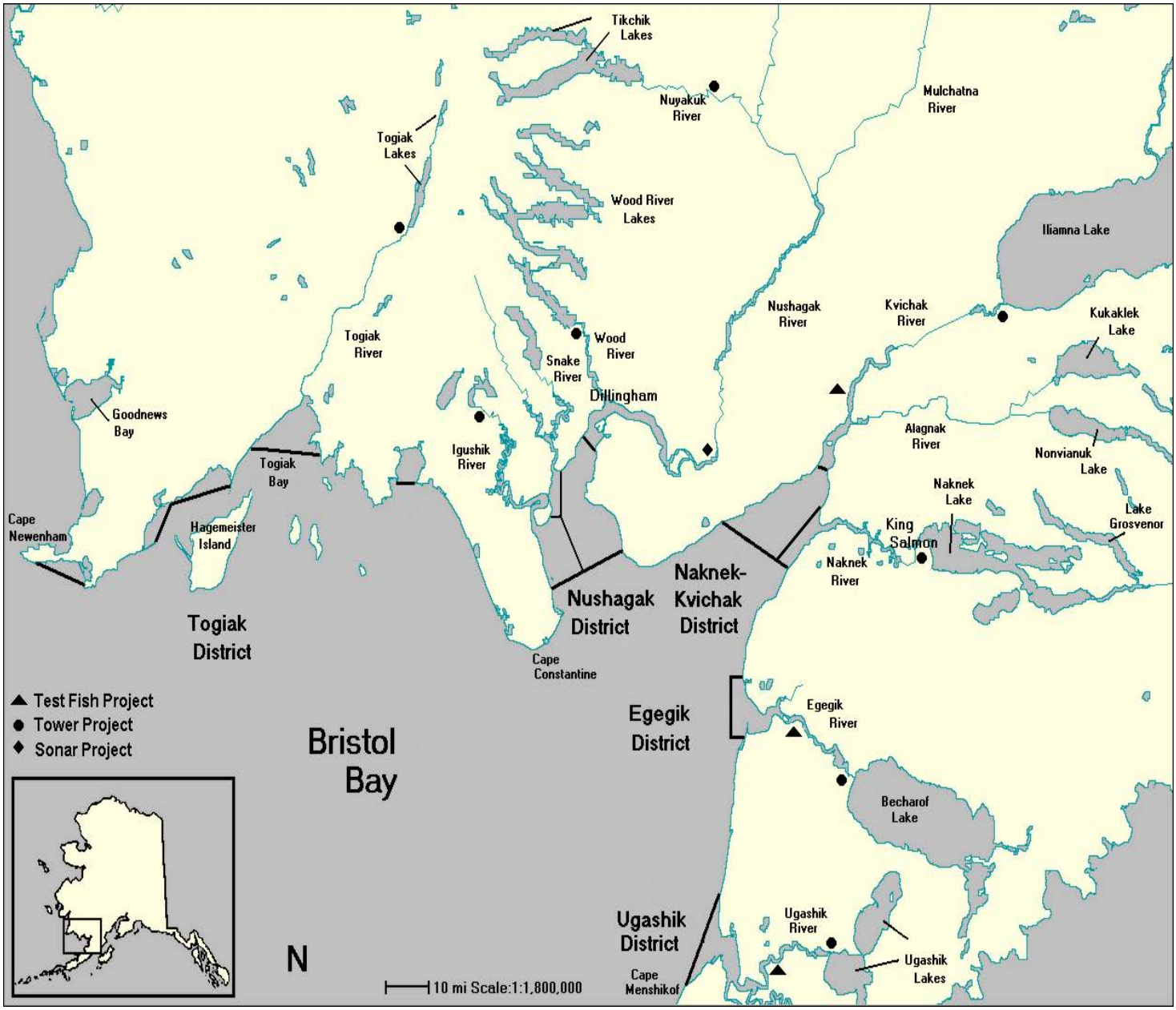

Figure 1 – Major river systems, commercial fishing districts, and escapement projects, Bristol Bay, Alaska.

