**Regional Information Report No. 5J14-05**

# Report to the Alaska State Legislature on Status of Cook Inlet Coho and Sockeye Salmon Genetic Projects, 2014

**by**

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**Alaska Department of Fish and Game** **Divisions of Commercial Fisheries**

## Symbols and Abbreviations

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**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, $\chi^2$, 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 INFORMATION REPORT 5J14-05*

# REPORT TO THE ALASKA STATE LEGISLATURE ON STATUS OF COOK INLET COHO AND SOCKEYE SALMON GENETIC PROJECTS, 2014

by
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December 2014

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# INTRODUCTION

The Alaska State Legislature requested a status report to the Finance Committees describing work by the Alaska Department of Fish and Game in Cook Inlet on escapement monitoring, genetics baseline data, mixed stock sampling, smolt out migration, migratory studies and habitat improvements for Chinook, coho, and sockeye salmon. This report summarizes the status of activities associated with legislative increments directed at Cook Inlet coho and sockeye salmon genetic studies conducted by the Division of Commercial Fisheries Gene Conservation Laboratory and Region II staff. For Cook Inlet coho salmon, project updates for three investigative phases are provided. In Phase I, analysis of existing samples indicated that sufficient population genetic structure exists among populations of to warrant construction of a full genetic baseline for genetic stock identification. Phase II describes the status of the genetic baseline following the second year of sampling when 3,319 fish were collected. Preliminary results using samples through 2013 indicate at least five genetic reporting groups are feasible and that additional baseline collections are be necessary before genetic stock identification can be effectively applied to Cook Inlet fishery samples. Phase III describes the status of genetic stock identification of harvests in test and commercial fisheries of Cook Inlet for the 2013–2015 seasons. To date, over 16,000 samples have been collected for future analysis from the Central District drift gill net fishery, the General and Eastern subdistrict set gill net fisheries, and the northern and southern offshore test fisheries. For sockeye salmon, we summarize the status of a project to analyze DNA from archived scales as a means to retrospectively estimate stock composition in historic Cook Inlet harvests. This is the second of a five-year project that will reconstruct Susitna River sockeye salmon escapement and total runs for the major systems in Upper Cook Inlet.

Key words: Coho salmon, sockeye salmon, genetic stock identification, genetic baselines, mixed stock analysis

# COOK INLET COHO SALMON GENETIC STOCK IDENTIFICATION PROJECT

## PHASE I: FEASIBILITY STUDY

Phase I of the Cook Inlet Coho Salmon Genetic Stock Identification project was completed in 2013 and the results were described in the previous report (DeCovich et al. 2013). For continuity, a brief description is provided here to help with understanding phases II and III.

The estimation of stock composition using genetic stock identification requires the existence of genetic differences among populations or groups of populations that can be detected by the technology available. Prior to spending state resources to collect samples and develop a baseline for Cook Inlet coho salmon, a skeleton baseline was developed using archived samples and existing genetic markers to ascertain whether sufficient population structure exists to warrant the construction of a full genetic baseline for genetic stock identification. The results of this phase demonstrated that genetic stock identification would likely provide accurate results; therefore, we began the process of building a comprehensive baseline (Phase II), to be used for genetic stock identification of fishery samples collected during the 2013–2015 seasons (Phase III).

Tissues from 1,948 coho salmon collected from 22 locations within Cook Inlet (Figure 1) were obtained from tissue archives at the Alaska Department of Fish and Game (ADF&G) and U.S. Fish and Wildlife Service (USFWS) and analyzed for 12 microsatellite and 107 single nucleotide polymorphism (SNP) markers. Both marker types showed similar genetic structuring and levels of

variation among collections. Clustering analyses showed that genetic similarities generally follow geographic characteristics (DeCovich et al. 2013). In addition, the genetic differences among the coho salmon collections were similar to differences within Cook Inlet for sockeye salmon (Barclay and Habicht 2011) and Chinook salmon (Barclay et al. 2012). Both sockeye and Chinook salmon currently have successful genetic stock identification programs within Cook Inlet.

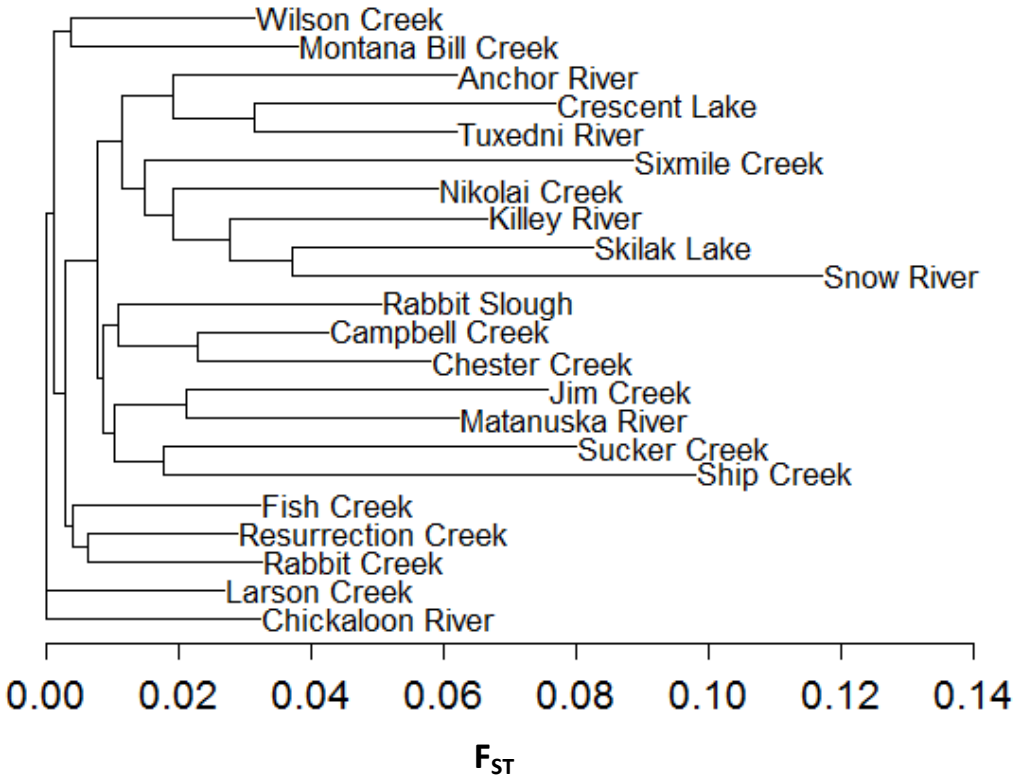


Figure 1.–Cavalli-Sforza and Edwards (1967) genetic tree of $F_{ST}$ values among coho salmon collections based on 107 SNPs analyzed for Phase I of the Cook Inlet Coho Salmon Genetic Stock Identification Project.

