Regional Operational Plan No. ROP.SF.1J.2022.15

Operational Plan: Estimation of Smolt Production and Harvest of Stikine River Chinook Salmon, 2019–2021

by

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July 2022

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

Symbols and Abbreviations

The following symbols and abbreviations, and others approved for the Système International d'Unités (SI), are used without definition in the following reports by the Divisions of Sport Fish and of Commercial Fisheries: Fishery Manuscripts, Fishery Data Series Reports, Fishery Management Reports, and Special Publications. All others, including deviations from definitions listed below, are noted in the text at first mention, as well as in the titles or footnotes of tables, and in figure or figure captions.

Weights and measures (metric)

centimeter	cm
deciliter	dL
gram	g
hectare	ha
kilogram	kg
kilometer	km
liter	L
meter	m
milliliter	mL
millimeter	mm

Weights and measures (English)

cubic feet per second	ft^3/s
foot	ft
gallon	gal
inch	in
mile	mi
nautical mile	nmi
ounce	oz
pound	lb
quart	qt
yard	yd

Time and temperature

day	d
degrees Celsius	°C
degrees Fahrenheit	°F
degrees kelvin	K
hour	h
minute	min
second	s

Physics and chemistry

all atomic symbols	
alternating current	AC
ampere	A
calorie	cal
direct current	DC
hertz	Hz
horsepower	hp
hydrogen ion activity (negative log of)	pH
parts per million	ppm
parts per thousand	ppt, ‰
volts	V
watts	W

General

Alaska Administrative Code	AAC
all commonly accepted abbreviations	e.g., Mr., Mrs., AM, PM, etc.
all commonly accepted professional titles	e.g., Dr., Ph.D., R.N., etc.
at	@
compass directions:	
east	E
north	N
south	S
west	W
copyright	©
corporate suffixes:	
Company	Co.
Corporation	Corp.
Incorporated	Inc.
Limited	Ltd.
District of Columbia	D.C.
et alii (and others)	et al.
et cetera (and so forth)	etc.
exempli gratia (for example)	e.g.
Federal Information Code	FIC
id est (that is)	i.e.
latitude or longitude	lat or long
monetary symbols (U.S.)	$, ¢
months (tables and figures): first three letters	Jan,...,Dec
registered trademark	®
trademark	™
United States (adjective)	U.S.
United States of America (noun)	USA
U.S.C.	United States Code
U.S. state	use two-letter abbreviations (e.g., AK, WA)

Mathematics, statistics

all standard mathematical signs, symbols and abbreviations	
alternate hypothesis	H_A
base of natural logarithm	e
catch per unit effort	CPUE
coefficient of variation	CV
common test statistics	(F, t, χ^2, etc.)
confidence interval	CI
correlation coefficient (multiple)	R
correlation coefficient (simple)	r
covariance	cov
degree (angular)	°
degrees of freedom	df
expected value	E
greater than	>
greater than or equal to	≥
harvest per unit effort	HPUE
less than	<
less than or equal to	≤
logarithm (natural)	ln
logarithm (base 10)	log
logarithm (specify base)	$\log_2$, etc.
minute (angular)	'
not significant	NS
null hypothesis	H_O
percent	%
probability	P
probability of a type I error (rejection of the null hypothesis when true)	α
probability of a type II error (acceptance of the null hypothesis when false)	β
second (angular)	″
standard deviation	SD
standard error	SE
variance	
population	Var
sample	var

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OPERATIONAL PLAN: ESTIMATION OF SMOLT PRODUCTION AND HARVEST OF STIKINE RIVER CHINOOK SALMON, 2019-2021

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Approval

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ABSTRACT

The primary goals of this study are to estimate the number of Chinook salmon *Oncorhynchus tshawytscha* smolt leaving the Stikine River and the length and weight of these Chinook salmon smolt yearly from 2019-2021. In addition, the harvest and marine survival of adult Chinook salmon returning to the Stikine River in the corresponding 2017-2019 brood years will be estimated, as well as length and weight of coho salmon smolt yearly from 2019-2021. A modified Petersen 2-event mark-recapture project will be used to estimate smolt abundance, and a coded wire tag project in conjunction with harvest sampling programs will be used to estimate harvest. Chinook smolt will be marked with adipose fin clips and coded wire tags each spring. Marked fish will be recaptured through creel, port, and escapement sampling programs. The Alaska Department of Fish and Game and Fisheries and Oceans Canada use these data, along with adult escapement information, to make terminal and regional management decisions, and the Pacific Salmon Commission uses the data for coastwide management and stock assessment through the Transboundary and Chinook Technical Committees.

Keywords: Chinook salmon, *Oncorhynchus tshawytscha*, adult production, smolt production, coded wire tag, Petersen estimator, marine survival, exploitation, mark-recapture, inriver run, escapement, total run, age composition, Stikine River, Southeast Alaska

PURPOSE

The primary goals of this study are to estimate a) the number of Chinook salmon *Oncorhynchus tshawytscha* smolt (≥50 mm FL) leaving the Stikine River yearly from 2019-2021, and b) the mean length and weight of Chinook salmon smolt leaving the Stikine River yearly. Additional objectives include estimating the marine harvest and marine survival of adult Chinook salmon returning to the Stikine River from the 2017-2019 brood years and estimating the length and weight of coho salmon *Oncorhynchus kisutch* smolt that are captured during their outmigration. A modified Petersen 2-event mark-recapture project will be used to estimate smolt abundance and a coded wire tag (CWT) project relying on harvest sampling programs will be used to estimate harvest. Length and weight data will be collected during the CWT and event 1 smolt tagging project. Chinook smolt will be marked with adipose fin clips and CWTs each spring. Marked fish will be recaptured through creel, port and escapement sampling procedures. The Alaska Department of Fish and Game (ADF&G) and Department of Fisheries and Oceans Canada (DFO) use these data, along with adult escapement information (see separate operational plan), to make terminal and regional management decisions, and the Pacific Salmon Commission (PSC) uses the data for coastwide management and stock assessment through the Transboundary and Chinook Technical Committees (TTC, CTC).

The Alaska Department of Fish and Game has chosen the Stikine River as 1 of the 12 statewide Chinook salmon indicator stocks and this population is also an indicator stock for the CTC. These population characteristics can be tailored for strategies to achieve management objectives while providing fishing opportunities to various user groups. Currently, there are no stock assessment projects for coho salmon on the Stikine River. However, in the future we wish to better understand the characteristics of the coho salmon population on the Stikine River and develop an abundance-based management approach, as outlined in Chapter 1 of the Pacific Salmon Treaty (PST).

BACKGROUND

The Stikine River is a transboundary river (TBR), originating in British Columbia and flowing to the sea near Wrangell, Alaska. The river is one of the largest producers of Chinook salmon in Northern British Columbia/Southwest Yukon Territory and Southeast Alaska (SEAK). It is one of three TBR systems that produce major runs of Chinook salmon, the terminal runs of which are jointly managed by ADF&G and DFO. The ADF&G and DFO assessed that the Stikine River

Chinook salmon stock rebounded from overfishing and low survival rates in the 1970s (Bernard et al. 2000), however in recent years this stock has been in a period of low abundance once again (Courtney et al. *Unpublished*). Provisions for harvest sharing and management of directed terminal fisheries for Stikine River large Chinook salmon (≥660 mm mid eye to fork length (MEF)) were successfully negotiated by the Transboundary Panel and implemented in 2005. These arrangements, with slight adjustments, were adopted through PST negotiations in 2006, renegotiated in 2019, and are in effect through 2028 (Paragraph 3 (a) (iii) of Annex IV, Chapter 1 of the PST). In years that directed Chinook salmon fisheries were allowed, total terminal harvests ranged from about 7,000 to 48,000 large fish. In years that directed fisheries were not allowed, total terminal harvests ranged from about 60 to 5,500 large fish (Table 1). Directed fisheries may be implemented based on pre-season forecasts only if the pre-season forecast terminal run size equals or exceeds the spawning objective as defined in the annual management plan in addition to the combined Canada and U.S. base level catches and assessment fishery catches of Stikine River Chinook salmon.

Chinook salmon escapement to the Stikine River has been monitored since 1975 by counting large spawners at the Little Tahltan River. A cooperative mark-recapture program between the ADF&G, DFO and the Tahltan First Nation (TFN) was begun in 1996 to estimate Chinook salmon escapement to the Stikine River (Pahlke and Etherton 1998) and has continued to the present. The estimated spawning escapement of large Chinook salmon has ranged from about 7,900 to 63,500 since 1996 (Table 2). All Chinook salmon less than 660 mm MEF, which are almost entirely "Jack" (male) Chinook salmon, are not included in the above estimates and comprise an additional 5% to 20% of the above numbers, depending on the year and brood strength. Results from this program were used to develop the current escapement goal of 14,000 to 28,000 large spawners in 2000 (Bernard et al. 2000). As part of that analysis, a revised expansion factor of 5.15 (SE = 0.77) for Little Tahltan River weir counts was also estimated, recognizing that 19% of the drainage wide escapement is estimated to be counted through this weir. However, since 2007 the ratio of the weir counts at the Little Tahltan River weir to the estimated Stikine River escapement have been extremely variable, ranging from about 1% to 18%.

Table 1.–US and Canadian terminal harvest of Stikine River large (≥660 mm MEF) Chinook salmon and years of directed fisheries, 2005-2018.

Year	US Harvest	Canada Harvest	Total Harvest	Directed Commercial Fisheries	Source
2005	27,882	20,016	47,898	Yes	Richards et al. (2008)
2006	22,060	15,776	37,836	Yes	Richards et al. (2012)
2007	10,885	10,505	21,390	Yes	Richards et al. (2012)
2008	7,335	7,906	15,241	Yes	Richards et al. (2012)
2009	1,350	2,284[b]	3,634	No	Jaecks et al. (*Unpublished*)[1]
2010	1,303	1,819[b]	3,122	No	Jaecks et al. (*Unpublished*)[2]
2011[a]	2,145	2,336[b]	4,481	No	Courtney et al. (*Unpublished*)[3]
2012[a]	2,370	4,642[b]	7,012	Yes	Courtney et al. (*Unpublished*)[4]
2013[a]	1,566	1,954[b]	3,520	No	Courtney et al. (*Unpublished*)[5]
2014[a]	1,622	1,974[b]	3,596	No	Courtney et al. (*Unpublished*)[6]
2015[a]	1,438	4,233[b]	5,671	No	Courtney et al. (*Unpublished*)[7]
2016[a]	1,707	3,235	4,942	No	Courtney et al. (*Unpublished*)[8]
2017[a]	207	603	810	No	Courtney et al. (*Unpublished*)[9]
2018[a]	37	165	202	No	Courtney et al. (*Unpublished*)[10]

[a] Preliminary

[b] Includes directed Chinook assessment/test fishery harvests 2009–2015.

[1] Jaecks, T.A., P. Etherton, and P.J. Richards. *Unpublished*. Abundance of the Chinook salmon escapement on the Stikine River, 2009. Alaska Department of Fish and Game, Division of Sport Fish. Draft in Review, located at: Alaska Department of Fish and Game, Juneau

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Table 2.–Estimated spawning escapement of Stikine River large (≥660 mm MEF) Chinook salmon versus Little Tahltan River weir counts, 1996–2018.