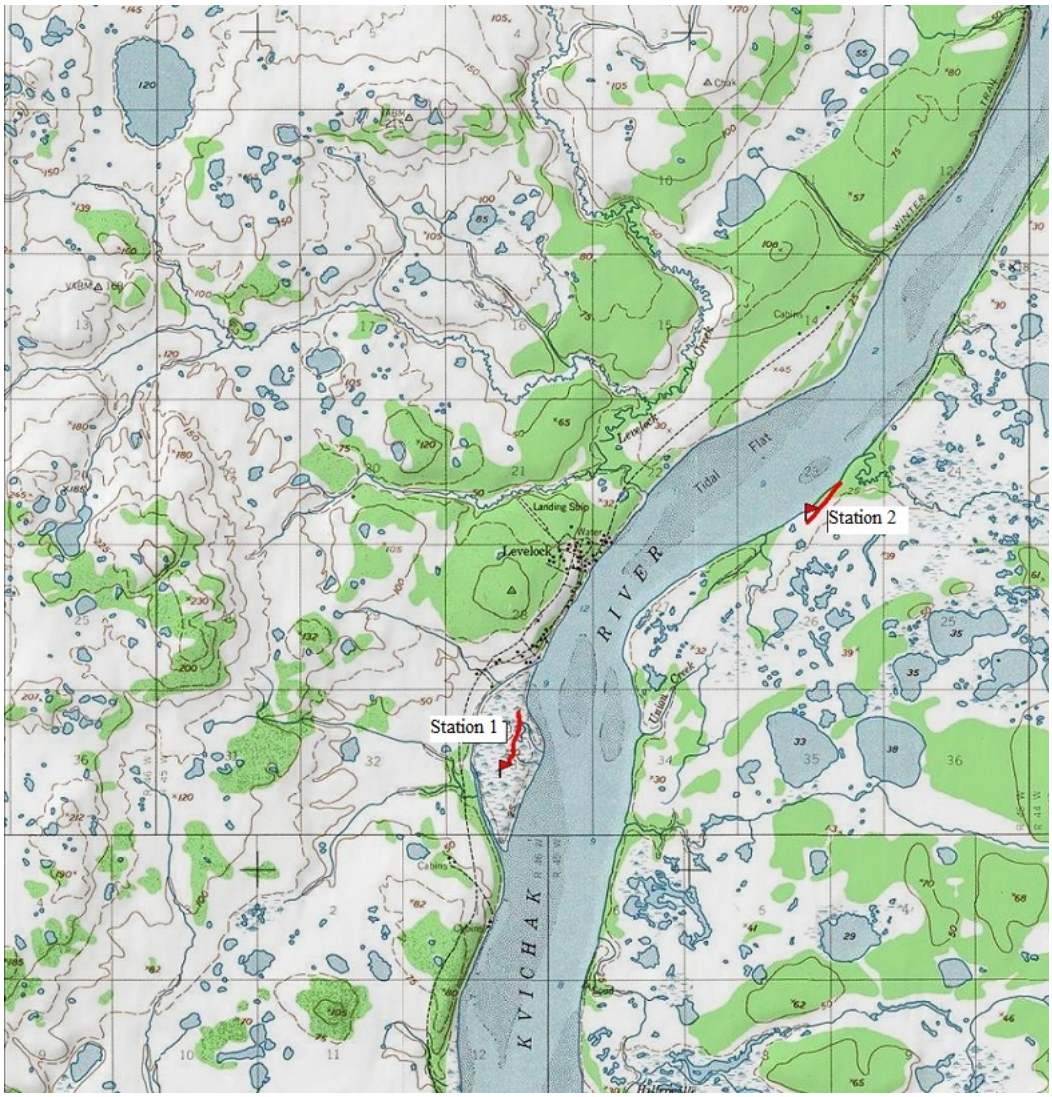

Figure 2 – Kvichak River test fish stations, Bristol Bay, Alaska.