The pattern of relationships among collections of coho salmon in Cook Inlet coupled with the level of genetic differences among those collections indicated that genetic stock identification would be possible for coho salmon in Cook Inlet (Figure 1). However, the incomplete correlation of genetic distance with geography in this initial study also indicates that the baseline will need to be comprehensive to provide an adequate understanding of population structure and accurate estimates for genetic stock identification.

## PHASE II: BASELINE DEVELOPMENT

Phase II of the Cook Inlet Coho Salmon Genetic Stock Identification project is currently in its second and final year. This phase began after Phase I demonstrated that sufficient structure exists among Cook Inlet coho salmon populations to warrant construction of a genetic baseline. The objectives for this phase are 1) to collect tissues from coho salmon spawning locations in the Matanuska-Susitna drainages and Cook Inlet, and 2) to develop the genetic baseline necessary for stock composition

analysis of fishery samples collected during the 2013–2015 seasons (Phase III). An initial baseline composed of genotypes from fish representing all spawning aggregates that might contribute to a fishery is scheduled to be completed by Spring 2015.

Development of the comprehensive baseline necessary for this project in the short timespan available has required a coordinated effort of multiple projects to collect samples of coho salmon (Table 1; Figure 2; Appendix A). To date, tissues are available from 11,860 coho salmon from various sources. Archived collections from the ADF&G Gene Conservation Laboratory and the United States Fish and Wildlife Service (USFWS) provided the initial samples for this project. Since then, this project collected 5,562 samples from 70 locations in 2013 and 2014. These samples were collected by crews from the Gene Conservation Laboratory and regional offices. An additional 1,098 fish were sampled at 8 weirs in Northern Cook Inlet operated by ADF&G Division of Sport Fish, 499 were collected by the Gene Conservation Laboratory under an Alaska Energy Authority project and 100 fish were collected by Cook Inlet Aquaculture Association (Table 1). See Appendix A for a detailed list of all collection locations and sample sizes per collection available for development of this baseline.

In a preliminary part of the Phase II analysis, a subset of these collections representing 46 spawning aggregates were genotyped and analyzed using a subset of the most informative genetic markers evaluated during Phase I (Table 2). The population structure revealed by this analysis demonstrated potential for apportioning fishery mixture samples into at least five reporting groups (Figure 3). This analysis also demonstrated that additional baseline collections will be necessary before genetic stock identification can be applied to Cook Inlet fishery samples.

Table 1.–Source of Cook Inlet coho salmon tissue samples currently available for the Cook Inlet Coho Salmon Genetic Stock Identification Project (details in Appendix A).

| Source | Number | Percentage of baseline |
|---|---|---|
| This project - Gene Conservation Laboratory | 5,562 | 47% |
| Sport Fish weirs | 1,098 | 9% |
| Gene Conservation Laboratory archive | 2,353 | 20% |
| USFWS archive | 2,248 | 19% |
| Alaska Energy Authority | 499 | 4% |
| Cook Inlet Aquaculture Association | 100 | 1% |
| Total | 11,860 | 100% |

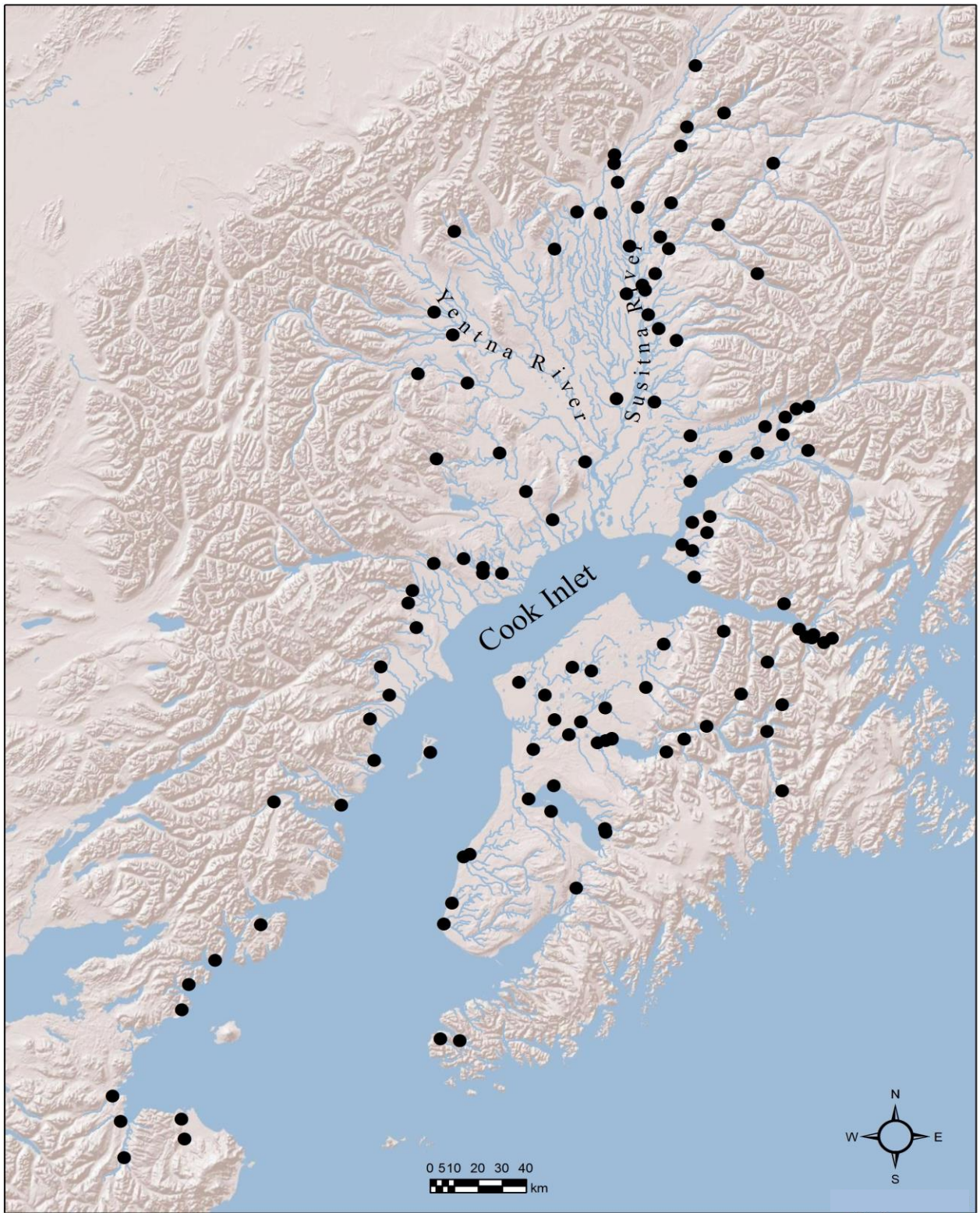


Figure 2.–Map showing locations of coho salmon tissue collections currently available for the Cook Inlet Coho Salmon Genetic Stock Identification Project (details in Appendix A).