Year	Estimated spawning escapement, large Chinook	Weir count, large Chinook	Weir count as % of estimated spawning escapement	Source
1996	28,949	4,821	17	Pahlke and Etherton (1998)
1997	26,996	5,557	21	Pahlke and Etherton (1999)
1998	25,968	4,879	19	Pahlke and Etherton (2000)
1999	19,947	4,738	24	Pahlke et al. (2000)
2000	27,531	6,640	24	Der Hovanisian et al. (2001)
2001	63,523	9,728	15	Der Hovanisian et al. (2003)
2002	50,875	7,490	15	Der Hovanisian et al. (2004)
2003	46,824	6,492	14	Der Hovanisian et al. (2005)
2004	48,900	16,381	33	Der Hovanisian and Etherton (2006)
2005	39,806	7,253	18	Richards et al. (2008)
2006	24,405	3,860	16	Richards et al. (2012)
2007	14,560	562	3	Richards et al. (2012)
2008	18,352	2,634	15	Richards et al. (2012)
2009	12,803 [a]	2,245 [a]	18 [a]	Jaecks et al. (*Unpublished*)[11]
2010	15,116 [a]	1,057 [a]	7	Jaecks et al. (*Unpublished*)[12]
2011	14,480 [a]	1,754 [a]	12	Courtney et al. (*Unpublished*)[13]
2012	22,327 [a]	720 [a]	3	Courtney et al. (*Unpublished*)[14]
2013	16,737 [a]	878 [a]	5	Courtney et al. (*Unpublished*)[15]
2014	24,360 [a]	169 [a]	0.7 [a,b]	Courtney et al. (*Unpublished*)[16]
2015	21,342 [a]	450[a]	2 [a,b]	Courtney et al. (*Unpublished*)[17]
2016	13,789 [a]	921[a]	7[a]	Courtney et al. (*Unpublished*)[18]
2017	7,938 [a]	492[a]	5[a]	Courtney et al. (*Unpublished*)[19]
2018	8,768 [a]	453[a]	5[a]	Courtney et al. (*Unpublished*)[20]

[a] Preliminary Mark Recapture Estimates

[b] Due to a slide in May 2014 on the lower Tahltan River, upstream migration patterns and distribution may have been affected.

The CWT program is designed to estimate smolt production and harvest of Stikine River Chinook salmon and has been ongoing since 2000 (1998 brood year). (Table 3). The CWT-based harvest estimation will complement a genetic stock identification (GSI) program initiated in 2005 that

[11] Jaecks, T.A., P. Etherton, and P.J. Richards. *Unpublished*. Abundance of the Chinook salmon escapement on the Stikine River, 2009. Alaska Department of Fish and Game, Division of Sport Fish. Draft in Review, located at: Alaska Department of Fish and Game, Juneau

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[18] Courtney, K.R., P. Etherton, and P.J. Richards. *Unpublished*. Abundance of the Chinook salmon escapement on the Stikine River, 2016. Alaska Department of Fish and Game, Division of Sport Fish. Located at: Alaska Department of Fish and Game, Juneau

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[20] Courtney, K.R., P. Etherton, and P.J. Richards. *Unpublished*. Abundance of the Chinook salmon escapement on the Stikine River, 2018. Alaska Department of Fish and Game, Division of Sport Fish. Located at: Alaska Department of Fish and Game, Juneau

independently estimates the terminal harvest contribution of the Stikine River stock to the commercial gillnet, commercial troll and sport harvests in district 8 (statistical weeks 19 to 29), and in the commercial troll and sport fisheries occurring throughout the remainder of the region. For terminal harvest accounting, GSI methods will be used when samples sizes are appropriate. Harvest estimates using CWTs also allow for an estimate of harvest by age and brood year, while this GSI does not provide this information. Improved stock identification, whether by CWTs or GSI is a critical element in the strategy to improve stock assessment and management of Chinook salmon, as outlined in Attachment F to the 1996 U.S. Letter of Agreement (LOA), the 2018 Pacific Salmon Treaty agreement, and U.S. coastwide Chinook salmon stock assessment standards (PSC 1997). Stock identification programs provide stock specific harvests, from which total adult production, exploitation rates, harvest distribution and survival parameters are estimated. These data are being used to improve planning and implementation related to: 1) regional management by ADF&G; 2) terminal run management by ADF&G and DFO; and 3) coastwide management in the PSC process.

Chinook salmon smolt on the Stikine River have been captured using minnow traps and beach seines beginning in 2000, or brood year 1998. In the first year of this project, we captured approximately 14,700 Chinook salmon smolt and released about 14,600 with tags (Table 3). In 2001, we deployed more traps (about 200 versus 160) and hoped to capitalize on the experience and knowledge acquired during the first year of this project (e.g., location of productive trapping areas, migration timing, etc.), but only released about 5,770 smolt with tags. In 2002, we tagged and released approximately 17,400 Chinook salmon smolt. About 15,000 of these were collected with beach seines, which proved to be particularly effective during high and dynamic water conditions when minnow traps could not be deployed effectively. Since 2003 additional seining crews have been added and this method of capture has become the central focus of the project. Through time, increased effort in defining efficient seining locations and timing, and improved techniques to increase tagging rates and decrease mortality have been instituted and refined, including a floating tag shack platform first used in 2012 that reduces handling time and offers a ready source of fresh water through circulating water pumps. Overall, tagging rates have increased since 2006 (Table 3) with about 48,000 smolt tagged in 2006 and 2013 and more than 41,560 smolt tagged in more than half of other years. Despite this increasing success, water conditions have proven to be a difficult factor to mitigate as large snowpack and warmer than normal air temperatures can create a very short window of opportunity to capture outmigrating smolt before the river floods and makes seining ineffective.

Table 3.–Juvenile Chinook salmon captured and marked with coded wire tags on the Stikine River, 2000–2018.

Tag code	Brood year	Stage	Mean weight	Mean length	Year released	Date last released	Clipped and tagged	Clipped and not tagged	Total released
40357	1998	SMOLT	5.2	74	2000	6/13/2000	9,715	10	9,725
40358	1998	SMOLT	5.2	74	2000	5/30/2000	1,842	0	1,842
40359	1998	SMOLT	5.2	74	2000	6/13/2000	3,003	9	3,012
	Cumulative brood year total						14,560		
40459	1999	SMOLT	5.5	75	2001	6/1/2001	5,774	17	5,791
	Cumulative brood year total						5,774		
40533	2000	SMOLT	6.3	77	2002	6/1/2002	10,953	44	10,997
40534	2000	SMOLT	6.3	77	2002	6/13/2002	6,458	13	6,471
	Cumulative brood year total						17,411		
40802	2001	SMOLT	4.9	72	2003	5/28/2003	11,269	34	11,303
40803	2001	SMOLT	4.9	72	2003	6/9/2003	8,658	17	8,675
	Cumulative brood year total						19,927		
40804	2002	SMOLT	4.4	71	2004	5/11/2004	11,351	46	11,397
40956	2002	SMOLT	4.4	71	2004	5/21/2004	11,387	46	11,433
40957	2002	SMOLT	4.4	71	2004	5/30/2004	3,892	0	3,892
	Cumulative brood year total						26,630		
41130	2003	SMOLT	4.5	72	2005	5/11/2005	10,822	54	10,876
41131	2003	SMOLT	4.5	72	2005	6/2/2005	10,862	0	10,862
	Cumulative brood year total						21,684		
41148	2004	SMOLT	3.8	71	2006	5/31/2006	7,783	16	7,799
41149	2004	SMOLT	3.8	71	2006	5/26/2006	6,645	0	6,645
41297	2004	SMOLT	3.8	71	2006	5/8/2006	10,592	21	10,613
41298	2004	SMOLT	3.8	71	2006	5/13/2006	11,062	33	11,095
41299	2004	SMOLT	3.8	71	2006	5/17/2006	11,166	22	11,188
	Cumulative brood year total						47,248		
41132	2005	SMOLT	3.6	70	2007	5/22/2007	11,610	12	11,622
41469	2005	SMOLT	3.6	70	2007	5/28/2007	10,847	44	10,891
41470	2005	SMOLT	3.6	70	2007	5/28/2007	1,302	8	1,310
	Cumulative brood year total						23,759		

Table 3.–Page 2 of 3.

Tag code	Brood year	Stage	Mean weight	Mean length	Year released	Date last released	Clipped and tagged	Clipped and not tagged	Total released
41471	2006	SMOLT	4.1	73	2008	5/14/2008	23,042	69	23,111
41547	2006	SMOLT	4.1	73	2008	5/29/2008	9,702	0	9,702
41551	2006	SMOLT	4.1	73	2008	5/19/2008	11,268	23	11,291
	Cumulative brood year total						44,012		
41781	2007	SMOLT	4.4	74	2009	5/21/2009	11,776	0	11,776
41782	2007	SMOLT	4.4	74	2009	5/26/2009	6,821	0	6,821
41788	2007	SMOLT	4.4	74	2009	5/15/2009	23,459	0	23,459
	Cumulative brood year total						42,056		
41533	2008	SMOLT	4.3	73	2010	5/28/2010	6,706	0	6,706
41534	2008	SMOLT	4.3	73	2010	5/28/2010	5,932	0	5,932
41555	2008	SMOLT	4.3	73	2010	5/20/2010	22,386	0	22,386
	Cumulative brood year total						35,024		
41024	2009	SMOLT	5.1	81	2011	5/26/2011	21,853	22	21,875
41519	2009	SMOLT	5.1	81	2011	5/26/2011	9,232	0	9,232
41524	2009	SMOLT	5.1	81	2011	5/24/2011	1,084	0	1,084
	Cumulative brood year total						32,169		
42965	2010	SMOLT	5.9	77	2012	5/21/2012	21,402	43	21,445
42966	2010	SMOLT	5.9	77	2012	5/26/2012	10,517	74	10,591
42977	2010	SMOLT	5.9	77	2012	5/29/2012	1,511	0	1,511
	Cumulative brood year total						33,430		
43047	2011	SMOLT	4.6	74	2013	5/8/2013	11,031	0	11,031
43048	2011	SMOLT	4.6	74	2013	5/11/2013	11,278	0	11,278
43049	2011	SMOLT	4.6	74	2013	5/15/2013	11,411	0	11,411
43069	2011	SMOLT	4.6	74	2013	5/22/2013	11,226	0	11,226
43353	2011	SMOLT	4.6	74	2013	5/27/2013	3,501	0	3,501
	Cumulative brood year total						48,447		

Table 3.–Page 3 of 3.

Tag code	Brood year	Stage	Mean weight	Mean length	Year released	Date last released	Clipped and tagged	Clipped and not tagged	Total released
43564	2012	SMOLT	3.9	71	2014	5/11/2014	21,490	0	21,490
43565	2012	SMOLT	3.9	71	2014	5/15/2014	11,112	0	11,112
43583	2012	SMOLT	3.9	71	2014	5/26/2014	9,115	0	9,115
	Cumulative brood year total						41,717		
41781	2013	SMOLT	5.7	80	2015	5/23/2015	20,213	0	20,213
	Cumulative brood year total						20,213		
42251	2014	SMOLT	5	76	2016	5/8/2016	21,479	0	21,479
43974	2014	SMOLT	5	76	2016	5/22/2016	3,485	0	3,485
43975	2014	SMOLT	5	76	2016	5/13/2016	10,183	0	10,183
	Cumulative brood year total						35,147		
43978	2015	SMOLT	5.9	81	2017	5/25/2017	1,352	0	1352
44788	2015	SMOLT	5.9	81	2017	5/12/2017	8898	0	8898
44789	2015	SMOLT	5.9	81	2017	5/16/2017	11,891	0	11,891
44790	2015	SMOLT	5.9	81	2017	5/19/2017	10,479	0	10,479
44791	2015	SMOLT	5.9	81	2017	5/22/2019	10,274	0	10,274
	Cumulative brood year total						42,894		
44885	2016	SMOLT	5.4	79	2018	5/17/2018	11,216	0	11,216
44886	2016	SMOLT	5.4	79	2018	5/11/2018	10,312	0	10,312
44887	2016	SMOLT	5.4	79	2018	5/26/2018	8,162	0	8,162
	Cumulative brood year total						29,690		

The CTC of the PSC models coastwide Chinook salmon abundance through analysis of escapement, harvest, age structure, and exploitation rates derived from CWT recoveries; the Stikine River Chinook stock is included in the PSC Chinook model. Smolt tagging and adult escapement projects enable parameters such as harvest, escapement, exploitation rate, harvest rate, smolt production, and brood year production to be directly estimated. The TTC, CTC, ADF&G and DFO will use this information to improve the assessment and predictions of wild spring Chinook stocks, which are important contributors to U.S. and Canadian fisheries.