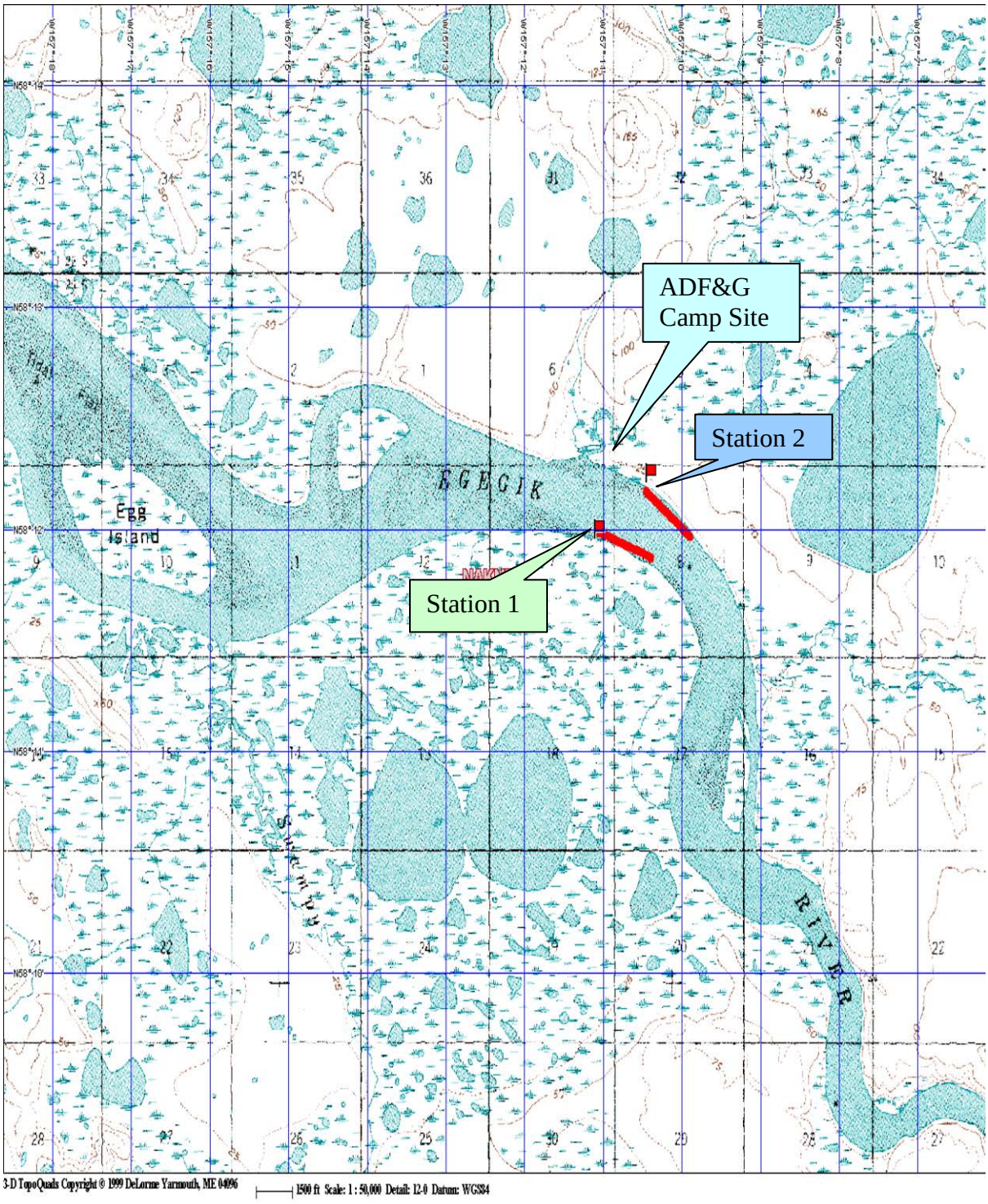

Figure 3 – Egekik River test fish stations, Bristol Bay, Alaska.