Table 2.–Collection location of coho salmon samples analyzed to date for 48 single nucleotide polymorphism markers for the Cook Inlet Coho Salmon Genetic Stock Identification Project.

| Genetic Reporting Group | Area | Location | Year(s) Collected | Number Analyzed | Latitude | Longitude |
|---|---|---|---|---|---|---|
| Southwest Cook Inlet | Southwest Cook Inlet | | | | | |
| | | Douglas River - Clearwater | 2013 | 93 | 58.9507 | –153.7603 |
| | | Douglas Reef River | 2013 | 95 | 59.0280 | –153.7829 |
| | | Kamishak River | 2013 | 91 | 58.8772 | –154.1951 |
| | | Little Kamishak River | 2013 | 95 | 59.0185 | –154.2192 |
| | | Tuxedni River | 2012 | 81 | 60.2597 | –153.0815 |
| | | Crescent Lake - Late | 1998 | 93 | 60.3569 | –152.8631 |
| | | Crescent River | 2013 | 93 | 60.3603 | –152.8009 |
| North Cook Inlet | Westside Cook Inlet | | | | | |
| | | Little Jack | 2013 | 95 | 60.5755 | –152.3477 |
| | | Montana Bill Creek | 2012 | 95 | 60.6675 | –152.1969 |
| | | Kustatan River | 2013 | 95 | 60.9267 | –151.9739 |
| | | Wilson Creek | 2010 | 93 | 61.1519 | –151.4490 |
| | | Theodore River weir | 2013 | 60 | 61.2302 | –150.8341 |
| | | Lewis River weir | 2013 | 57 | 61.3268 | –150.8929 |
| | Susitna Drainage | | | | | |
| | | Indian River | 2013 | 94 | 62.8265 | –149.6483 |
| | | Whiskers Creek | 2013 | 78 | 62.3754 | –150.1695 |
| | | Troublesome Creek | 2013 | 72 | 62.6267 | –150.2374 |
| | | Sheep River | 2013 | 95 | 62.2380 | –149.1686 |
| | | Larson Lake - outlet stream | 2011 | 84 | 62.3570 | –149.8614 |
| | | Chunilna Creek - Clear Creek | 2013 | 65 | 62.5267 | –149.8447 |
| | | Question Creek | 2013 | 76 | 62.2221 | –150.0885 |
| | | Montana Creek weir | 2013 | 92 | 62.1051 | –150.0569 |
| | Yentna Drainage | | | | | |
| | | Canyon Creek | 2013 | 55 | 61.8727 | –151.5116 |
| | | Talachulitna River | 2013 | 72 | 61.6815 | –151.3862 |

-continued-

Table 2.–Page 2 of 2.

| Genetic Reporting Group | Area | Location | Year(s) Collected | Number Analyzed | Latitude | Longitude |
|---|---|---|---|---|---|---|
| Knik/Turnagain | Knik Arm | | | | | |
| | | Little Susitna River | 2013 | 94 | 61.6250 | –149.7858 |
| | | Fish Creek | 2009 | 94 | 61.4486 | –149.8211 |
| | | Rabbit Slough | 2011 | 95 | 61.5414 | –149.2756 |
| | | Eska Creek | 2013 | 59 | 61.7019 | –148.9431 |
| | | Matanuska River mainstem | 2009 | 94 | 61.6125 | –149.0880 |
| | | Jim Creek | 2009 | 68 | 61.5368 | –148.8840 |
| | Turnagain Arm | | | | | |
| | | Chester Creek | 2011 | 53 | 61.1861 | –149.7972 |
| | | Ship Creek | 2012 | 93 | 61.2455 | –149.7100 |
| | | Campbell Creek | 2009 | 94 | 61.1787 | –149.8307 |
| | | Rabbit Creek | 2010 | 53 | 61.0761 | –149.8291 |
| | | Resurrection Creek | 2010 | 94 | 60.8581 | –149.6340 |
| | | Mystery Creek - Chickaloon | 2010 | 100 | 60.6572 | –150.2525 |
| | Northwest Kenai Peninsula | | | | | |
| | | Sucker Creek | 1997 | 91 | 60.7322 | –150.6573 |
| Kenai Drainage | Kenai Drainage | | | | | |
| | | Snow River - South Fork | 1998, 2002 | 95 | 60.2238 | –149.2792 |
| | | Russian River | 2013 | 91 | 60.4474 | –149.9854 |
| | | Skilak Lake | 1999 | 78 | 60.4657 | –150.5309 |
| | | Killey River | 2000, 2002 | 92 | 60.4522 | –150.6400 |
| Southeast Cook Inlet | Kasilof Drainage | | | | | |
| | | Nikolai Creek | 2009 | 86 | 60.1936 | –151.0129 |
| | Southeast Cook Inlet | | | | | |
| | | Ninilchik River | 2013 | 93 | 60.0383 | –151.6310 |
| | | Deep Creek | 2013 | 95 | 60.0294 | –151.6792 |
| | | Anchor River | 2006, 2009 | 94 | 59.7701 | –151.8433 |
| | | Stariski Creek | 2013 | 51 | 59.8499 | –151.7782 |
| | Total | | | 3776 | | |