PRIMARY OBJECTIVES

1. Estimate the number of Chinook salmon smolt ≥50 mm fork length (FL) leaving the Stikine River annually such that the estimate is within 25% of the true value 95% of the time.
2. Estimate the mean length of Chinook salmon smolt ≥50 mm FL captured yearly such that the estimated mean is within 1 mm of the true mean 95% of the time.
3. Estimate the mean weight of Chinook salmon smolt to the nearest 0.1g captured yearly such that the estimated mean is within 0.1 g of the true mean 95% of the time.
4. Estimate the mean length of coho salmon smolt captured yearly such that the estimated mean

is within 1.1 mm of the true mean 95% of the time.

5. Estimate the mean weight of coho salmon smolt to the nearest 0.1g captured yearly such that the estimated mean is within 0.2 g of the true mean 95% of the time.

SECONDARY OBJECTIVES

1. Consistent with the terms and conditions of the Biological Opinion for Southeast Alaska, if during the course of a marine vessel survey injured or entangled marine mammals are observed, the following protocols will be implemented:
    a. Document with photos/video (remain at least 100 yards from the animal) and record the date, time, and location (latitude/longitude, description of bay, point, island, etc.).
    b. As soon as possible, report to Alaska Marine Mammal Stranding Network 24-hour Hotline: 877-925-7773 (877-9-AKR-PRD).
    c. If a large whale is alive and entangled, immediately call the U.S. Coast Guard at VHF Channel 16.
    d. If possible, record the species, age class, sex (for sea lions), type of gear, a description of the gear and how the animal is entangled, its relative degree of impairment, and direction of travel. Include this information in the report to the Hotline/USCG above.
    e. For dead animals, if communications allow, contact the Stranding Hotline while you are near the carcass to determine if samples or additional information can be collected.
2. Estimate the marine harvest, terminal return, marine exploitation, and marine survival of Chinook salmon for each brood year.

Estimation of the above parameters (#2) will allow us to describe total adult production, exploitation rates, and survival rates. Annual length and weight data for smolt allow us to examine the optimum smolt production for the system and provide additional information for escapement goal analysis.

METHODS

STUDY DESIGN

Chinook Salmon Smolt Abundance (Objective 1)

A mark-recapture experiment will be used to estimate the abundance of Chinook salmon smolt emigrating from the Stikine River in 2019-2021. Smolt will be tagged and marked each spring as the first of two sampling events. Returning adult Chinook salmon will be inspected inriver for marks for each of the five years following initial tagging (e.g. 2020-2026) as the second sampling event.

Sample Sizes-Smolt Abundance

Sampling targets for Chinook salmon smolt are based on historical smolt abundance estimates and the number of adults inspected for missing adipose fins in joint ADF&G and DFO gillnet operations at Kakwan Point, Canadian inriver fisheries (aboriginal, commercial, test and recreational), and at or near spawning locations in Canada (Little Tahltan River weir, Verrett River). We will inspect adults for missing adipose fins each year until five years after event 1 tagging. (ages 1.1 to 1.5; European age notation).

We have inspected an average of 3,998 (range 2,693 to 8,482) returning adults per brood year (age 1.1 to 1.5) from the 2000–2011 brood years that returned from 2003–2018 and the average smolt abundance estimate for these brood years is approximately 3,000,000 (range 1.2 to 4.4 million). Using these averages and the methods of Robson and Regier (1964), we need to tag about 41,560 Chinook smolt to meet the criteria in Primary Objective 1. We have met Primary Objective 1 in 3 of the past 5 completed brood years (2007-2011) and data from the 2009-2011 brood years suggest we may meet this objective in the future. Due to recent poor Stikine River Chinook salmon returns (Table 2) and poor marine survival from the 2003 to 2008 brood years, and failure to meet objectives when tagging over 41,560 smolt for the 2004 brood year, we will aim to tag at least 41,560 Chinook salmon smolt in the coming years, and to continue tagging beyond this minimum as long as conditions are favorable. In 2019, the TTC jointly agreed to set a target of 50,000 smolt tagged each year.

Mean Length and Weight of Chinook and Coho Salmon Smolts (Objectives 2-5)

A systematic sample of captured juvenile Chinook and coho salmon will be measured to the nearest mm FL and weighed to the nearest 0.1 g.

Sample Sizes-Mean Length and Weight

Based on data collected from the Stikine River since 2006, the standard deviation of Chinook salmon smolt lengths of Chinook salmon smolt from the Stikine River is estimated at 10 mm. According to procedures in Thompson (2002), the sample size to meet objective criteria is $[(1.96)(10)/(1)]^2$ or 385 smolt. Based on an expected catch of more than 41,560 Chinook smolt (see above), about every 100^{th} smolt captured should be measured for length to the nearest mm FL (and measured for weight to the nearest 0.1 gram). To achieve this without disrupting tagging operations and to reduce bias, a subsample of 10 from the 100 tagged smolt that are checked daily for CWT retention will be measured and weighed before release. The length weight data (often expressed as a condition factor) along with estimates of smolt production and spawner recruit data may provide another way of evaluating optimum escapement. Both of these factors when modelled against a variety of environmental factors could identify production bottle necks.

Similar to Chinook salmon, coho salmon captured in minnow traps and beach seines will be assessed yearly for mean length and weight. Based on data from 2006, where the standard deviation of smolt length was 11 mm, and to be consistent with our Chinook salmon smolt sample size, $[(1.96)(11)/(1.1)]^2$ or 385 fish will need to be sampled to have a mean length within 1.1 mm of the true value 95% of the time.

DATA COLLECTION

Observations of Injured or Entangled Marine Mammals

Documentation will follow protocols identified in Secondary Objectives 1a – 1e on page 8.

Chinook Salmon Sampling

Chinook salmon smolt will be captured with beach seines and baited minnow traps by three to four 3-person crews in the 20 km of the mainstem Stikine River upstream of the international border (56.65469, -131.84884) ending at the mouth of Choquette Creek that flows into the Stikine River opposite of the Great Glacier (56.81153, -131.78543) (Figure 1).

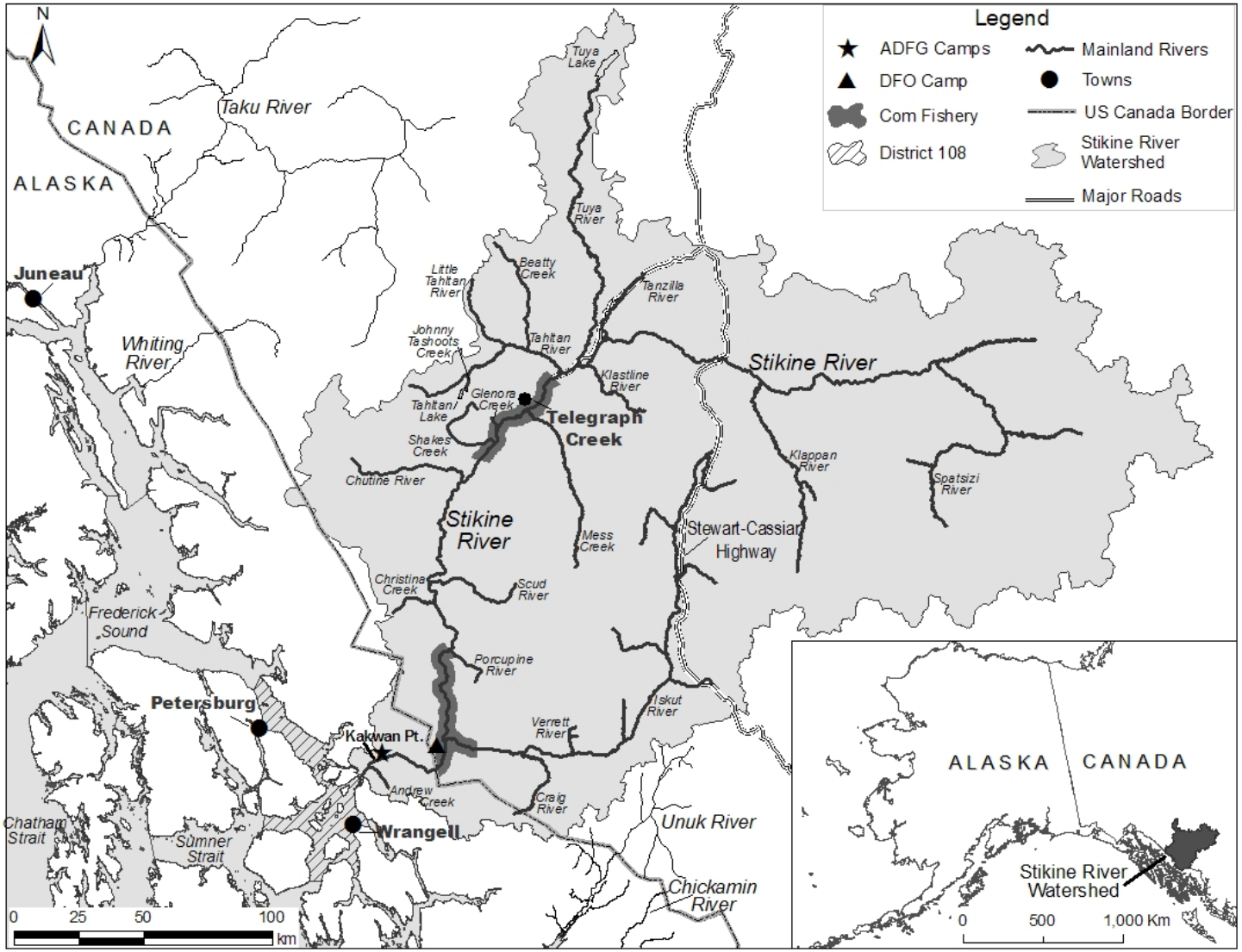

Figure 1.–Stikine River drainage in Southeast Alaska, showing detail of study area.

Approximately 200 baited minnow traps will be fished and checked daily beginning about April 20 each year. When the outmigration commences in early May, beach seining effort will be increased, and trapping willbe limited to maximize catch. Project staff will assist with CWT operations during this period to ensure timely tagging of captured smolt. Smolt will be transported from capture sites to the tagging location in skiffs using coolers filled with fresh river water and equipped with aerators. Temperature and aeration levels and smolt behavior will be monitored throughout the day. In 2019 we plan to increase the level of seining effort during peak migration by adding an additional sampling crew during the peak of the smolt run. We will also continue to increase efficiency of crew schedules, to focus on the most productive areas we found in previous years and test new areas to increase the number of smolt we are able to capture.

All healthy Chinook salmon smolt ≥50 mm FL without CWTs will be tranquilized with a buffered MS 222 solution, tagged with a CWT following procedures described in Magnus et al. (2006), and have their adipose fin removed. Chinook smolt less than 50 mm are very fragile and they will not be tagged to avoid increased mortality of released smolt. Any smolt captured that have missing adipose fins prior to tagging will be passed through a magnetic tag detector, and the presence or absence of a CWT will be recorded. A systematic sample of smolts will be measured to the nearest mm FL (and weighed to the nearest 0.1 g). All newly tagged fish will be held overnight to test for post-tagging mortality and a portion (100 from each tagging event) will be tested for tag retention; see below for details on action taken in event of mortality or tag retention problems. All smolt will be released near the DFO camp.

Codes used will be recorded on an **ADF&G TAGGING SUMMARY AND RELEASE INFORMATION** form provided by ADF&G Division of Commercial Fisheries (CF) Mark, Age, and Tag Laboratory (Tag Lab); a 5 cm section from each spool of coded wire will be taped to the form the first day of tagging with a new tag code. A new **TAGGING SUMMARY AND RELEASE INFORMATION** form will be used for each tag code. If one roll of coded wire is depleted during a session, a new **TAGGING SUMMARY AND RELEASE INFORMATION** form will be filled out, and a piece of wire from the new spool will be attached to the form. Information on this form will be used to estimate the number of smolt that survived tagging and retained CWTs. Guidelines in the CWT manual provided by the Tag Lab will be used to complete this form.

All tag and recapture data will be recorded daily on the form entitled **SPORT FISH DIVISION SALMON SMOLT CWT DAILY LOG** (**DAILY LOG** (Appendix B1)). The data on the **DAILY LOG** form will be used to record environmental, catch, tagging, release, and recapture data for each day's session. A separate **DAILY LOG** form will be filled out for each day of operation.

