

February 2, 2009

State of Alaska Department of Fish and Game  
Division of Sport Fish HQ  
P.O. Box 115526  
Juneau, Alaska 99811  
Attention: Robert Piorkowski

**Subject: Fish Collection Activities Report – Fish Resource Permit Number SF2008-025**

Dear Mr. Piorkowski:

OASIS Environmental, Inc. is pleased to submit the following summary report for activities conducted under the ADF&G Collection Permit SF2008-025. Included in the report is a summary of the species, numbers, dates, locations, lengths, disposition and method of capture for all collected fish. Also attached is the ADF&G spreadsheet with data presented in the requested format. Thank you for granting OASIS the collection permit. If you have any questions, please feel free to contact me at 907 258-4880 or at [d.trudgen@oasisenviro.com](mailto:d.trudgen@oasisenviro.com).

Sincerely,



**OASIS Environmental, Inc.**  
David Trudgen

Enclosures:  
OASIS Summary Report  
Summary Spreadsheet

# Report of Collecting Activities: Fish Resource Permit Number SF2008-025

## Introduction

PacificRim Coal has proposed to develop a surface coal mine and associated facilities, collectively termed the Chuitna Coal Project, on the northwest side of Cook Inlet near the village of Tyonek in Southcentral Alaska. The proposed Project has potential impacts on the Chuitna drainage including Lone Creek, Middle Creek, Base Creek and Threemile Creek (Figure 1).

The naming convention preferred by the Project is different from what is listed in the Alaska Department of Fish and Game (ADF&G) Catalog of Waters Important for the Spawning, Rearing or Migration of Anadromous Fishes (Catalog and Atlas). The Chuitna River is simply referred to as Chuitna, Lone Creek is referred to as stream 2002, Middle Creek is referred to as stream 2003, and Base Creek is referred to as stream 2004 (Table 1). The exception is Threemile Creek, which is referred to as Threemile Creek. The Catalog and Atlas identification number of each of these streams is listed in Table 1. The information presented in this report uses the Project's naming convention, because all data records use that convention.

In support of the development of the Chuitna Coal Project, OASIS Environmental, Inc. (OASIS) designed and implemented a Freshwater Aquatic Biology Program (OASIS 2007, 2008). This report adds to the knowledge base of the previous two reports and discusses juvenile fish use of winter habitat. The objective of the winter program was:

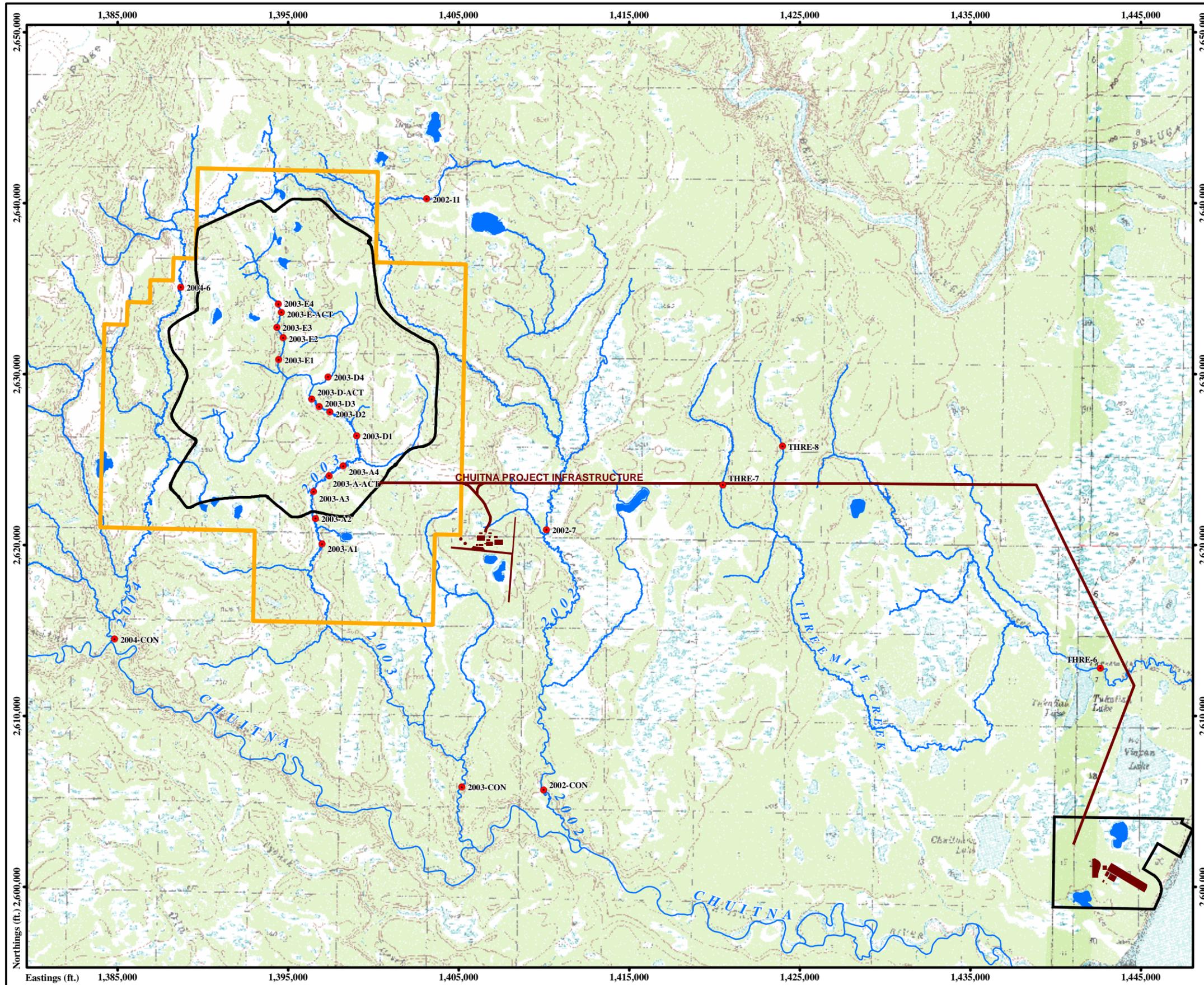
Determine the location, longitudinal movements (upstream/downstream) and habitat use of tagged, overwintering fish (emphasis on juvenile coho salmon (*Oncorhynchus kisutch*) and small resident Dolly Varden (*Salvelinus malma*)) within randomly selected segments of stream 2003 in the mine area during the winter of 2007/2008. All capture work was authorized under a State of Alaska Department of Fish and Game, Fish Resource Permit number **SF2008-025**. This report describes the methods utilized in this investigation and also summarizes the results.