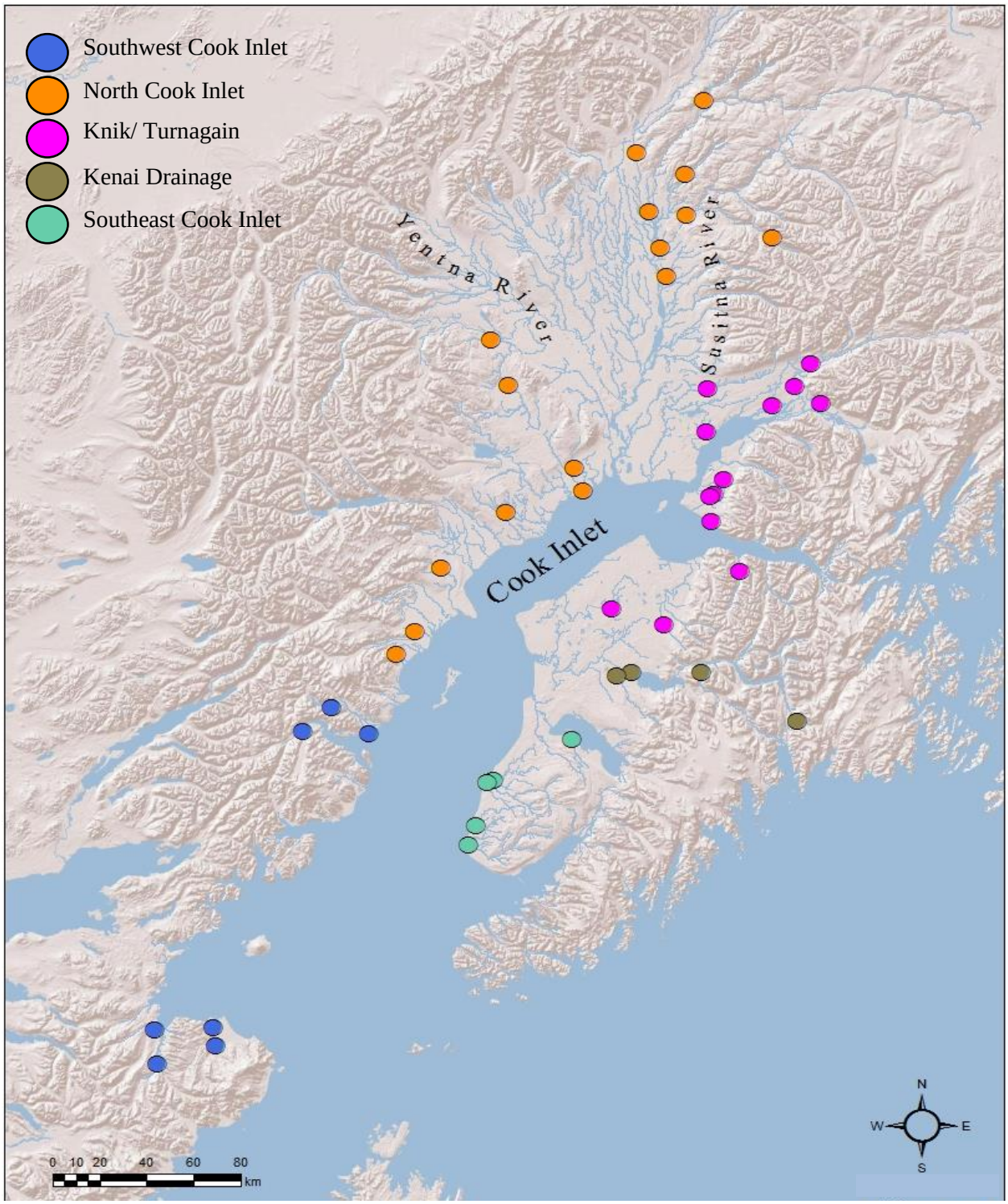


Figure 3.–Map representing five reporting groups identified during preliminary analysis in Phase II of the Cook Inlet Coho Salmon Genetic Stock Identification Project (Table 2).

In 2014 additional baseline samples were collected with the following priorities: 1) target spawning aggregates represented by fewer than 50 fish in the current baseline, and 2) target unsampled locations that represent significant spawning aggregates. Additional genetic markers will also be assayed across this larger baseline and statistical analyses will be conducted to further assess reporting groups and genetic stock identification performance.

This phase of the project is on schedule and within the original budget. Laboratory analysis of all 2013 and 2014 baseline samples will be completed by the end of the winter 2015 (Table 3). Statistical analysis, determination of reporting groups for genetic stock composition and baseline testing will be completed during the spring of 2015. A final report will be published in the ADF&G Fishery Data Series and available to the public by June 30, 2015.

Table 3.–Schedule for completion of the genetic baseline for coho salmon in Cook Inlet.

| Date | Activity | Status |
|---|---|---|
| Spring 2013 | Develop plan to sample spawning coho salmon in Cook Inlet rivers in 2013. | Completed |
| Summer/Fall 2013 | Sample coho salmon in Matanuska/Susitna drainages and Cook Inlet. | Completed |
| Winter 2013/2014 | Extract DNA from available baseline samples. | Completed |
| Spring 2014 | Develop plan to sample spawning coho salmon in Cook Inlet rivers in 2014. | Completed |
| Summer/Fall 2014 | Sample coho salmon in Matanuska/Susitna drainages and Cook Inlet. | Completed |
| Winter 2014/2015 | Extract DNA from available baseline samples and laboratory analysis of all baseline samples. | 2014 completed 48 markers<br>2015 ongoing |
| Spring 2015 | Statistical analysis of genetic baseline. | On schedule |
| | Final report of project results | On schedule |

## PHASE III: FISHERY ANALYSIS

Phase III of the Cook Inlet Coho Salmon Genetic Stock Identification Project involves genetic stock identification of coho salmon harvested in the test and commercial fisheries of Cook Inlet during the 2013–2015 seasons. This analysis will use the genetic baseline developed and tested in Phase II.

In 2013 and 2014, tissue samples were collected from coho salmon captured in the commercial fishery and offshore test fisheries in Cook Inlet. A total of 16,352 fish were sampled over both years by this project. The total number of samples available from the harvest by fishery is 1) Central District drift gillnet fishery, 5,949 fish, 2) General Subdistrict set gillnet fishery, 5,963 fish, and 3) Eastern Subdistrict set gillnet fishery, 2,063 fish. The offshore test fishery catch samples were successfully collected in each year from the Northern (876 fish) and Southern (1,501 fish) transects. Detailed sampling results by year from each fishery are available in Table 4. The locations of fishing districts in Cook Inlet are shown in Figure 4.