Daily procedures will be as follows:

1. Record location, date, and species on the **DAILY LOG** form
2. Record water and air temperature to nearest °C, water depth to nearest cm (from USGS gauge station), and precipitation to the nearest mm on the **DAILY LOG** form. Data should be collected at 0730 hours each day.
3. At 0700–0730 hours mix the fish in the holding net pen and check 100 representative smolt for tag retention and record on the **DAILY LOG** form. If tag retention is 98% or greater, empty the net, count and record mortalities, and transport smolt approximately 3 km to the release site at the U.S.\Canada border which is approximately 100 m downriver of all seining operations, and release all fish. If tag retention is 97% or less, reprocess the entire batch and retag any that test negative for CWTs. Also adjust tagging procedures, e.g., sharpen needles, adjust tag depth, or change head molds to increase the rate to 100%.

4. Check the minnow trap line and/or beach seine and transport fish to camp. Place fish in net pens designated for trap-caught or beach-seined fish. Sort Chinook salmon from other species. Inspect each live fish and count the number with adipose clips and record the number under "Recaptures" on the **DAILY LOG** form. Test all recaptures for tag retention. Retag any recaptures that test negative and record them as retags. Record results of tag retention for recaptures on the **DAILY LOG** form.

5. Give all untagged healthy Chinook salmon smolt ≥50 mm FL a CWT and pass each through the tag detector. If rejected by the detector, retag and tally all retags on a hand counter. Write the beginning and ending machine numbers on the **DAILY LOG** form and record retags, mistags (goofs, misses, etc), and practice tags. Show your calculations for the number of tags issued for each tag code for each day. Hold all fish overnight for tag retention and short-term mortality evaluation.

6. Draw a random sample from tagged Chinook salmon smolt during tag retention protocols so that the sample is at least .01 of the previous days tagging total. Measure to the nearest mm FL (and weigh to the nearest 0.1 gram), and record all data on the **SMOLT AWL DATA** form (Appendix B2). Also record the capture method, i.e., trap or seine.

7. Fill out the **CWT SUMMARY DATA** (Appendix B3; valid releases only) form daily. The project biologist will submit the **TAGGING SUMMARY AND RELEASE INFORMATION** forms to the Tag Lab via the Online Release Entry program postseason.

Returning adults will be inspected for clipped adipose fins denoting a CWT in the 5 years following any smolt tagging event. Data for documenting the fraction of the escapement bearing valid CWTs and adipose fin clips will be recorded on a **HATCHERY RACK AND ESCAPEMENT SURVEY** form (provided by the Tag Lab) each day adult sampling occurs at Kakwan Point or Andrew Creek. Sampling data collected from the Canadian inriver fisheries or spawning grounds will be recorded by DFO on forms provided by their tag lab. Heads will be taken from all adult Chinook salmon missing adipose fins, and a uniquely numbered cinch strap will be attached to each head. Capture site, date, gear, sex, length (MEF), and head number (off the cinch strap) will be recorded by field crews on field data forms and Rite-n-Rain™[21] labels. Each cinch tagged and clearly labeled head will be shipped to ADF&G in Douglas or DFO in Whitehorse depending on the sampling site (i.e., a site in the U.S. or Canada). If shipment is delayed and refrigeration is unavailable, heads will be preserved with salt or borax. Depending on sampling location, project leaders will complete either the **HATCHERY RACK AND ESCAPEMENT SURVEY** form (as provided by the Tag Lab) or the corresponding DFO form and include them with head shipments to each agency's respective tag lab.

A scale sample will also be taken from every adult Chinook salmon observed during sampling that is missing the adipose fin to verify brood year. Scales will also be sampled from every Chinook salmon caught at Kakwan point and from a representative sample of inspected fish from the escapement surveys and lower river commercial fishery. Scales will be taken from the left side of the fish from the preferred area (2 rows up from the lateral line at the bottom of a diagonal from the posterior end of the insertion of the dorsal fin) according to the procedures in Welander (1940). Five scales will be taken from each fish and mounted on gum cards for later impression into acetate.

[21] This and subsequent product names are included for a complete description of the process and do not constitute product endorsement.

DATA REDUCTION

The field crew leader will record and error check all data. Data forms (primary data capture) will be kept up to date at all times. Data will be sent to the office at least three times per week and inspected for accuracy and compliance with sampling procedures. Data will be transferred from field books or forms to EXCEL™ spreadsheet files (secondary data capture). When input is complete, data lists will be obtained and checked against the original field data.

Electronic data files will be used to check tagging totals with field notebooks, to identify lengths less than prescribed guidelines, sampling rates for age, length, and weight, and for data on the **TAGGING SUMMARY AND RELEASE INFORMATION and HATCHERY RACK AND ESCAPEMENT SURVEY** forms.

When the report is complete, copies of selected data and a data map will be sent to the Research and Technical Services (RTS) section for archiving. Completed **TAGGING SUMMARY AND RELEASE INFORMATION and HATCHERY RACK AND ESCAPEMENT SURVEY** forms will be sent to the Mark, Tag, and Age Lab, which is the permanent repository for all CWT data for ADF&G. The Mark, Tag, and Age Lab will submit the Alaskan CWT data to the Pacific States Marine Fisheries Commission, which stores coastwide CWT data in a permanent and standardized database (https://www.rmpc.org/).

Catches of smolt and adult Chinook salmon, numbers tagged, and fish missing adipose fins will be tabulated by day. Scale ages will be used to verify brood year. CWT codes from recovered adult Chinook salmon will be used to verify stock origin.

DATA ANALYSIS

Smolt Abundance

The mark-recapture experiment will use Chapman's modification of the Petersen method (Seber 1982) to estimate abundance of smolt and its variance for each year, 2019-2021. Smolt will be tagged and marked each spring as the first of two sampling events. Returning Chinook salmon will be inspected for marks in the 5 years following (2019 tagging: 2020-2025; 2020 tagging: 2021-2026; 2021 tagging; 2022-2027) as the second sampling event to determine the marked fraction. The relationships among brood, tagging and adult return years are shown in Table 4, where n_i is the estimated number of adults sampled from the river that are from brood year y and of ocean age i, $m_{,i}$ is the number of adults in that sample with missing adipose fins, t is the number of smolt tagged from brood year y, and $n.$ and $m.$ are the total numbers of adults and marked adults found in the sample from brood year y, respectively. Smolt abundance from brood year y will be estimated using a 2-event, mark-recapture experiment with Petersen's estimator as modified by Chapman (1951):

$$\hat{N}_s = \frac{(t+1)(n.+1)}{m.+1} - 1 \qquad (1)$$

Table 4.–Components of equation 1 for brood year y Chinook salmon on the Stikine River, Southeast Alaska.

	Brood year	Tagging year	Age class and sampling year					
			1.1	1.2	1.3	1.4	1.5	Total
	y	*y+2*	*y+3*	*y+4*	*y+5*	*y+6*	*y+7*	
Smolt tagged		*t*						
Estimated adults inspected[a] n_i			n_1	n_2	n_3	n_4	n_5	$n.$
Marked adults m_i			m_1	m_2	m_3	m_4	m_5	$m.$

[a] Not all adults sampled for adipose fin clips and CWTs are sampled for age. Entries are calculated as the product of lower river harvest, spawning ground sample, or the tagging event of the mark-recapture project and appropriate age proportions.

Adults inspected will come from 3 sources (*see* Richards et al. 2012): 1) adults caught in the tagging event of the annual Stikine River mark-recapture project; 2) adults caught and sampled from the Canadian inriver fisheries; and 3) adults captured and sampled on spawning grounds during the recovery event of the annual mark-recapture project.

As a result of sampling variability in estimates of the number of each age class inspected (n_i), the variance of $\hat{N}_s$ will be estimated through Monte Carlo simulation. The number of fish examined by brood year will be simulated with a normal distribution $N(n., \mathrm{var}(n.))$, and the number of clips found will be simulated with a binomial distribution $(n., m./n.))$. Equation 1 will be used to generate simulated values of $\hat{N}_s$ and a sample variance taken of the generated values. The quantity $\mathrm{var}(n.)$ will be calculated by summing annual estimated variances of estimated inspected fish for the respective recovery years. (Annual estimates originate from independent sampling events).

The conditions for accurate use of the Petersen methodology are:

1. all smolt have an equal probability of being marked; or
2. all adults have an equal probability of being inspected for marks in the five years following smolt tagging; or all of the following will be true:
3. marked fish mixed completely with unmarked fish in the population between years; and
4. there is no recruitment to the population between years; and
5. there is no trap induced behavior; and
6. fish do not lose their marks and all marks are recognizable.

Condition 1: Minnow traps will be continuously deployed, and beach seines will be fished with consistent effort during the project. Minnow traps are thought to be biased toward large smolt, however they also constitute less than 5% of our yearly catch whereas beach seines which are not considered size-selective make up the remainder and vast majority of the captures. High water events, and to a lesser degree, missing the very beginning of the outmigration of smolt may preclude all smolt having an equal probability of capture however it is believed this will not lead to large biases.

Condition 2: Adult immigrations will be sampled consistently in gillnet catches during tagging operations. This relatively constant sampling effort will tend to equalize the probabilities of capture for all fish passing the international border. However, gillnets are size selective, and capture a higher proportion of larger individuals. Some but not all spawning grounds are sampled as well and fish that spawn on sampled grounds have a higher probability of capture. Still, if either condition 1 or those associated with condition 3 are met, or if the bias from gillnet size, or spawning ground inspections are small, the necessary conditions will be met.

Condition 3: If migratory timing of smolts are unrelated to that of adults, it is likely that significant mixing of marked and unmarked smolt will have occurred in the population prior to their return as adults. When sufficient adult CWT Chinook salmon are encountered, we will assess the degree of mixing by comparing the order in which tag codes are applied to smolts with the order of codes we find in returning adults. We will also test for temporal changes in the fraction of adults missing adipose fins: if either condition 1 or condition 3 has been met, this fraction will not change with time. It is noted that changing marked fractions in adults over time can be consistent with condition 2; condition 2 states that a random sample of adults is taken and makes no assumption about changing marked fractions over time in the population. Temporal changes in the marked fractions will be tested against a χ^2 distribution.

Condition 4: Almost all surviving smolts return to their natal stream as adults to spawn, so there will be no meaningful recruitment added to the population of "smolts" while they are at sea.

Condition 5: Results from other studies (Elliott and Sterritt 1990; Vincent-Lang 1993) indicate that excising adipose fins and implanting CWTs will not increase the mortality of marked salmon, provided that care is taken in handling them until release back into the river. Tagging practices will be monitored frequently through the overnight mortality and tag loss assessments.

Condition 6: Adipose fins will be removed from all CWT-tagged smolt, clips will be double checked prior to tagging as a means of quality control, and recovery personnel will carefully examine returning adults for missing adipose fins.

The mark-recapture experiment to estimate the abundance of Chinook salmon smolts is complicated by adults returning not in 1 year, but over five. For example, Chinook salmon marked in 2019 will return from 2020 through 2024. Each year there will be an opportunity to estimate the fraction of the population that had been marked in year *y*. In year *y+1*, only fish age 1.1 (estimated from scale analysis) will be used to estimate smolt abundance in year *y*. In year *y+2*, estimated abundance of smolt will be updated with data collected from fish aged 1.2. If θ is the fraction of the population originally marked, the null hypothesis $H_o: \theta_{1.1} = \theta_{1.2}$ will be tested against a χ^2 distribution with 1 degree of freedom (df). If the hypothesis is not rejected, data from years *y+1* and *y+2* will be pooled and used to estimate abundance of smolt in year *y*. This procedure will continue through year *y+5* for those Chinook salmon marked in year *y* as data and df accumulate. If H_o is rejected during any one of these years, the data will still be pooled if we believe the adult sampling has accessed the run in a consistent and representative manner among the sampling years. If we cannot assume representative sampling in the adult sampling phase, the estimated θ will be averaged over the years (instead of pooling all data) and its variance estimated accordingly as suggested in Seber (1982:114–115).