**Table 1.** Chuitna Watershed Stream Naming Conventions

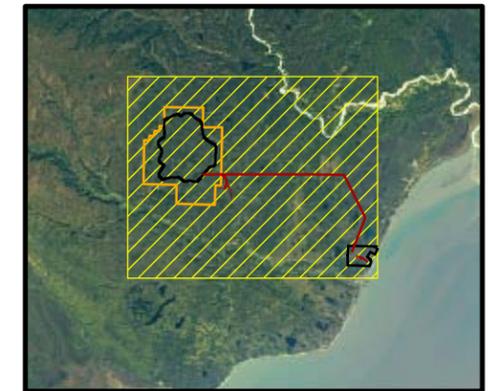
Stream Name	ADF&G Code	Chuitna Coal Project Name
Chuitna River	247-20-10010	Chuitna
Lone Creek	247-20-10010-2020	Stream 2002
Middle Creek	247-20-10010-2030	Stream 2003
Base Creek	247-20-10010-2040	Stream 2004
Threemile Creek	247-20-10002	Threemile Creek

## Methods

Study objectives were accomplished through mark and recapture sampling. Beginning in September 2007 and ending in early October 2007, a total of 2,032 fish (juvenile coho salmon n=1,907 and small resident Dolly Varden n=125) was captured in randomly selected segments of stream 2003 and marked with Visual Implant Elastomer (VIE) tags. Recapture minnow trap sites were chosen within stream 2003 which allowed OASIS to detect the movement of marked fish between and among stream segments. Minnow trap sites were also maintained at the mouths of streams 2002, 2003, and 2004 as a check for fish movement between Chuitna tributaries (Figure 1). Severe winter weather conditions hindered the recapture of tagged fish in October, November and December, 2007. Coverage of all designated trapping locations was completed in January, February, March, April and May 2008.