Table 4.–Number of coho salmon collected by fishery in 2013 and 2014 and the number anticipated to be genotyped for the Cook Inlet Coho Salmon Genetic Stock Identification Project.

| | Number collected | | Number anticipated to genotype | |
|---|---|---|---|---|
| Fishery | 2013 | 2014 | 2013 | 2014 [a] |
| Commercial harvest | | | | |
| Central District drift gillnet | 3,377 | 2,572 | 2,000 | 1,600 |
| General Subdistrict set gillnet | 3,998 | 1,965 | 1,095 | 800 |
| Eastern Subdistrict set gillnet | 1,251 | 812 | 505 | 400 |
| Total commercial harvest | 8,626 | 5,349 | 3,600 | 2,800 |
| Offshore test fishery catches | | | | |
| Northern | 488 | 388 | 488 | 388 |
| Southern | 745 | 756 | 745 | 756 |
| Total offshore test fishery catches | 1,233 | 1,144 | 1,233 | 1,144 |
| Grand total | 9,859 | 6,493 | 4,833 | 3,944 |

[a] Sample selection for 2014 will not occur until final harvest numbers are available. These are the projected sample sizes for analysis of 2014 samples.

Fish sampled from these harvests will be subsampled in proportion to harvest numbers so final numbers of analyzed fish will depend on the time-by-area strata for each fishery. We anticipate all of the fish collected in the offshore test fisheries in 2013 and 2014 will be genotyped (Table 4). The 2013 fishery samples (4,833 fish) were selected and extracted during the spring of 2014. In the winter of 2015, DNA extraction will begin on approximately 3,944 of the 6,493 fish sampled in 2014 (Table 5).

After the baseline is completed in the spring of 2015 (Phase II), the set of genetic markers to be used for genetic stock identification will be selected and laboratory analysis of the 2013 and 2014 fishery samples will begin. During the spring and summer of 2015, approximately 8,777 fish will be genotyped from both years and (Table 4).

This phase will continue into 2016 (Table 5). Genetic stock identification will only be possible once Phase II is complete in the spring of 2015. Samples from the 2015 fishery will be completed by winter of 2015/2016. The final report will be available in spring of 2016.

Table 5.–Schedule for completion of genetic stock identification of the coho salmon harvest in Cook Inlet, 2013–2015.

| Date | Activity | Status |
|---|---|---|
| Summer 2013 | Collect samples from commercial and offshore test fisheries | Completed |
| Summer 2014 | Collect samples from commercial and offshore test fisheries | Completed |
| | Extract DNA from 2013 commercial and offshore test fishery samples | Completed |
| Winter 2014/2015 | Extract DNA from 2014 commercial and offshore test fish samples | Ongoing |
| Spring/Summer 2015 | Genetic baseline completed (Phase II) | On schedule |
| | Genotype 2013 and 2014 commercial and offshore test fish samples | On schedule |
| Fall 2015 | Extract DNA and genotype 2015 commercial and offshore test fishery samples | On schedule |
| Winter 2015/2016 | Genetic stock identification | On schedule |
| Spring 2016 | Final genetic stock identification report out for publication | On schedule |

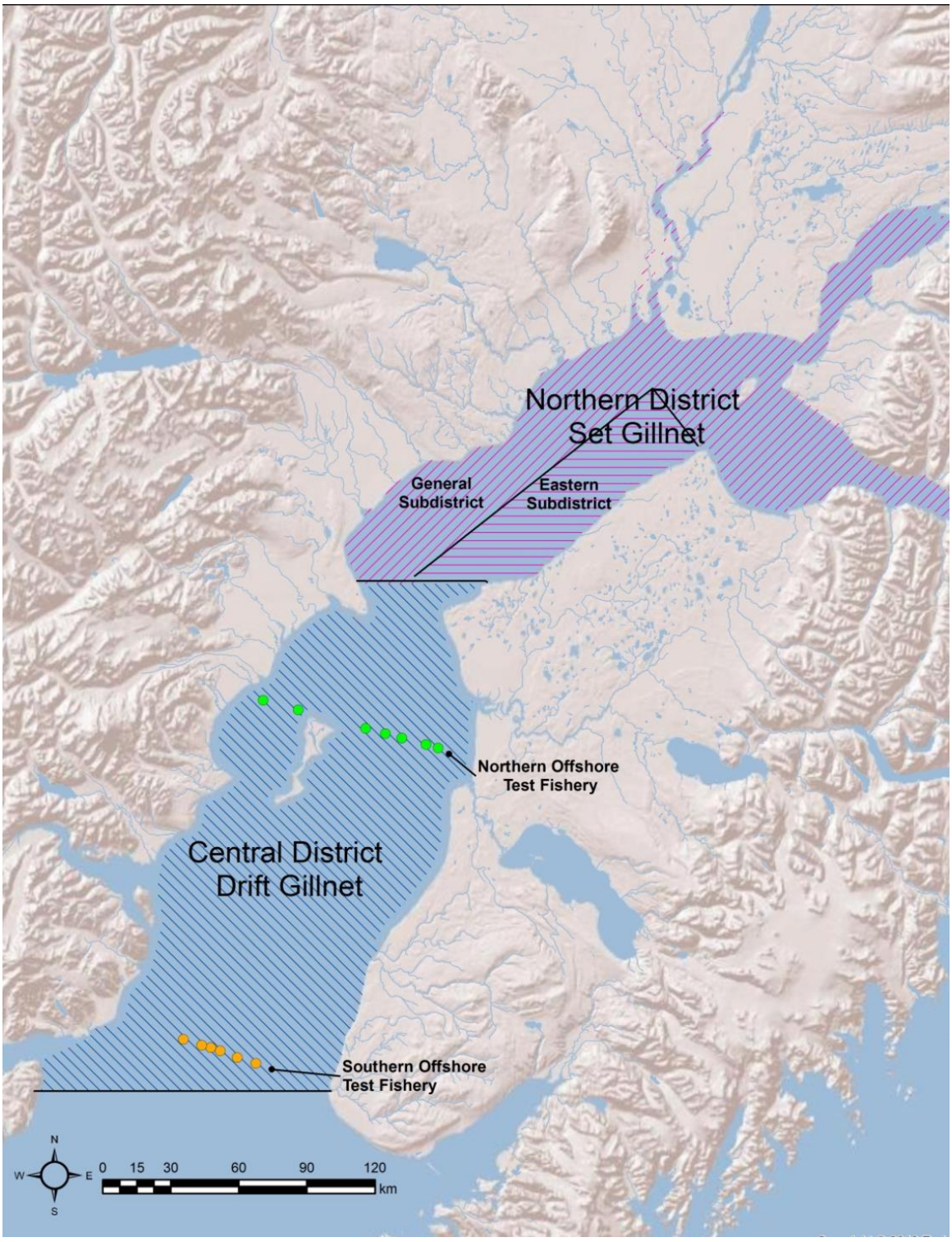


Figure 4.–Map of Cook Inlet showing locations of commercial and test fisheries sampled for coho salmon in for the Cook Inlet Coho Salmon Genetic Stock Identification Project.