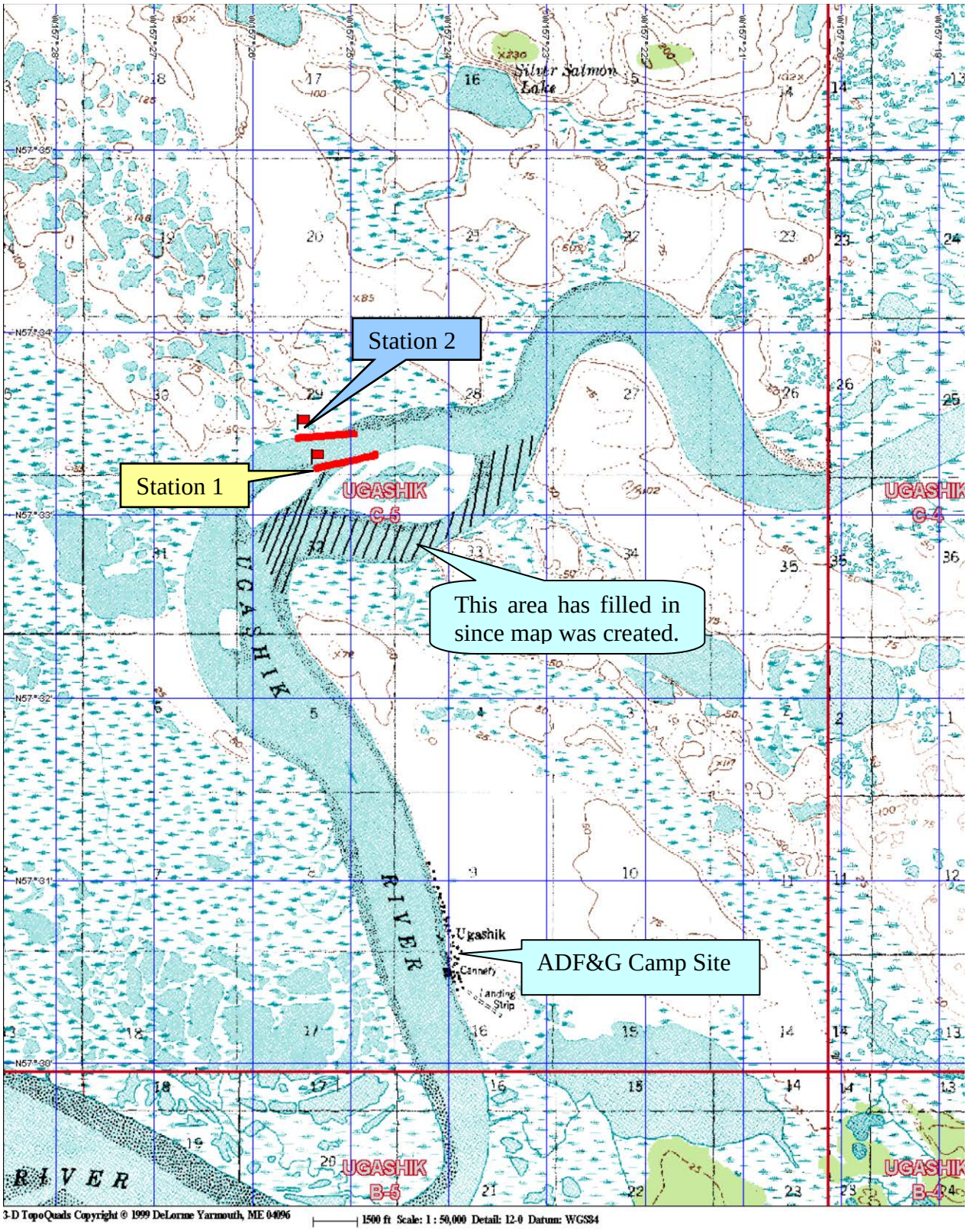

Figure 4 – Ugashik River test fish stations, Bristol Bay, Alaska.

Appendix A1.– Inriver test fishing project worksheet form.

ALASKA DEPARTMENT OF FISH AND GAME
CFM&D DIVISION

River Test Fishing Project Worksheet

Year 05 Observers Lochner / Romeo Page ___ of ___

Date	Drift No.	Station No.	(A) Gill Net Length (fathoms)	Gill Net Set Times (a) Start Out	(b) Full Out	(c) Start In	(d) Full In	(B) Mean Fishing Time (minutes) (c-b)+[(b-a)/2]+[(d-c)/2]	(C) Number of Sockeye Caught	Index (Sockeye per 100 fathom hrs) (6000xC)/(AxB)	Tide Stage	Number of Other Salmon Caught (by species)
7/12	147	2		ϕ	.35	2.35	2.93	2.5	33	3143		
7/12	148	2		ϕ	.48	2.48	3.28	2.6	40	3692		
7/12	149	1		ϕ	.37	2.37	3.12	2.6	35	3231		1 CHUM
7/12	150	1		ϕ	.50	2.50	3.3	2.7	32	2824		
7/12	151	2		ϕ	.43	2.43	3.2	2.6	37	3415		
7/12	152	2		ϕ	.42	2.42	3.8	3.0	27	2160		4 CHUMS
7/12	153	1		ϕ	.52	2.52	3.4	2.7	39	3441		
7/12	154	1		ϕ	.37	2.37	3.0	2.5	31	2952		
7/13	155	2		ϕ	.33	2.33	3.0	2.5	22 0	2095		
7/13	156	2		ϕ	.45	2.45	3.2	2.6	25	2308		7 CHUMS
7/13	157	1		ϕ	.47	2.47	3.1	2.5	30	2857		
7/13	158	1		ϕ	.45	2.45	3.0	2.5	20	1905		

Form BBTF-97-01

Appendix A2.– Test Fish Transmission Form.