Mean Length and Weight

Estimates of mean length and weight of Chinook and Coho salmon smolts and the variance will be calculated with standard sample summary statistics (Thompson 2002), unless there is a trend in the data for a particular year (lengths or weights of smolt either increase or decrease through time). In that case, variance will be approximated according to the procedures in Wolter (1985):

$$v\left(\sum_{i=1}^{n} l_i / n\right) = \frac{\sum_{i=2}^{n} (l_i - l_{i-1})^2}{2n(n-1)} \quad (2)$$

Marine Harvest, Terminal Return, Marine Exploitation, and Marine Survival

Marine Harvest

Chinook salmon from the Stikine River are almost all (95% to 100%) from a single freshwater age, overwintering 1 year as fry and emigrating as age-1 (total age 2) smolt (Richards et al. 2012). Therefore, any smolt tagged are essentially from a single brood year (e.g. Chinook salmon smolt tagged in 2019 are from the 2017 brood year). The return of adult Chinook salmon from the 2017 brood year encompasses 5 years, beginning with age-1.1 "jacks" in 2020 and ending with age-1.5 fish in 2024. Similarly, smolt from brood years 2018 and 2019 will be tagged in 2020 and 2021 and adult age-1.5 fish from these brood years will return in 2025 and 2026.

Recovery of CWT-tagged Chinook salmon in fisheries through 2026 will be used to estimate the total marine harvest for the 2017-2019 brood years per the methods of Bernard et al. (1998). Brood year 2011 is the most recent complete brood year. The 95% CI for the estimate of total marine harvest is within 40% of the estimate.

Marine harvest of Chinook salmon from the Stikine River will be estimated by calendar year for each brood year class through a stratified catch sampling program of commercial and recreational fisheries using the methods described in Bernard and Clark (1996) as applied in Richards et al. (2008). Commercial catch data will be summarized by ADF&G by statistical week and district for gillnet fisheries, by seine period and seine area for seine fisheries, and by troll period and quadrant for troll fisheries. Sport fish CWT recovery data will be summarized by biweek (fortnight) and fishery (e.g., biweek 16 during the Sitka Marine Creel Survey). Harvest estimates for commercial fisheries will be obtained from the OceanAK Database. Sport harvest estimates from ADF&G Statewide Harvest Survey reports (e.g., Jennings et al. 2011) will be apportioned using information from sampled marine sport fisheries to obtain estimates of total harvest by biweek and fishery. Sport fish CWT recovery data will be obtained from the Mark, Tag, and Age Lab online reports and summarized by biweek, port, and harvest type (e.g., biweek 16, Sitka, marine sport). In most cases, CWTs of interest may be recovered in only a few of the sport fish sampling strata that defined the fishery biweek. Assuming that the harvests of fish with CWTs of interest are independent of sampling strata within fishery biweeks, harvests and sampling information will be totaled over the fishery biweek to estimate contributions.

Terminal Return, Marine Exploitation, and Marine Survival

Inriver return, marine exploitation, and marine survival will be estimated using the methods described in Richards et al. (2008). Preliminary marine harvest estimates for brood years 1998-2011 are in Appendix A1. Inriver return for brood year *t* will be estimated by adding escapement and inriver harvest data collected in years *t+3, t+4, …, t+7* (e.g. escapement and inriver harvest data from 2021 through 2025 will be used to compute the inriver return for brood year 2018). Total return will be estimated by adding inriver return and marine harvest. The estimate of total return assumes that all fish harvested in the marine fishery are mature, which is thought to be a reasonable assumption for Stikine origin Chinook salmon (Bernard et al. 2000). Marine exploitation is the fraction of the total return harvested in marine fisheries. Marine exploitation will be estimated by dividing the estimate of marine harvest by the estimate of total return. Marine survival is the fraction of smolt that survived and were either harvested by marine fisheries or made it back to the river. Marine survival will be estimated by dividing the estimate of total return by the estimate of smolt abundance.

BUDGET

Details of the ADF&G budget are contained in the state FY19 DJ proposal *Stikine River Chinook Salmon Stock Assessment* and the FY20/FY21 Pacific Salmon Treaty Letter of Agreement (LOA) proposal *Stikine River Chinook Salmon Stock Assessment.*

SCHEDULE AND DELIVERABLES

Field activities for smolt tagging will begin inriver approximately 20 April and extend through early June yearly. Field activities for recovering Chinook salmon with missing adipose fins will begin approximately early May and extend through August annually, for the five years following each smolt tagging event. Data editing and analysis will be initiated before the end of each season. Data will be sent to RTS for archiving by September each year.

REPORTS

A draft ADF&G, Division of Sport Fish Fishery Data Series (FDS) report summarizing smolt abundance and adult harvest will be prepared by 1 June, 6 years after completion of each smolt tagging event (i.e., 2019 results will be captured in a draft report in 2025; 2020 results will be reported in 2026; and 2021 results will be reported in 2027), The same reports will also be submitted under separate cover to the PSC and NOAA.

RESPONSIBILITIES

I. U.S. Personnel Responsibilities

Kristin Neuneker, FB II. In concert with Aaron Foos sets up all aspects of project, including planning, budget, sample design, permits, equipment, personnel, and training. Will hire seasonal technicians and supervise entire ADF&G crew**.**

Philip Richards, FB III. Assists in project planning, budget, sample design, permits, equipment, personnel, and training. Assists in supervising field operations. Coalesces, edits, analyzes, and reports data; assists with fieldwork.

Ed Jones, Salmon Research Coordinator. Responsible for general oversight of project. Assists in planning project and writing operational plan.

Randy Peterson, Biometrician II. Provides input to and approves sampling design. Coauthors operational plan and provides biometric support. Completes data analysis, writes programming code, and coauthors the final report.

Stephen Todd, FB I. Responsible for logistics, resupply and general instruction to crew during camp set up and break down. Position will assist with fishing crews when sampling intensity requires. Will lead in equipment maintenance and resupply and logistics.

Kiana Putman, FWT III. Will work as crew lead and assist in all aspects of field operations, including delegating crew tasks and schedules, safe operation of riverboats, trapping, beach seining, tagging, data collection, and general field camp duties.

Graham Gablehouse, FWT II. Will assist in equipment maintenance and all aspects of field operations, including safe operation of riverboats, trapping, beach seining, tagging, data collection, and general field camp duties.

Vacant, FWT II. Will work in all aspects of all aspects of field operations, including safe operation

of riverboats, trapping, beach seining, tagging, data collection, and general field camp duties.

II. Canadian Personnel Responsibilities

Aaron Foos. Sr. Aquatic Science Biologist. In concert with Neuneker, is responsible for all Canadian aspects of the program including oversight and supervision of field programs, sample and data management, and report preparation. Will provide Canadian recovery data to ADF&G. Will review data, provide input into report, write sections regarding recovery, and serve as coauthor.

Johnny Sembsmoen, Sr. Aquatic Science Technician. In concert with Kristin Neuneker and Stephen Todd, sets up and assists with all Canadian aspects of project, including logistics, equipment, facilities, and personnel. Will assist in supervising the entire DFO crew**.**

Cheri Frocklage, Tahltan Fisheries Manager. In concert with Aaron Foos and Johnny Sembsmoen, coordinates all aspects of Tahltan Fisheries involvement in the project,. Will assist in supervising TFN members of crew.

Melvin Besharah, Fishery Technician. Will assist in all aspects of field operations, including safe operation of riverboats, trapping, beach seining, tagging, data collection, and general field camp duties.

Mathieu Ducharme, Fishery Technician. Will assist in all aspects of field operations, including safe operation of riverboats, trapping, beach seining, tagging, data collection, and general field camp duties.

Various DFO and TFN Fishery Technicians. Will assist in all aspects of field operations, including safe operation of riverboats, trapping, beach seining, tagging, data collection, and general field camp duties.

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APPENDIX A: STIKINE RIVER MARINE HARVEST ESTIMATE TIMESERIES

Appendix A1.–Marine harvest estimates and coefficient of variation (CV) for brood years 1998 through 2011 Stikine River Southeast Alaska.

Brood Year	Marine Harvest	CV
1998	15,721	34.2%
1999	26,061	33.8%
2000	43,274	10.9%
2001	12,944	25.3%
2002	14,874	11.3%
2003	7,746[a]	19.9%[a]
2004	3,877[a]	22.7%[a]
2005	5,842[a]	24.8%[a]
2006	6,839[a]	20.9%[a]
2007	6,531[a]	14.7%[a]
2008	3,712[a]	25.8%[a]
2009	3,952[a]	31.5%[a]
2010	2,328[a]	55.3%[a]
2011	1,219[a]	23.0%[a]

[a] Preliminary Data

APPENDIX B: PROJECT DATA FORMS

Appendix B1.–Coded wire tag daily log.

SPORT FISH DIVISION SALMON CWT DAILY LOG

TAGGING SITE: _____ DATE: _____ PAGE: _____

SPECIES: _____ Fall Juvenile or Spring Smolt (circle one)

AIR TEMP: Minimum _____ (°C); Maximum _____ (°C)

WATER: Temperature _____; Depth _____ (ft/cm/m)

PRECIPITATION: _____ (in/mm)

MACHINE S/N: _____ HEAD MOLD SIZE: _____

YESTERDAY'S TAGGING

1. TAG RETENTION AND SHORT-TERM MORTALITY EVALUATION

a. Number held 24 hrs
_____ (Yesterday's line 7 entry)

b. Tag Retention
(Number of positive beeps/100)
_____ (Test 100 fish)

c. Mortalities
_____ (Overnight mortality)

d. Released Live Today (1a – 1c) x 1b
_____ (Release)

Appendix B1.–Page 2 of 2.

TODAY'S TAGGING

2. TODAY'S TAG CODE

_____

3. RECAPTURES

_____ (Ad-clipped fish in traps)

a. Total with CWTs
_____ (Release)

b. Number without CWTs
_____ (Tag and Release)

4. NEW CWTs APPLIED:	Trap	Seine
a. Ending Number (Machine Counter)	_____	_____
b. Beginning Number (Machine Counter)	_____	_____
c. Retags (Hand Counter)	_____	_____
d. Subtotal (a – b – c) (Total CWTs Applied)	_____	_____
5. POST TAGGING MORTALITY: (Croakers)	_____	_____
6. NUMBER TAGGED (4d – 5)	_____	_____

7. NUMBER HELD FOR TAG RETENTION AND SHORT-TERM MORTALITY

(sum line 6) _____(Carry over to next day)

Notes:

Appendix B2.–Smolt age-weight-length data sheet.

SMOLT AWL DATA

Tagging Site: _____ ***Species:*** _____ ***Year:*** _____ ***Page:*** _____

Date	Fish #	Trap or seine	Length, mm FL	Weight, g	Date	Fish #	Trap or seine	Length, mm FL	Weight, g

Appendix B3.–Coded wire tag daily release log

CWT SUMMARY DATA

Site: ____________________ ***Year:*** ______________ ***Page:*** ___________

Date	Chinook Released w/CWT		Coho Released w/CWT	
	Daily	Cum	Daily	Cum

APPENDIX C: STIKINE RIVER COVID ACTION PLAN

ADF&G Covid-19 Response-Stikine Field Action Plan

This Plan assumes that all crew members are negative when they depart for camp and assumes that if a crew member begins to show symptoms once out in field camp, that the other members of the crew have a high level of exposure and are likely infected. There are up to 11 crew members working on this project, five of which reside in Wrangell, five are from elsewhere in Alaska, and one is from out of state. All state and local travel and Covid-19 guidelines will be followed by staff.

Project Title

Stikine River Stock Assessment

Season Start and End Dates

- April 1 to August 15

Administration

Crew members returning from SLWOP will be provided locations where they can complete paperwork while maintaining 6-foot distancing. Every effort should be made to minimize the number of technicians in the workspace at any one time.

One Crew member returning from SLWOP will start April 1st, one crew member will start April 6th, 3 crew members will start April 13th; one crew member will start on April 21st and 3 crew members will start on May 1st.

Nobody will be expected or pressured to participate on these projects. If staff are uncomfortable and would like to withdraw from a project, please let the project leader know as soon as you can so that new plans can be made. These actions will have no bearing on the status the employee's PCN, and their position will be secured until next year.