# COOK INLET SOCKEYE SALMON RETROSPECTIVE ANALYSIS, 2014

This is the second year of a five-year retrospective analysis by ADF&G that will use recently developed genetic technologies to extract DNA from archived scales sampled from sockeye salmon captured in selected Upper Cook Inlet commercial fisheries from 1986 to 2005. The DNA will then be used to estimate stock composition of historic harvests with genetic stock identification in the same way that has been used annually with contemporary harvests since 2006. This information can be used to achieve two objectives:

1. Reconstruct Susitna River escapement. Sonar estimates of sockeye salmon escapement in the Yentna River go back into the 1980s but appear to be a poor indicator of escapement (Fair et al. 2009). Sporadic weir counts also exist for select systems within the Susitna drainage beginning in the 1970s, three of which now have sustainable escapement goals. However, it is only since 2006 that ADF&G has estimates of total drainagewide escapement. Susitna River escapements from 1986 to 2005 will be reconstructed by first estimating the proportion of Susitna River-bound fish from historical catches in the Central District drift gillnet, Eastside set gillnet, and Northern District set gillnet fisheries, since these harvest areas intercept the vast majority (98%) of Susitna River sockeye salmon harvested in Upper Cook Inlet (Table 6; Barclay et al. 2010). DNA will be extracted from historical scales collected from harvests in these three areas using standard methods similar to a recent Bristol Bay study (Smith 2010). Escapement to the Susitna River drainage will then be estimated using the annual proportional harvest in the historic commercial fisheries with the same method used since 2006.
2. Reconstruct Upper Cook Inlet total runs for the major systems. The harvest of sockeye salmon in Cook Inlet can be separated into four large-scale stocks: Kenai River, Kasilof River, Susitna River, and Other. This objective will use a modified version of the Bristol Bay run reconstruction model (Cunningham et al. 2012) that accounts for the unique characteristics of Upper Cook Inlet fisheries and escapements and will tie in the critical components from Objective 1.

Initial planning for this project was based on target sample sizes of 400 fish per fishery stratum for each year from 1986 to 2005 (Table 7). This was a good starting point, but necessary sample sizes will change depending on success rates for extracting usable DNA from archived scales.

The Central District drift gillnet fishery is the highest priority for analysis because most Susitna-bound fish are harvested in this fishery (Table 6). For this reason, samples from the Central District drift gillnet fishery for all years will be analyzed prior to analysis of the Eastside set gillnet and Northern District set gillnet fishery samples. Using this method, sample sizes from the Eastside set gillnet or Northern District set gillnet harvests can be adjusted to account for changes necessitated by success rates with archived DNA or reduction in future funding for the project.

During the winter of 2013/2014, 6,000 individual scale samples were identified from the archived scale cards collected from the Central District drift gillnet fishery harvests from 1986 to 2001. During the spring and summer of 2014, DNA extraction and genotyping began on the first 190 samples from the 1986 drift fishery to optimize laboratory methods. Initial analyses failed to produce genotypes. We suspected that this failure was due to a combination of low DNA yield that failed to amplify and fish-to-fish contamination. We then applied a series of methods designed to increase DNA amplification and we identified methods that yielded high amplification success (99% of the samples amplified). However, these amplifications produced genotypes that documented DNA from multiple

fish per sample (contamination) in 65% of the samples. Excluding these contaminated samples allowed for genotyping of the remaining samples.

Based on these 190 samples from a single year, we estimate that this project will need to analyze 3 fish for every 1 fish successfully genotyped. These dropouts should not affect the stock composition estimates because fish-to-fish contamination is not stock associated. However, these dropouts will add cost. This increased cost can be absorbed by excluding lower-priority samples from the project or by extending the project for additional years using general funds from the Cook Inlet Sockeye Salmon Genetics Project. Before these decisions can be made we will need to investigate the rates of DNA yield and contamination across years.

DNA yield and contamination rates are affected by sampling methods: given that scales were not intended for DNA analysis, slight deviations in methods across years might result in different levels of DNA yield and contamination. For example, some technicians cleaned scales more thoroughly than others before placing them on scale cards (most of the DNA is in the mucus around the scale, not in the scale itself) or some scale cards were dried more quickly than others (fast drying preserves DNA better). To investigate DNA yield and contamination across years, a quarter (N=100) of the selected (N=400) drift gillnet fishery scales from each year will be analyzed. This analysis will provide a better estimate of the level of oversampling that will be needed to meet the target of 400 fish per year. This work is ongoing and will be completed Winter 2014/2015.

During fall of 2014, 400 scale samples were selected from each year of the drift gillnet samples from 2002 to 2005. A quarter (N=100) of these will be selected per year to determine DNA yield and contamination within each year's drift samples.

This project is on schedule and will be and will be completed in five years, 2018.

Table 6.–Proportion of total Susitna River sockeye salmon harvest in Upper Cook Inlet gillnet fishery strata, 2006–2012 (calculated from Barclay et al. 2010, 2011, 2013, 2014, and *In prep).*

| Fishery stratum | Mean | Min | Max |
|---|---|---|---|
| Central District drift | 0.706 | 0.459 | 0.839 |
| Eastside (Upper Subdistrict) set | | | |
| Kasilof Section set | 0.051 | 0.001 | 0.146 |
| Kenai/East Forelands sections set | 0.056 | 0.009 | 0.140 |
| Kalgin Island Subdistrict set | 0.015 | 0.002 | 0.075 |
| Western Subdistrict set | 0.001 | 0.000 | 0.003 |
| Northern District set | 0.042 | 0.005 | 0.089 |

Table 7.–Initial sample sizes to estimate stock composition of sockeye salmon from each gillnet fishery stratum by year in Upper Cook Inlet. Shaded cells indicate the samples to be analyzed by spring 2015. No drift fishery occurred in 1989.