ALASKA DEPARTMENT OF FISH & GAME
CFM&D Division
Egegik River Test Fish Data Transmission Form

Year 2005 Observers RUSSELL / MIDDLETON Page 1 of 1

Date (m/dd)	Drift No.	Station No. 1-L. Bank 2-R. Bank	Gill Net Length (fathoms)	Mean Fishing Time (00.0 min)	Number of Sockeye Caught	INDEX (No. of sockeye per 100 fathom hours; nearest whole no.)	Comments
6/14	1	1	25	5.1	0	0	WATER TEMP 13°
6/14	2	2	25	6.5	5	185	
6/14	3	1	25	6.5	0	0	
6/14	4	2	25	7.1	1	34	
6/14	5	1	25	7.0	0	0	WATER TEMP 13°
6/14	6	2	25	6.9	0	0	
6/14	7	1	25	8.6	2	56	
6/14	8	2	25	6.8	0	0	
6/15	9	1	25	6.5	0	0	WATER TEMP 13°
6/15	10	2	25	7.3	1	33	
6/15	11	1	25	7.0	0	0	
6/15	12	2	25	6.9	1	35	
6/15	13	1	25	6.5	0	0	WATER TEMP 13°
6/15	14	2	25	6.8	2	71	1 DOG "CHUM" SET 2
6/15	15	1	25	6.5	0	0	1 FLOUNDER SET 3
6/15	16	2	25	7.3	29	953	2 DROPS SET 2
6/16	17	1	25	8.5	3	85	WATER TEMP 14°
6/16	18	2	25	7.8	14	431	SET 2 1 KING
6/16	19	1	25	7.3	3	99	SET 4 1 FLOUNDER
6/16	20	2	25	7.3	1	33	
6/16	21	1	25	5.6	8	343	WATER TEMP 14.5°
6/16	22	2	25	5.6	2	86	
6/16	23	1	25	5.8	12	497	
6/16	24	2	25	5.3	2	91	
6/17	25	1	25	6.0	0	0	WATER TEMP 13.5°
6/17	26	2	25	5.8	2	83	
6/17	27	1	25	6.0	2	80	WIND BLOWING DOWN
6/17	28	2	25	5.9	0	0	RIVER POSS PUSHING FISH OUT
6/17	29	1	25	6.8	0	0	WATER TEMP
6/17	30	2	25	6.5	2	74	1 FLOUNDER
6/17	31	1	25	6.9	0	0	1 JACK ALL FISH BRIGHT
6/17	32	2	25	6.6	10	364	

EGTF-98-02

Egegik Drift Station #1 - off the left bank, facing downstream
Egegik Drift Station #2 - off the right bank, facing downstream

Appendix A3.– Test Fish Bycatch Data Form.

ALASKA DEPARTMENT OF FISH AND GAME
Commercial Fisheries Division

Test Fishery Bycatch Data Form

Project: EGEGIK RIVER TEST
Target Species: SOCKEYE
Gear Type: GILL NET
Samplers: RUSSELL / MIDDLETON

Date (mm/dd/yy)	Drift No.	Species [a]	Qty.	Comments
06/15/05	2	1 CHUM "DOG	1	
06/15/05	3	FLOUNDER	1	
06/16/05	2	1 KING	1	
06/16/05	4	FLOUNDER	1	
06/17/05	4	FLOUNDER	1	
06/19/05	4	KING	1	
06/19/05	1	FLOUNDER	1	
06/21/05	1	CHUM	1	
06/22/05	1	FLOUNDER	1	
06/22/05	2	CHUM	1	
06/23/05	1	FLOUNDER	2	
06/23/05	2	FLOUDER	1	
06/24/05	1	FLOUDERS	3	
06/25/05	3	FLOUDERS	6	
06/25/05	2	1 CHUM	1	
06/26/05	1	1 CHUM	1	
06/27/05	2	CHUM	1	
06/28/05	2	CHUM	1	
06/28/05	2	FLOUNDER	1	
06/29/05	3	CHUM	1	
07/01/05	1	CHUM	2	
07/04/05	2	KING	1	
07/05/05	2	CHUM	1	

[a] Species: Chinook Salmon, Chum Salmon, Pink Salmon, Arctic Flounder, Starry Flounder, Arctic Char, Lake Trout, and Rainbow Trout

Appendix A4.– Climatological and Stream Observation Form.