Project leaders will contact community leaders and/or visit the local community website to determine any community health mandates/requirements prior to entry into the local community or start of a project to communicate the department's intent and how to best address concerns.

Training

Fish capture, handling and tagging trainings for new staff that must be conducted will be done groups of 3 or less while maintaining 6-foot distancing. Standard group trainings such as Firearms, Wildlife Safety, Spot Sexual Harassment and First Aid/CPR will be postponed for this field season, unless individualized online versions are available (e.g., Spot training). Employees that passed the Firearms training since 2019 must be the crew member handling firearms. If possible, staff are encouraged to practice shooting at least once during the early portion of the field season.

Prior to Departure

All staff will be screened for fever prior to returning to work and departure for field camp and no staff who are symptomatic will be allowed to return to work or into the field. Fever screening should be conducted by the Project Leader, Crew Leader or other local available department personnel in the absence of the Project Leader and Crew Leader.

Testing of all staff prior to departure, if feasible/available. For any crew members traveling into Canada for work related activities, as part of the Canada Border Services Agency (CBSA) clearance protocols, a negative polymerase chain reaction (PCR) covid test must be taken within 72 hours of entry and provided to CBSA along with other necessary travel documents.

The DOA has indicated that the SOA is not requiring employees to receive the COVID-19 vaccine. CDC Guidelines for staff who have been fully vaccinated can be found at When You've Been Fully Vaccinated | CDC; Appendix A. A standard set of COVID-19 questions will be asked prior to departure to the field to assess risk and the following guidelines will be followed general or high risk to the community or field crew.

COVID-19 Risk Questionnaire/Questions

- Within the last 14 days have you traveled outside of the state of Alaska or your home community? If YES, see quarantine guidelines.
- Do you have any Covid-related symptoms (wet or dry cough, shortness of breath or difficulty breathing, fever, chills, muscle aches, headache, loss of smell or taste, sore throat, fatigue, etc.)? If YES, see quarantine guidelines.
- Have you been in contact or have been exposed to anyone who has tested positive for COVID-19? If YES, see quarantine guidelines as well as Health Advisory No. 1 Recommendations for Keeping Alaskans Safe. If NO, see SOA guidelines Health Advisory No. 1 regarding practicing good hygiene, social distancing, wearing a mask, monitoring your health, and testing.
- Do you live or take care of someone who have tested positive for COVID-19? If YES, see quarantine guidelines as well as Health Advisory No. 1 Recommendations for Keeping Alaskans Safe.
- Have you been in "close contact" with a person who has tested positive for COVID-19 for more than 10 minutes? Close contact is someone who was within 6 feet of an infectious person for a *cumulative total* of 15 minutes or more over 24 hours while the person was infectious. This definition applies regardless of whether the infected person or close contacts were wearing masks. If YES, see quarantine guidelines as well as Health Advisory No. 1 Recommendations for Keeping Alaskans Safe.
- Were you in the same indoor environment as a confirmed case for a prolonged period but not within 6 feet of the confirmed case? If YES, see Health Advisory No. 1 Recommendations for Keeping Alaskans Safe regarding practicing good hygiene, social distancing, wearing a mask, monitoring your health, and testing.
- Have you had a negative Covid test within the last 72 hours, if not, could you get tested prior to departing for the field and provide the results to your supervisor?

Information and guidelines on when and how to quarantine is available on the CDC and DHSS webpages:

02.14.21-Health-Advisory-1-Recommendations.pdf (alaska.gov); Appendix C 1-B
COVID-19: Quarantine guidance (alaska.gov); Appendix C 1-C
COVID-19: When to Quarantine | CDC; Appendix C 1-D

Transportation to Field

Field crew members that do not reside in Wrangell (six total) will fly Alaska Airlines to Wrangell and proceed to the Stikine River as quickly as possible and with limited interaction with the Wrangell community and follow all state and local guidelines during travel. Field crew members that reside in Wrangell (five total) will leave from the Wrangell harbor to the Stikine River in individual SOA jet skiffs. Staff start times are staggered and five will jet boat to camp on April 16th, one crew member will be transported by charter jet boat on April 21st and the remaining three crew will come in on SOA skiffs May 1st. Jet boat operators will wear gloves and sanitize surfaces when finished with travel. Staff will clean cloth masks regularly and will be expected to wear them during transportation to and from field and camp and when working with others.

Field crew members will wear masks and disposable gloves when being transported by charter vessels and/or planes. Masks will be assigned to each crew member (at least 2 per person) to be kept for the duration of the project. Staff will clean cloth masks regularly and will be expected to wear them during transportation to and from field and camp and when working with others.

Once in the field, ideally crews will stay in the field and will not return to town until the project is over.

Project leaders will contact community leaders and/or visit the local community website to determine any community health mandates/requirements prior to entry into the local community or start of a project to communicate our intent and how we may address their concerns.

Supply contingencies

There are up to 11 personnel working on this project.

Camps will maintain food supplies adequate for three weeks of normal operation; a weeks' worth of backup supplies will be stored Wrangell.

At least 2 cloth masks per person, one set of safety goggles per person, along with 500+ latex gloves and various cleaning agents will be in camp.

The camp will email grocery lists to City Market weekly, and City Market will deliver groceries to the expeditor in town. Field camp crews will wear latex gloves while offloading the supplies that are stored on the outside deck of the boat; the expeditor will remain in the cabin of the vessel.

Supplies, materials, and personal mail arriving from town once field camps are established shall be quarantined for 72 hours or sanitized prior to use and handling.

Work and Living Protocols

Crew members will maintain 6-foot distancing as much as possible when actual work needs do not require working closer than 6 feet.

Crew members will always practice the Covid-19 protocol with frequent hand washing, sanitization of common areas and equipment, and through wearing of gloves and masks.

Crews will be limited 2-3 people in boats and 3-4 people in the tag shack while working.

In response to Covid-19, crews from DFO Canada are not participating in this project through at least June; however, ADF&G crews have performed this work historically and impacts to the project objectives will be minimal.

If crew members become ill, they will not report to work and they will immediately notify their supervisor. See section "Possible cases of Covid-19 occur in camp."

Crew members will take their temperatures each morning and evening.

Crew members will sleep in individual tents or rooms.

Communication

Crew leader will maintain a list of emergency contacts in town. Kristin Courtney (available in Juneau after 6/1), Juneau, work: (907) 465-4271, cell: (907) 518-0853; Phil Richards, Juneau, work: (907) 465-8114, cell: (907) 723-6141; Ed Jones, Juneau, work: (907) 465-4417, cell: (907) 209-8661; Patrick Fowler, Petersburg, work: 772-5231, cell: (907) 738-2864.

Crew leader and project leader will maintain a list of emergency contacts for all crew members. This list will be on file with the Project leader and in personnel files at the home office.

Graham Gablehouse: David Mork (stepfather) (907) 874-3269

Chris Kamal: Dorothy Kamal (mother) (404) 966-9817

Brendan Jackson: Robert Jackson (father) (608) 606-6058

Kyle Martini: Amy Martini (mother) (513) 659-4259

Stephen Todd: Amber Al-Haddad (spouse) (907) 874-4644

Kristin Courtney: Michael Courtney (spouse) (907) 854-3091

Kiana Putman: Ginger Baim (mother) (907) 414-7077

Michelle Dutro: Siri Dutro (mother) (425) 830-5638

Anna Tollfeldt: Tony Belback (partner) (907) 617-1931

Paul Lecheung: Jeanna Singleton (mother) (912) 856-8966

Lindsey Lorgen-Jones: Marie Lorgen (mother) (425) 232-5053

The project leader will check in daily with Phil Richards, and Kristin Courtney after June 1. The project leader will email crew and project status weekly to ADF&G and DFO offices.

Satellite phones, Satellite Texting devices, and radios will be sanitized between each use.

Transportation Plan Contingency

Crews will stay in camp for duration of project when possible instead of crew swapping.

If crews need to be evacuated, transportation options are: Travel to Wrangell via fixed-wing (Sunrise Aviation, 874-2319), travel by jet boat to Wrangell (Breakaway Adventures, 874-2488) or through use of existing boats on the river, followed by Juneau via helicopter (Coastal Helicopters, 789-5600), followed by fixed-wing to Juneau (Ward Air, 789-9150). If emergency extraction from Canada is required, crew members will take those in need of extraction to the U.S. side of the border for removal by aircraft.

If indications of COVID-19 become evident while in the field, the afflicted will be secluded as best as possible, and plans described below will be followed.

Possible cases of Covid-19 occur in camp

If a crew member becomes symptomatic (fever over 100.3, dry cough, headache), the crew member will immediately be isolated and evacuated to town seeking medical advice and testing. The remaining crew will continue their daily activities.

Prior to evacuation, the patient (if able) or crew leader will keep a daily health log where body temperature and symptoms will be recorded to identify recovery or severity and if necessary, relay accurate information to health professionals.

During extraction, all crew will wear cloth masks and try when possible to maintain 6-foot distancing (at least in boats).

All equipment used will be disposed or sanitized or quarantined before next use.

If extraction is necessary due to suspected Covid-19 illness, at the Director's discretion the project will be shut down for the year, and the remaining crew will decommission the camp as much as practical prior to evacuation.

APPENDIX C 1-A

Centers for Disease Control and Prevention

When You've Been Fully Vaccinated

How to Protect Yourself and Others

Updated Mar. 23, 2021 Print

COVID-19 vaccines are effective at protecting you from getting sick. Based on what we know about COVID-19 vaccines, people who have been fully vaccinated can start to do some things that they had stopped doing because of the pandemic.

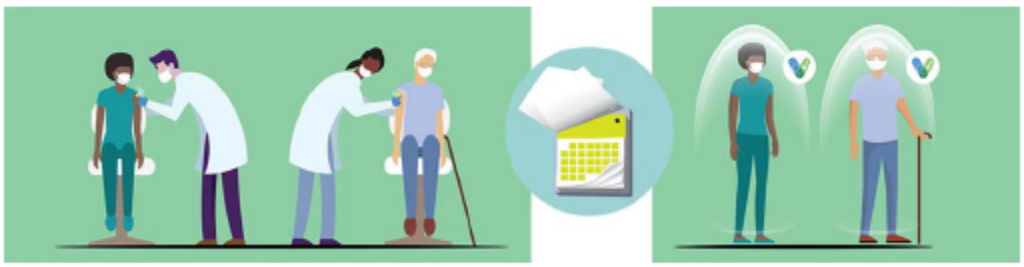
We're still learning how vaccines will affect the spread of COVID-19. After you've been fully vaccinated against COVID-19, you should keep taking precautions in public places like wearing a mask, staying 6 feet apart from others, and avoiding crowds and poorly ventilated spaces until we know more.

Have You Been Fully Vaccinated?

People are considered fully vaccinated:

- 2 weeks after their second dose in a 2-dose series, such as the Pfizer or Moderna vaccines, or
- 2 weeks after a single-dose vaccine, such as Johnson & Johnson's Janssen vaccine

If it has been less than 2 weeks since your 1-dose shot, or if you still need to get your second dose of a 2-dose vaccine, you are NOT fully protected. Keep taking all prevention steps until you are fully vaccinated.



What's Changed

If you've been fully vaccinated:

- You can gather indoors with fully vaccinated people without wearing a mask.
- You can gather indoors with unvaccinated people from one other household (for example, visiting with relatives who all live together) without masks, unless any of those people or anyone they live with has an increased risk for severe illness from COVID-19.

- If you've been around someone who has COVID-19, you do not need to stay away from others or get tested unless you have symptoms.
  - However, if you live in a group setting (like a correctional or detention facility or group home) and are around someone who has COVID-19, you should still stay away from others for 14 days and get tested, even if you don't have symptoms.

What Hasn't Changed

For now, if you've been fully vaccinated:

- You should still take steps to protect yourself and others in many situations, like wearing a mask, staying at least 6 feet apart from others, and avoiding crowds and poorly ventilated spaces. Take these precautions whenever you are:
  - In public
  - Gathering with unvaccinated people from more than one other household
  - Visiting with an unvaccinated person who is at increased risk of severe illness or death from COVID-19 or who lives with a person at increased risk
- You should still avoid medium or large-sized gatherings.
- You should still delay domestic and international travel. If you do travel, you'll still need to follow CDC requirements and recommendations.
- You should still watch out for symptoms of COVID-19, especially if you've been around someone who is sick. If you have symptoms of COVID-19, you should get tested and stay home and away from others.
- You will still need to follow guidance at your workplace.