**FIGURE 1.**  
 2008 MINNOW TRAPPING SITES FOR  
 STREAMS 2002, 2003, 2004, AND  
 THREEMILE CREEK.

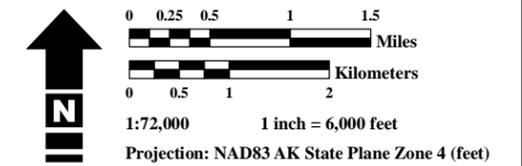


**FIGURE LOCATION MAP**

**Legend**

- 2008 Minnow Trap Sites
- ~ Project Area Stream
- Proposed Road & Conveyor
- Proposed Facilities
- ⊕ Ladd Landing Boundary
- ⊕ Lease Mining Unit-1 Boundary
- ⊕ Lease Boundary

**Data Sources:**  
 Stream Sample Sites, Oasis, 2007 & 2008.  
 Mine Infrastructure, Mine Engineers, 2006.  
 Hydrology, Oasis, 2007  
 USGS Topographic Quadrangle, 1:63360,  
 Tyonek Sheets A2, A5, & A7, 1958.



**CHUITNA COAL PROJECT**



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The fish species present in the Chuitna watershed include coho salmon, Chinook salmon (*O. tshawytscha*), chum salmon (*O. keta*), pink salmon (*O. gorbuscha*), sockeye salmon (*O. nerka*), Dolly Varden (*Salvelinus malma*), rainbow trout (*O. mykiss*), lamprey (*Lampetra spp.*), sculpin (*Cottus spp.*), threespine stickleback (*Gasterosteus aculeatus*), ninespine stickleback (*Pungitius pungitius*) and longnose suckers (*Catostomus spp.*). Species collected in 2008 by OASIS were coho salmon, Dolly Varden, rainbow trout, lamprey, sculpin (unspecified) and stickleback (unspecified).

In 2008, OASIS attempted to recapture VIE-tagged juvenile coho salmon and small stream resident Dolly Varden. Galvanized minnow traps with 0.32 cm size mesh and 1.90 cm funnel openings were baited with uncured salmon roe. Approximately two ounces of roe were placed in a nylon stocking and suspended from the middle of each trap. The traps were set for approximately 24 hours on a monthly schedule.

All living organisms collected in the traps were transferred to a three-gallon bucket filled with freshwater. Fish were placed in a separate three-gallon bucket containing a clove oil solution to anesthetize them for accurate measurements and identification. Clove oil solution concentration was increased from 0.5 milliliters (ml) (the concentration typically used during summer minnow trapping) to 0.75 ml. This was done in order to achieve the desired effect quickly, and reduce handling time because fish react more slowly to clove oil in cold water. Recovery from the anesthetic was good to excellent. Fish were identified to species and total length was measured to the nearest millimeter (mm). After identification and measurement were completed, the fish were placed in a five-gallon bucket of freshwater until they resumed active behavior, then were returned to the stream location from which they were collected.

## Results

The total number of fish captured in the Chuitna River drainage during the 2008 sampling season using minnow traps was 1,392 fish. The number and species of each fish captured from the drainages sampled in 2008 is summarized below (Table 2).

**Table 2.** Total number of fish captured in 2008 by species and drainage

	Streams				
	Total	2002	2003	2004	Threemile Creek
Coho salmon	1,312	17	1,138	112	45
Dolly Varden	51	1	48	2	0
Rainbow Trout	8	2	1	5	0
Sculpin spp.	12	0	11	0	1
Lamprey spp.	2	0	2	0	0
Stickleback spp.	7	0	0	0	7
<b>Total</b>	<b>1,392</b>	<b>20</b>	<b>1,200</b>	<b>119</b>	<b>53</b>

More specific data from stream and lake sampling is included in the attached ADF&G Summary Report of Fish Collection Activity. This list includes the site identification number, coordinates of the site, method for obtaining coordinates, name of the water body, date (in terms of minnow trapping this date is the date the site was checked), the primary observer name, the fish collection method, species, life stage, length, length method, and disposition. Three unintended mortalities (all juvenile coho salmon) were recorded in 2008.

## VIE Recaptures

A total of 88 VIE marked fish, 4% of the total number marked, was recaptured during monthly sampling between October 2007 and May 2008. The 4% figure assumes a 5% tag loss thus making the calculation based on a total number of fish marked of 1,931 (Bailey et al. 1998). Of the 88 recaptures, 82 were juvenile coho salmon and six were Dolly Varden (Table 3). Dolly Varden were recaptured in the same proportion to the number that were tagged ( $125/2,032 = 6\%$ ;  $6/88 = 6\%$ ). Due to the small recapture sample size of Dolly Varden ( $n=6$ ) they were excluded from the statistical analysis except for movement distance analysis. Tagged fish from five of the original eight tagging sites were recaptured at the 15 selected recapture stations in the three river segments (A, D, E). Marked fish were recaptured during every sampling month with the highest number of recaptures occurring in January, 2008 ( $n=32$ ) and the lowest in the months of March ( $n=2$ ), and May ( $n=2$ ), 2008. Coho CPUE decreased over time with significantly fewer fish found in April and May as compared to January:  $F(4,145)=4.8441$ ,  $p=.00107$ .