| Year | Central District drift | Eastside set | Northern District set | Total |
|---|---|---|---|---|
| 1986 | 400 | 400 | 400 | 1,200 |
| 1987 | 400 | 400 | 400 | 1,200 |
| 1988 | 400 | 400 | 400 | 1,200 |
| 1989 | | 400 | 400 | 800 |
| 1990 | 400 | 400 | 400 | 1,200 |
| 1991 | 400 | 400 | 400 | 1,200 |
| 1992 | 400 | 400 | 400 | 1,200 |
| 1993 | 400 | 400 | 400 | 1,200 |
| 1994 | 400 | 400 | 400 | 1,200 |
| 1995 | 400 | 400 | 400 | 1,200 |
| 1996 | 400 | 400 | 400 | 1,200 |
| 1997 | 400 | 400 | 400 | 1,200 |
| 1998 | 400 | 400 | 400 | 1,200 |
| 1999 | 400 | 400 | 400 | 1,200 |
| 2000 | 400 | 400 | 400 | 1,200 |
| 2001 | 400 | 400 | 400 | 1,200 |
| 2002 | 400 | 400 | 400 | 1,200 |
| 2003 | 400 | 400 | 400 | 1,200 |
| 2004 | 400 | 400 | 400 | 1,200 |
| 2005 | 400 | | 400 | 800 |
| Total | 7,600 | 7,600 | 8,000 | 23,200 |

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# APPENDIX A

Appendix A.– Genetic tissue collections from Cook Inlet coho salmon currently available for the Cook Inlet Coho Salmon Genetic Stock Identification Project.

| Area/Drainage | Location | Year Collected | N | Source[a] |
|---|---|---|---|---|
| West Side | | | | |
| | Douglas River - Clearwater | 2013 | 106 | This project |
| | | 2014 | 150 | This project |
| | Douglas Reef River (Right) | 2013 | 113 | This project |
| | | 2014 | 128 | This project |
| | Kamishak River | 2013 | 110 | This project |
| | | 2014 | 106 | This project |
| | Little Kamishak River | 2013 | 96 | This project |
| | | 2014 | 175 | This project |
| | McNeil River | 2013 | 41 | This project |
| | | 2014 | 183 | This project |
| | Sunday Creek | 2012 | 7 | This project |
| | Brown's Peak Creek | 2013 | 9 | This project |
| | | 2014 | 4 | This project |
| | Knoll's Head Creek | 2014 | 200 | This project |
| | Fitz Creek | 2013 | 3 | This project |
| | Tuxedni River | 2012 | 86 | ADF&G Archives |
| | Crescent Lake - Late | 1998 | 99 | USFWS Archives |
| | Crescent River | 2012 | 1 | ADF&G Archives |
| | Harriet Creek | 2012 | 1 | ADF&G Archives |
| | | 2014 | 63 | This project |
| | Packers Creek | 2013 | 4 | This project |
| | | 2014 | 37 | This project |
| | Little Jack | 2013 | 104 | This project |
| | Montana Bill Creek | 2012 | 101 | ADF&G Archives |
| | Big River | 2009 | 19 | ADF&G Archives |
| | Kustatan River | 2013 | 119 | This project |
| | McArthur River | 2014 | 98 | This project |
| | Farro Lake Outlet Creek | 2013 | 17 | This project |
| | | 2014 | 111 | This project |
| | Straight Creek | 2014 | 15 | This project |
| | Chuitna River | 1992 | 54 | USFWS Archives |
| | Wilson Creek | 2010 | 223 | ADF&G Archives |
| | Middle Creek | 2008 | 40 | ADF&G Archives |
| | Lone Creek | 2008 | 70 | ADF&G Archives |

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| Area/Drainage | Location | Year Collected | N | Source[a] |
|---|---|---|---|---|
| West Side | Coal Creek | 2013 | 41 | This project |
| | Coal Creek | 2014 | 46 | This project |
| | Theodore River | 2012 | 19 | ADF&G Archives |
| | | 2013 | 60 | ADF&G Sport Fish |
| | Lewis River | 2013 | 57 | ADF&G Sport Fish |
| Susitna Drainage | | | | |
| | Portage Creek | 2014 | 63 | This project |
| | Indian River | 2013 | 104 | AEA |
| | | 2014 | 52 | This project |
| | Susitna River - Slough 11 | 2013 | 1 | AEA |
| | Lane Creek | 2014 | 10 | This project |
| | Whiskers Creek | 2013 | 79 | AEA |
| | | 2014 | 2 | This project |
| | Honolulu Creek | 2013 | 4 | AEA |
| | Byers Creek | 2014 | 57 | This project |
| | Spink Creek | 2008 | 38 | ADF&G Archives |
| | | 2014 | 62 | This project |
| | Troublesome Creek | 2013 | 92 | AEA |
| | | 2014 | 15 | This project |
| | Bunco Creek | 2013 | 9 | AEA |
| | | 2014 | 56 | This project |
| | Swan Lake | 2009 | 20 | ADF&G Archives |
| | Prairie Creek | 2014 | 53 | This project |
| | Iron Creek | 2013 | 28 | AEA |
| | | 2014 | 12 | This project |
| | Sheep River | 2013 | 115 | AEA |
| | Larson Creek | 2011 | 84 | ADF&G Archives |
| | | 2014 | 48 | This project |
| | Chunilna Creek- Clear Creek | 2013 | 66 | AEA |
| | | 2014 | 70 | This project |
| | Fish Creek | 2013 | 1 | AEA |
| | | 2014 | 65 | This project |
| | Birch Creek | 2014 | 2 | This project |
| | Answer Creek | 2013 | 7 | This project |
| | Question Creek | 2013 | 77 | This project |
| | | 2014 | 71 | This project |
| | Rabideux Creek | 2014 | 1 | This project |
| | Montana Creek | 2013 | 200 | ADF&G Sport Fish |
| | Sheep Creek | 2014 | 47 | This project |