What We Know and What We're Still Learning

- **We know** that COVID-19 vaccines are effective at preventing COVID-19 disease, especially severe illness and death.
  - **We're still learning** how effective the vaccines are against variants of the virus that causes COVID-19. Early data show the vaccines may work against some variants but could be less effective against others.
- **We know** that other prevention steps help stop the spread of COVID-19, and that these steps are still important, even as vaccines are being distributed.
  - **We're still learning** how well COVID-19 vaccines keep people from spreading the disease.
  - Early data show that the vaccines may help keep people from spreading COVID-19, but we are learning more as more people get vaccinated.
- We're still learning **how long** COVID-19 vaccines can protect people.
- As we know more, CDC will continue to update our recommendations for both vaccinated and unvaccinated people.

Until we know more about those questions, everyone — even people who've had their vaccines — should continue taking basic prevention steps when recommended.

Want to learn more about these recommendations? Read our expanded Interim Public Health Recommendations for Fully Vaccinated People, and corresponding Science Brief, and recommendations for healthcare providers.

Last Updated Mar. 23, 2021
Content source: National Center for Immunization and Respiratory Diseases (NCIRD), Division of Viral Diseases

APPENDIX C 1-B

COVID-19 Response and Recovery
Health Advisory No. 1
Recommendations for Keeping Alaskans Safe

Issued: **February 14, 2021**

By: Commissioner Adam Crum, Alaska Department of Health and Social Services
Dr. Anne Zink, Chief Medical Officer, State of Alaska

COVID-19 poses a risk to all Alaskans. Containing the virus that causes COVID-19 cannot be done through community measures alone; Alaskans must take individual responsibility to protect themselves, their loved ones, and their community.The primary ways to do this are:

- Wearing a cloth face covering/mask when in public settings and when you are around people outside your household.
- Practicing social distancing by avoiding close contact and minimizing time spent indoors with persons outside your household.
- Monitoring your health and staying at home when sick.
- Practicing good hygiene by frequently washing your hands and disinfecting high-touch surfaces in your home andworkplace.

When we reduce the spread of the virus by taking these individual measures, we reduce the need for government intervention.

Wear a cloth face covering/mask

Wearing a cloth face covering is strongly recommended for all Alaskans two years of age and older, other than those with breathing problems and those who cannot remove the covering without assistance. **Face coverings protect those aroundyou, and also offer you some protection.**

- Make sure the face covering is made with at least two layers of fabric and covers both the nose and mouth.
- When removing the face covering, avoid touching the front of the face covering
- *Wash your hands immediately* after removing the face covering and before touching anything else.
- Wash cloth face coverings in hot, soapy, water between every use.
- Be careful to avoid developing a false sense of security when using face coverings.

Practice Social Distancing: Avoid close contact with people who are not in your household

- Put at least six feet of distance between yourself and people who don't live in your household.
- Remember that people infected with the virus, but who do not have any symptoms, can also spread the virus.
- Keeping distance from others is especially important for people who are at higher risk of getting very sick.
- Minimize time indoors with individuals outside your household even if you can maintain a distance of six feet.
- Avoid all gatherings, even small ones, with persons who are not in your household.

Monitor your health and stay home if you are sick

- Be alert for symptoms. Watch for fever, cough, shortness of breath, muscle and body aches, new loss of taste orsmell, and other symptoms of COVID-19.
  - Take your temperature if symptoms develop.
- If you develop symptoms, stay home – even if symptoms are only mild.
  - Consider providing additional protections or more intensive care for household members over 65 or with underlying health conditions.
- Get tested as soon as symptoms start, if you can, and stay away from others until your test results are back.

Practice good hygiene

- Wash your hands often.
- Cover coughs and sneezes.
- Disinfect surfaces like doorknobs, tables, desks, and handrails regularly.
- Increase ventilation by opening windows when able.
- Use noncontact methods of greeting each other.

Additional information

If you test positive

- If you test positive, you need to isolate away from others to keep them safe. "Isolate" is the term used in association with individuals who are sick with, or have tested positive for, the virus that causes COVID-19. Isolation means staying home all the time and keeping away from household members as much as possible. More information is available on the CDC and DHSS webpages.
- For most people with no, or mild, symptoms that are improving, isolation will be for ten days since your symptoms start, or if you never have any symptoms,

ten days since you had your test. Consult with a healthcare provider or public health staff member if you have questions about how long you need to be in isolation.

- You do not need to have a negative test to be cleared from isolation.
- It is very important for people who test positive to notify anyone they may have had contact with while infectious.
- Information on what counts as a "contact" can be found on the CDC webpages.
- If you test positive and are unable to isolate safely, or need resources during your isolation period, contact your local public center.

If you have had close contact with a confirmed case

If you have close contact with a confirmed case, you need to quarantine to keep others safe. "Quarantine" is the term used in association with individuals who have been exposed to someone with the virus that causes COVID-19. Quarantine means staying home all the time and keeping away from household members as much as possible. Information on when and how to quarantine is available on the CDC and DHSS webpages.

- The preferred quarantine period is currently 14 days from the last exposure to a known case, but may be able to be shorter under certain circumstances for contacts who do not develop symptoms. Briefly, those two options apply as follows:
  - Seven-day quarantine with a molecular or antigen test <48 hours before the end of quarantine. Individuals must remain in quarantine until their test results are available.
  - Ten-day quarantine.
- There is some risk of post-quarantine transmission associated with discontinuing quarantine before 14 days. Individuals should continue to monitor themselves for symptoms for a full 14 days after their last contact with a confirmed case.

Testing guidance

- Anybody with symptoms of COVID-19 should be tested.
  - A positive test within 90 days of someone's first infection can be difficult to interpret and needs to be discussed with a medical professional.
- Some people without symptoms should also be tested, including:
  - All close contacts of confirmed COVID-19 patients.
  - Health care workers in hospitals and congregate living settings.
  - Residents in congregate living settings (see DHSS guidance for specific groups) and other high- consequence settings (e.g., people coming into remote communities from areas where COVID-19 is circulating).
  - People who may be at increased risk for infection (discuss with medical professional).

- Please note: People with a prior positive test in the past 90 days, should NOT be re-tested.
- More information can be found in the Alaska Section of Epidemiology's testing guidance.

Travel considerations

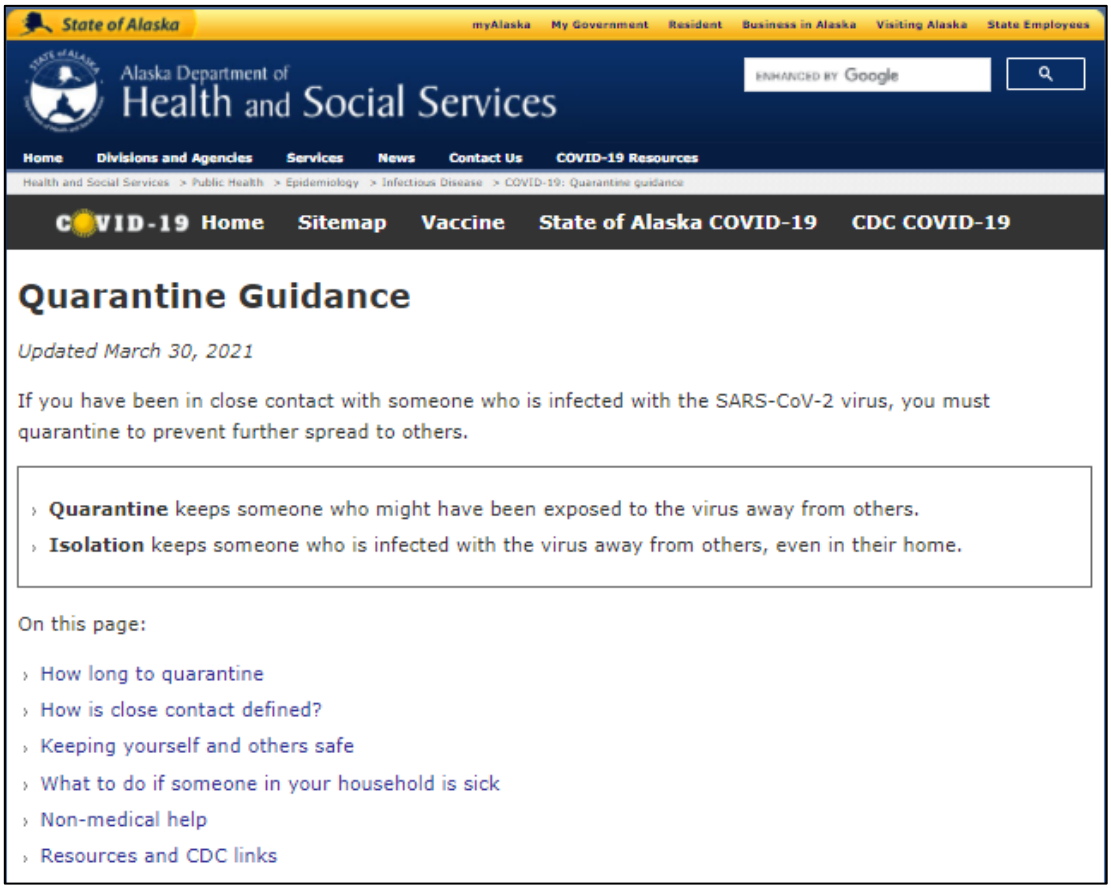
- Follow State of Alaska travel and CDC travel recommendations.
- Assess the risks of travel including the mode of transportation and the level of spread of the virus in the location you will be visiting.
- At-risk individuals and communities with limited health care infrastructure or high-risk populations shouldconsider limiting all non-essential travel.

Special considerations for workplaces, schools and childcare, correctional facilities, and other communitylocations and events are available at https://www.cdc.gov/coronavirus/2019-ncov/community/index.html and http://dhss.alaska.gov/dph/Epi/id/Pages/COVID-19/default.aspx

This is not a mandate.

Visit the State of Alaska's COVID-19 website at coronavirus.alaska.gov for more information

APPENDIX C 1-C



How long to quarantine

According to the U.S. Centers for Disease Control and Prevention (CDC), a 14-day quarantine period is still the safest quarantine duration; however, based on emerging science, CDC has issued updated guidance to provide two acceptable alternatives to shorten the quarantine period.

- If testing is available, you may be able to end your quarantine after 7 days of quarantine, on the 8th day. You can take a COVID-19 test within 48 hours prior when you hope to end your quarantine (on day 6 or 7). You must continue to quarantine until your test comes back negative, which may be longer than 7 days. Even if your test is negative and you end quarantine, you must continue to wear a mask when around others and monitor for symptoms for the full 14 days. If you develop any symptoms or your test result is positive, you must self-isolate.
- If testing is not readily available, quarantine for a full 10 days after you were exposed. You may end your quarantine on day 11 if you do not develop symptoms. You must continue to wear a mask when around others and monitor for symptoms for the full 14 days. Self-isolate if you develop symptoms and get tested.

People who have been in close contact with someone who has COVID-19 are not required to quarantine if they have been fully vaccinated against the disease within the last three months and show no symptoms.

If you are fully vaccinated and have been exposed to someone who has COVID-19, you do not need to quarantine or get tested unless you have symptoms or you live in a group setting (like a correctional or detention facility or group home). Review the complete updated guidelines at the CDC website.

Table: Options to reduce quarantine period

Table. Options to reduce quarantine period for close contacts.