Bb0002.xls
4/06/00

ALASKA DEPARTMENT OF FISH AND GAME
Commercial Fisheries Division

Climatological and Stream Observation Form

Project Naknek Tower Year 2005

Date	Sky		Precipitation			Wind Dir. Vel.		Air Temp. °C		Water Temp. °C		Water Color	
(mm/dd)	8 am	8 pm	8 am	8 pm	total [a]	8 am	8 pm	8 am	8 pm	8 am	8 pm	8 am	8 pm
06/18	1	2	0	0	0	S 10	SSE 5	16	19	10	11	1	1
06/19	3	3	0	0	0	W 5	Calm	15	19	10	11	1	1
06/20	4	4	A	0	1mm	S 5	S 10	15	21	11	11	1	1
06/21	4	3	A	0	Tr	SW 5	S 15	16	20	11	12	1	1

Sky Codes:
n No observation
1 Clear sky, <1/10 cloud cover
2 Cloud cover < 1/2 sky
3 Cloud cover > 1/2 sky
4 Completely overcast
5 Fog or thick haze

Precipitation Codes:
n No observation
0 No precipitation
Tr Trace
A Intermittent rain
B Continuous rain
C Snow
D Snow and Rain
E Hail
F Thunderstorm

Water Color Codes:
n No observation
1 Clear
2 Light Brown
3 Brown
4 Dark brown
5 Murky or glacial

[a] total = amount of precipitation (nearest 0.5 mm or 0.01 in) accumulated in 24 hours.

Form No. (BB-00-02)

Appendix B1.– General equipment, camp maintenance, and camp policy.

EQUIPMENT MAINTENANCE

Equipment maintenance is one of the most important operations performed during the field season. The outboard motors, generators, and other equipment must be kept in good operating condition.

It will be the crew leader's responsibility to see that all equipment is kept in good operating condition.

ENGINE CARE AND OUTBOARD OPERATION

If outboard uses mixed fuel, the correct outboard motor fuel mixture is 50:1. The newer Precision Blend outboards mix the 2-cycle oil and gas automatically, but older engines will need to have their fuels pre-mixed. Always pour the oil into the tank first, then add 2 or 3 gallons of gas and mix thoroughly, then fill tank to capacity always using a large funnel and filter. Some outboards may be 4-stroke engines, which need to have oil level checked routinely. Always mix fuel tanks or equipment under cover to prevent water contamination and always use a funnel and filter. Note that some chainsaws have a fuel mixture of 25:1, but some newer models (e.g., Stihls) use a 50:1 mix. Chainsaw gas should be mixed in a separate can and clearly marked that it is chainsaw fuel to avoid accidentally being used in outboards.

Always place outboard motors in neutral when starting and always make sure a safety line is attached between the boat and motor. Perform a check daily of the clamp screws “dog ears” that hold the outboard to the transom. Also routinely check the motor for loose screws and bolts, cracks, and breaks, especially in the area of the lower unit.

In the normal operation of an outboard, a stream of water is discharged from a hole in the bottom edge of the cowling or from the back of the shaft. If this stream of water stops, the water pump may not be working and the motor should be shut off. On propeller outboards, the side plate over the water intake can be removed for cleaning as it may be plugged. If the pump continues not to function, the outboard should not be run, and a report to base camp should be made. On jet units, a cover on the side of the cylinder head through which water circulates can be removed and cleaned, and the cover over the temperature sensor (thermostat) can also be cleaned to restore flow. Take along a piece of bailing wire to dislodge sand from the small water discharge tube under the cowling.

Check the gear oil in the lower unit of the outboard once a week and drain and replace the gear oil at the end of the season and every 50 hours of operation. Jet units must be greased daily. This is crucial. Grease guns will be provided.

If the prop, skeg or jet unit hits bottom, check the screws to make sure they are still secure and there is no damage to the lower unit. Also, remove any rocks stuck between the grates on the jet unit.

All outboards are to be tilted in the up position when moored to preclude silt accumulation in the jet unit or water pump and skeg or housing damage.