**Table 3.** Numbers of Tagged and Recaptured Fish by Species.

Tagging Site	Coho Marked	Coho Recapture	Recapture Stations	DV Marked	DV Recapture	Recapture Stations
A	291	11	A_ACT (10), D_ACT (1)	8	1	A_ACT (1)
B	347	4	D_1 (4)	16	0	n/a
C	243	0	n/a	7	0	n/a
D	549	34	D_ACT (26), D_3 (1), D_4 (7)	46	0	n/a
E	177	30	E_ACT (29), D_3 (1)	23	4	E_ACT (1), E_2 (1), E_3 (2)
H	83	0	n/a	2	0	n/a
I	182	3	A_ACT (1), A_4 (2)	22	1	A_4 (1)
J	35	0	n/a	1	0	n/a
<b>Total</b>	<b>1,907</b>	<b>82</b>		<b>125</b>	<b>6</b>	

## Habitat Use

Three broad categories were used to characterize the recapture sites: Large channel ( $n=8$ ), small channel ( $n=4$ ), and beaver pond ( $n=3$ ). Most fish were recaptured in large channel habitat ( $n=47$ ), followed by small channel habitat ( $n=34$ ), and beaver ponds ( $n=7$ ). Overall CPUE was higher in large channel habitat but with weak significance ( $p=.05097$ ). For the most part, tagged fish remained in the same habitat category and location in which they were originally tagged, remaining there throughout the winter, with two notable exceptions. In the first case a 92 mm total length (TL) age 1.0 juvenile coho salmon migrated from small channel habitat and was recaptured in a beaver pond 1,000 m downstream. In the second case a 52 mm TL age 1.0 juvenile coho salmon migrated from a large channel habitat and was recaptured in a beaver pond 200 m downstream. Tagged fish were not recaptured at any of the stream confluences nor in streams 2002 or 2004.

## Winter Movement

The majority of fish (81% of the total recaptures) were recaptured at their original VIE tagging site ( $n=71$ ). Upon recapture, four of a total of six Dolly Varden (66%) had moved at least 200 m from their original tagging site. In comparison, only 12 out of 82 (or 15%) of recaptured juvenile coho salmon had moved at least 200 m from their original tagging sites. Among recaptured fish that moved, upstream movement ( $n=8$ ) was as common as downstream movement ( $n=8$ ). Movement direction by species was 100% downstream for Dolly Varden and 33% downstream for juvenile coho salmon. However, a test for

significance ( $\alpha=0.05$ ), using a two-sided t-test revealed that the average upstream and downstream movement of both Dolly Varden and juvenile coho salmon was not significantly different than zero and had a very high standard deviation (571 m and 233 m respectively for coho salmon and Dolly Varden) (Table 4). There was scatter both upstream and downstream indicating some fish movement with an insignificant downstream tendency. High variability in movement patterns indicated some fish were moving but, overall, most fish remained in close proximity to their original capture and tagging site throughout the winter.

Based on the results of winter sampling OASIS concludes that juvenile coho salmon and small resident Dolly Varden utilize habitat in Chuitna River tributary stream 2003 during fall (September-October) and throughout the winter from freeze-up (November) until break-up (May). Bustard (1986), similarly observed “no net change” in coho numbers during trapping in the fall before ice up and again in the spring, suggesting that most juvenile coho salmon remained in the vicinity of rearing areas used in late October, throughout the winter. Juvenile coho salmon were observed wintering in large channel habitat and relied less on beaver dammed ponds than has been documented in other studies conducted in more southerly portions of their range (Bustard and Narver 1975; Swales et al. 1986; Pollock et al. 2004). While largely speculative, physiological barriers (i.e. limited energy reserves and associated metabolic stress) and physical obstacles (i.e. ice, cold water), presented by winter conditions may discourage the type of longer range movement, and movement between habitat types, documented for these species in other portions of their range.

**Table 4.** Fish Movement Distance in Meters

	<b>Coho Salmon</b>	<b>Dolly Varden</b>
mean in meters (negative reflects downstream movement)	-76.20	-85.70
standard deviation	570.99	232.99
n (sample size)	82.00	6.00
standard error	63.04	95.12
lower bound of 95% confidence interval	-201.63	-330.22
upper bound of 95 % confidence interval	49.24	158.80
t-test	-1.20	-0.90
P-Value	0.23	0.41

## Literature Cited

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