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| Area/Drainage | Location | Year Collected | N | Source[a] |
|---|---|---|---|---|
| Susitna Drainage | Kashwitna River | 2014 | 24 | This project |
| | Willow Creek | 2014 | 26 | This project |
| | Deshka River | 2013 | 100 | ADF&G Sport Fish |
| | Alexander Creek | 2014 | 101 | ADF&G Sport Fish |
| Yentna Drainage | | | | |
| | Martin Creek | 2013 | 35 | This project |
| | Canyon Creek | 2013 | 55 | This project |
| | | 2008 | 20 | ADF&G Archives |
| | Talachulitna River | 2013 | 74 | This project |
| Knik Arm | | | | |
| | Little Susitna River | 2013 | 97 | ADF&G Sport Fish |
| | | 2014 | 100 | ADF&G Sport Fish |
| | Fish Creek | 2009 | 203 | ADF&G Archives |
| | | 2013 | 94 | ADF&G Sport Fish |
| | | 2014 | 100 | ADF&G Sport Fish |
| | Cottonwood Creek | 2014 | 94 | This project |
| | Wasilla Creek | 2013 | 9 | This project |
| | | 2014 | 91 | This project |
| | Rabbit Slough | 2011 | 95 | ADF&G Archives |
| | Granite Creek | 2014 | 1 | This project |
| | Moose Creek | 2014 | 11 | This project |
| | Eska Creek | 2013 | 61 | This project |
| | | 2014 | 65 | This project |
| | Matanuska River mainstem | 2008 | 135 | USFWS Archives |
| | | 2009 | 194 | USFWS Archives |
| | | 2014 | 3 | This project |
| | Jim Lake | 2011 | 7 | ADF&G Archives |
| | Jim Creek | 2009 | 68 | ADF&G Archives |
| | | 2014 | 104 | This project |
| | Eagle River | 2014 | 24 | This project |
| | Sixmile Creek | 2009 | 46 | ADF&G Archives |
| | | 2014 | 43 | This project |
| | Ship Creek | 1991 | 11 | ADF&G Archives |
| | | 2012 | 400 | ADF&G Archives |
| | | 2014 | 189 | ADF&G Sport Fish |
| | Chester Creek | 2011 | 54 | ADF&G Archives |
| | | 2013 | 2 | This project |
| | | 2014 | 14 | This project |

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| Area/Drainage | Location | Year Collected | N | Source[a] |
|---|---|---|---|---|
| Turnagain Arm | | | | |
| | Campbell Creek | 1995 | 5 | ADF&G Archives |
| | | 2009 | 125 | ADF&G Archives |
| | | 2010 | 9 | ADF&G Archives |
| | Rabbit Creek | 2011 | 54 | ADF&G Archives |
| | | 2014 | 7 | This project |
| | California Creek | 2014 | 9 | This project |
| | Placer Creek | 2014 | 73 | This project |
| | Williwaw Creek | 2013 | 22 | This project |
| | | 2014 | 50 | This project |
| | Portage Creek - #2 | 2013 | 5 | This project |
| | | 2014 | 17 | This project |
| | Explorer Creek | 2013 | 94 | This project |
| | | 2014 | 66 | This project |
| | Placer River | 2014 | 6 | This project |
| | Ingram Creek | 2013 | 7 | This project |
| | | 2014 | 6 | This project |
| | Sixmile Creek | 2014 | 100 | This project |
| | Resurrection Creek | 2010 | 96 | ADF&G Archives |
| | Mystery Creek | 2010 | 22 | ADF&G Archives |
| | Chickaloon River | 2010 | 82 | ADF&G Archives |
| Northwestern Kenai Peninsula | | | | |
| | Sucker Creek | 1997 | 94 | USFWS Archives |
| | Gruska Creek | 2013 | 53 | This project |
| | | 2014 | 50[b] | This project |
| | Bishop Creek | 2014 | 50[b] | This project |
| Kenai Drainage | | | | |
| | Grant Creek | 2013 | 100 | CIAA |
| | Snow River - South Fork | 1998 | 73 | USFWS Archives |
| | | 2002 | 50 | USFWS Archives |
| | Trail Creek | 2006 | 134 | USFWS Archives |
| | Quartz Creek | 1998 | 75 | USFWS Archives |
| | | 2002 | 50 | USFWS Archives |
| | Moose Creek | 1993 | 150 | ADF&G Archives |
| | below Kenai Lake (mainstem) | 2002 | 57 | USFWS Archives |
| | | 1999 | 56 | USFWS Archives |
| | | 2014 | 117 | This project |
| | Russian River | 2002 | 31 | USFWS Archives |
| | | 2013 | 101 | This project |

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| Area/Drainage | Location | Year Collected | N | Source[a] |
|---|---|---|---|---|
| Kenai Drainage | Russian River | 2014 | 100 | This project |
| | Skilak Lake - Upper | 1999 | 60 | USFWS Archives |
| | Skilak River | 2003 | 100 | USFWS Archives |
| | Skilak Lake - Lower | 1999 | 20 | USFWS Archives |
| | Below Skilak Lake (mainstem) | 2002 | 50 | USFWS Archives |
| | | 1999 | 80 | USFWS Archives |
| | | 2014 | 95 | This project |
| | Killey River | 2000 | 68 | USFWS Archives |
| | | 2002 | 49 | USFWS Archives |
| | East Fork Moose River | 2002 | 100 | USFWS Archives |
| | | 2000 | 11 | USFWS Archives |
| | Moose River | 1998 | 35 | USFWS Archives |
| | Funny River | 2006 | 150 | USFWS Archives |
| | Soldotna Creek | 2013 | 8 | This project |
| | Slikok Creek | 2008 | 67 | USFWS Archives |
| | Beaver Creek | 2013 | 12 | This project |
| Kasilof Drainage | | | | |
| | Glacier Creek | 2009 | 68 | USFWS Archives |
| | Indian Creek | 2009 | 55 | USFWS Archives |
| | Shantatalik Creek | 2009 | 41 | USFWS Archives |
| | Nikolai Creek | 2009 | 92 | USFWS Archives |
| | Kasilof River mainstem | 2009 | 100 | USFWS Archives |
| Southern Kenai Peninsula | | | | |
| | Ninilchik River | 2013 | 108 | This project |
| | | 2014 | 100 | This project |
| | Deep Creek | 2013 | 101 | This project |
| | | 2014 | 100 | This project |
| | Anchor River | 2006 | 164 | ADF&G Archives |
| | | 2009 | 40 | ADF&G Archives |
| | Stariski Creek | 2013 | 59 | This project |
| | | 2014 | 100 | This project |
| | Fox River | 2013 | 117 | This project |
| | | 2014 | 111 | This project |
| | Port Graham River | 2014 | 114 | This project |
| | English Bay River | 2013 | 12 | This project |
| Total | | | 11,860 | |

[a] Sources of tissues or funding include collections by the ADF&G Gene Conservation Laboratory under this project (This project), ADF&G archives, U.S. Fish and Wildlife Service (USFWS) archives, ADF&G Sport Fish weirs (Sport Fish), Alaska Energy Authority (AEA), and Cook Inlet Aquaculture Association (CIAA).

[b] These sample sizes are preliminary field counts, these may change when samples are inventoried.