If your outboard will not start, check the following:

- Check to make sure the kill switch is clipped to the engine properly.
- Check to see if the fuel line is connected properly to the motor and the tank and not pinched or kinked, and that the air vent on the tank is open.
- Check to see if there is water in the gasoline.
- If the engine is flooded, wait 5 minutes for the plugs to dry before attempting to start again.
- Check the spark plugs and spark plug wires as they may be fouled or defective (replace if needed).

BOATS

Boats are to be kept clean and free of loose tools and debris, and moored at locations where they are not subject to damage by other traffic or through contact with the river bottom in rock laden areas. Boats must be bailed regularly of rainwater to keep them from sinking.

Further responsibility includes maintaining a bow line on each assigned craft and ensuring that each boat is properly moored at the end of each work day to preclude possible loss or damage.

GENERATORS

Portable generators may be supplied to field camps. Their maintenance is important. Since most of the generators have 4-cycle engines, mixed gas must not be used. The crankcase oil reservoir should be checked daily and maintained at the full level. At the end of the season, and after 25 hours of operation, the oil should be changed. Spark plugs should be checked at every oil change for fouling and gap.

CAMP MAINTENANCE

Keep the cabin, surrounding area, and yourself clean and neat. Appearance is important. You will not always be notified of the intended arrival of visitors, officials, etc. Visitor impressions are often based on your appearance.

Maintaining a clean and efficient field camp is required. Maintenance of living accommodations and other installations will be performed as necessary. All materials necessary will be provided.

Grounds will be kept free of litter. All garbage will be burned or bagged up and disposed of in town. Special precautions should be observed to ensure that garbage does not attract bears and other scavenger species. Dirty dishes should be washed daily and kept inside the cabin, not left in the yard or outdoors where it will attract bears.

Upon completion of the summer season, all camp equipment will be cleaned prior to winter storage. All sampling nets, tarps and life jackets must be dry before being stored. All skiffs will be brought back to the ADF&G compound.

The crew leader at the close of the field season will take a complete equipment inventory. A report detailing the equipment and storage locations will be submitted at the end of the season to the supervisor. A list of equipment needing replacement or repair will also be submitted, along with an equipment need list for next season.

CAMP POLICY

No alcoholic beverages are to be stored in areas open to public view. If alcohol is consumed at a camp an employee must be of legal age and off duty and under no circumstances shall he or she engage in the operation of any State equipment or firearms. Employees will not return to duty status under the influence of alcohol.

The crew leader of each camp shall establish a policy on living standards and personnel behavior in accordance with State guidelines. Time off for individual crew members must be scheduled by the supervisor. All employees will be required to act in a professional manner at all times and shall be especially courteous to the public.

It will be the responsibility of the crew leader to prevent any abuse of State equipment. The crew leader will report within 24 hours to the supervisor any damaged or lost equipment.

FOOD ORDERS

ADF&G will provide all food and non-alcoholic beverages while working in the field. Groceries will be purchased by either the field crew when in town or by available office personnel. It is useful to keep an on-going grocery list so you know what is needed or not needed since fridge and freezer space is limited.

COMMUNICATION

Two phones are available in camp. One is a 'bettors' phone and is a relay phone that operates in a normal manner. It should be used for routine matters as it is cheaper to operate. The 'track' phone is a satellite phone that is primarily used to communicate data with Dillingham.

Scheduled calls are used to pass on pertinent information to/from the field offices. It is expected that all employees will participate in these schedules to get familiar with the procedure. The morning schedule is used for relaying the daily species count and high priority business only as the Dillingham office personnel attempt to get counts from all field camps at the same time. Keep the conversations short so we do not hold up others using the same channel. The bettors phone may be used for personal calls using a calling card. The track phone is not to be used for personal use without permission and all personal calls must be logged.

Any employees performing job duties away from the field camp (such as boating trips up/downriver) or hiking/sport fishing/etc. on their own time are required to let others know their plans such as where they are going and when they are expected to return. Also, in each camp is a handheld VHF radio (with spare batteries), backpack with basic survival gear, and firearms and ammunition which the employee is encouraged to carry for their own safety. All employees should be aware of the gear in the camp and should request additional safety/survival items if needed or missing. Employees with any questions or concerns are asked to pass them on to their supervisor.

FIREARMS

A State firearm will be provided at this field camp. If you are unfamiliar with the operation and use of a firearm, please let your supervisor or the crew leader know. Training will be provided for anyone who requests it or is unfamiliar with firearms. Loaded guns are prohibited inside the camp facilities. Anyone handling a firearm should always treat it as if it were loaded. Guns should be kept clean and oiled daily if used and at the end of the project. Any horseplay or misuse of firearms while working for the Department of Fish and Game will not be tolerated and may be grounds for immediate dismissal. Completely unload a firearm of all rounds before cleaning or transporting back to town.

BEARS

Do not encourage bears to come around camp by leaving food or unburned garbage around. Do not shoot at a bear unless, in your best judgment, it is endangering someone's life or damaging personal or state property. Use your best judgment on whether to shoot a bear if property is at stake. When trying to frighten a bear away by shooting, do not fire toward it. You may wound it by pulling the shot, ricochets, etc. Do not use cracker shells at close distance (<30’). If a cracker shell hits a bear at close range, it may penetrate the body cavity and explode inside the bear, killing it.

GARBAGE

Burn garbage as needed, and box up any non-burnable trash to haul back to town. Be sure all burn barrels have proper grates or covers to prevent grass fires from sparks. Never leave a fire unattended and always have adequate fire extinguishing materials handy. Food that is discarded should be contained in a “slop bucket” inside the cabin. As needed, the bucket can be then be dumped into the river downstream of the weir. This should be done in the evenings when there are no sport fishermen down river.

FISH AND WILDLIFE VIOLATIONS

This is not intended as an inclusive procedure for handling violations. Below are guidelines for obtaining the necessary information and/or evidence to document a violation. It is important to be familiar with the commercial fishing, subsistence fishing, sport fishing, and hunting regulations in your area. Violation reporting procedures are printed on the back cover of the commercial fishing regulation book. Request the regulation book if your camp does not have one.

The use of the "4 Ws" can greatly aid the Fish & Wildlife Protection officer in obtaining sufficient evidence for a case.

- What is the violation?
- When did the violation occur (e.g., date, time, tide condition, etc.)?
- Where did the violation occur?
- Who is in violation and who are witnesses?

It is important that specifics about the event be documented so the appropriate officer can follow-up and contact those involved. If you have a camera available, pictures are extremely valuable in prosecuting offenders. Collect as much information as possible and contact your supervisor or a State Trooper from the Alaska Wildlife Troopers Division immediately. If you do not feel comfortable, or your personal safety may be in danger, do not pursue the violation. Contact your supervisor and they will handle the situation. Be aware that you do not have the power to arrest somebody or seize equipment. Just limit yourself to documenting the event as safely as possible.

TRANSPORTATION

Do not endanger life or property by using the skiff rough water conditions. If you are unfamiliar with running boats in marine waters and/or on rivers, it is imperative to inform the crew leader of this and proper training should occur. All personnel must wear a Coast Guard approved life jacket when out on any water. Be conservative and use good judgment: if you think it is dangerous, don't go out on the water.

A boat box equipped with all the necessary tools for the outboard should be in the boat at all times and kept as dry as possible. Necessary tools include pliers, wrenches, screw drivers, spark plugs, spark plug wrench, an extra boat plug, and baling wire. Oars and a bilge pump should also be in the boat. A life jacket is mandatory while operating the boat and handheld VHF and flares should also be carried. In case travel at night becomes necessary, carry a flashlight.

State-owned vehicles will be provided for work purposes and used **only** in the conduct of state business. Use of state-owned property for personal convenience is expressly prohibited. Individuals other than those on official state business shall not be permitted to travel in or operate state owned equipment. An official state credit card will be used to fuel up vehicles. Oil levels in the vehicles should be checked frequently. Use of state-owned vehicle, vessels, and equipment after consuming alcohol is explicitly prohibited.

FIRE AND FIRST AID

All remote employees should have up to date First Aid and CPR certificates. The Kvichak, Egegik and Ugashik Rivers are considered remote, therefore; it is required for these projects. Make an effort to avoid intestinal parasites such as *Giardia*. When in doubt, boil your drinking water for 15 minutes.

Check your camp's fire extinguishers. Know where it is and how to use it! Inventory your camp first aid kit, replace items as needed and become familiar with basic first aid treatment. Review the first aid booklet.

COMPATIBILITY OF FIELD PERSONNEL

If you find yourself unable to get along with your camp mate, notify your supervisor and an attempt will be made to resolve the situation.