	Option 1	**Option 2**
	7-day Quarantine + Test	*10-day Quarantine*
What type of test is required and when should it be obtained?	Molecular or antigen; specimen must be collected <48 hours before the time of planned quarantine discontinuation (i.e., on day 6 or 7 of quarantine)	No Test Required
Can quarantine be further shortened with a negative test result?	No	No
When is the earliest that a person can be released from quarantine and go back to work or school?	8 days after exposure with a negative test result	11 days after exposure
What should patients do if they haven't gotten their test result back before the time of planned quarantine discontinuation?	Remain in quarantine until they get a negative test result or 10 days have passed, whichever is earlier	No Test Required
Estimated residual post-quarantine transmission risk	5% (upper limit: 12%)	1% (upper limit: 10%)
What added precautions should people take after being released from quarantine under option 1 or 2?	**Take extra precautions until 14 days after exposure**: watch for symptoms, wear a mask when in public areas, avoid crowds, maintain 6-foot distance from others, wash hands frequently, avoid any contact with high-risk persons, discuss with employer whether it is safe to return to work.	

Notes:

1. *The above options are only for contacts who have remained asymptomatic for the entire duration of their quarantine. Anyone who develops symptoms within 14 days of an exposure (regardless of whether or not they remain in quarantine) should immediately self-isolate and seek testing.*
2. *Persons can continue to be quarantined for 14 days per existing CDC recommendations; this option maximally reduces the risk of post-quarantine transmission and is the strategy with the greatest collective experience at present.*
3. *Due to the added risk of transmission associated with reduced quarantine periods, a full 14-day quarantine period is recommended for persons in certain high-risk settings, such as long-term care facility residents and correctional facility inmates. Administrators of such facilities should also consider excluding staff from work for 14 days after exposure, if operationally feasible.*
4. *CDC guidance for health care workers who are close contacts has not changed from the standard 14-day quarantine.*
5. *Local community leadership (e.g., city mayor or Incident Command) may decide to continue a 14-day quarantine for residents of their communities, based on local conditions and needs. Prior to making this decision, community leadership should reach out to the Alaska Section of Public Health Nursing or the Section of Epidemiology to assure unified coordination.*

How is close contact defined?

A close contact is someone who was within 6 feet of an infectious person for a *cumulative total* of 15 minutes or more over 24 hours while the person was infectious. This definition applies regardless of whether the infected person or close contacts were wearing masks.

- The infectious period for COVID-19 starts 2 days before the patient experiences symptoms (or, for patients who show no symptoms, 2 days prior to testing) until the time the patient is isolated.
- Example of cumulative exposure:
  Three separate 5-minute exposures (for a total of 15 minutes) over a 24-hour period.

Keeping yourself and others safe

With cases on the rise in communities across Alaska, public health contact tracers may not be able to notify all close contacts. Because of this, contact tracers are asking people who have tested positive for COVID-19 to begin informing their close contacts of their potential exposure to the virus as soon as possible. The faster people begin to quarantine, the better we can prevent further transmission.

These resources can help you determine your close contacts and know what to say when you call:

- Thank you for getting tested – what to do after your test
- What to do if you have been exposed to COVID-19

If you are in quarantine, stay home, separate yourself from others, monitor your health and follow CDC, state and local health guidance. If you don't have symptoms, other household members do not need to quarantine. However, no visitors should come to your home during this time. If household members need to be in the same room with person in quarantine, everyone should wear a mask and stay six feet apart. Wash hands often and frequently clean and disinfect commonly-touched surfaces.

What to do if someone in your household is sick

Even if you experience very mild symptoms, isolate yourself immediately, call a health care provider and get tested. Isolation separates someone who is sick or tested positive for COVID-19 without symptoms away from others, even in their own home. If you live with others, try to stay in a specific "sick room" or area and away from other people. Use a separate bathroom, if available.

If you do experience symptoms or test positive, others in your household will need to quarantine. Their quarantine period begins on the date they last had close contact with you (before you were able to effectively isolate apart from household members). Any time a new household member gets sick with COVID-19 and others in the household have had close contact with that person, household members will need to restart their quarantine.

If you live in a household and cannot avoid close contact with family members or roommates who have COVID-19, you should avoid contact with others outside your home while the person is sick. Your quarantine period begins when the person who has COVID-19 meets the meets the criteria to end home isolation.

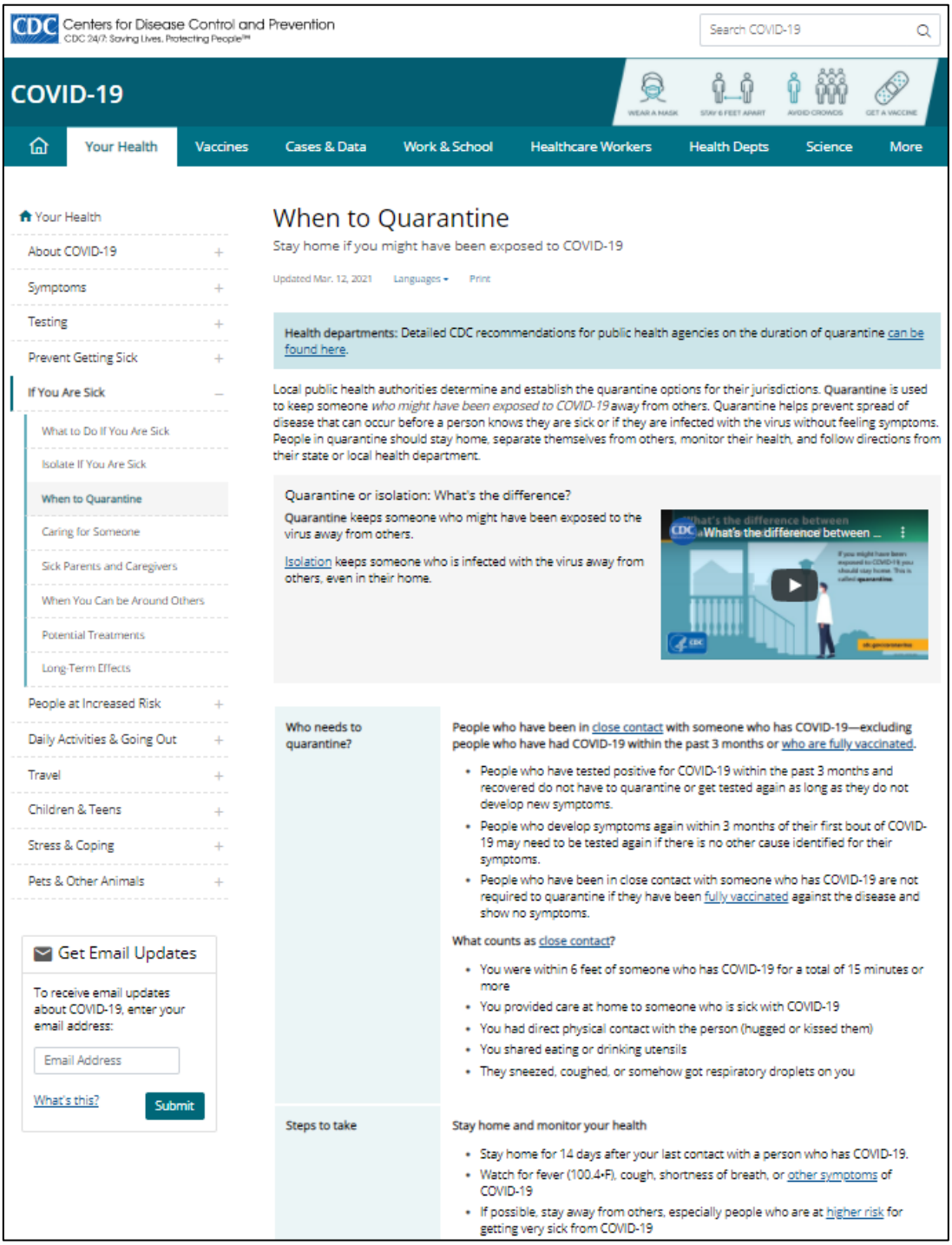
Non-medical help

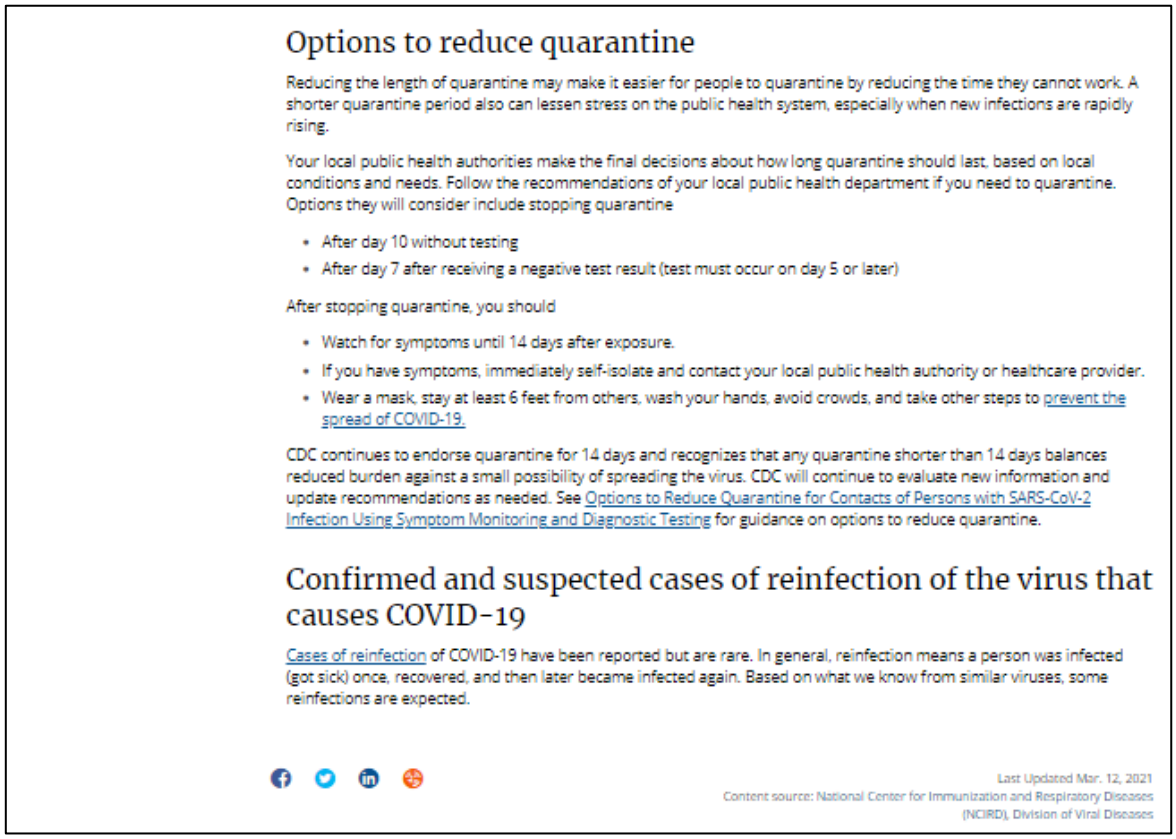
If you need non-medical help to successfully quarantine or isolate (e.g., groceries or other support) call 2-1-1 or 1-800-478-2221.

Resources and CDC links

- Letter template for returning to school or work after quarantining
- Options to Reduce Quarantine for Contacts of Persons with SARS-CoV-2 Infection Using Symptom Monitoring and Diagnostic Testing (CDC)
- When to Quarantine (CDC)
- What to Do If You are Sick (CDC)
- Isolate if You are Sick (CDC)

Appendix C 1-D





Options to reduce quarantine

Reducing the length of quarantine may make it easier for people to quarantine by reducing the time they cannot work. A shorter quarantine period also can lessen stress on the public health system, especially when new infections are rapidly rising.

Your local public health authorities make the final decisions about how long quarantine should last, based on local conditions and needs. Follow the recommendations of your local public health department if you need to quarantine. Options they will consider include stopping quarantine

- After day 10 without testing
- After day 7 after receiving a negative test result (test must occur on day 5 or later)

After stopping quarantine, you should

- Watch for symptoms until 14 days after exposure.
- If you have symptoms, immediately self-isolate and contact your local public health authority or healthcare provider.
- Wear a mask, stay at least 6 feet from others, wash your hands, avoid crowds, and take other steps to prevent the spread of COVID-19.

CDC continues to endorse quarantine for 14 days and recognizes that any quarantine shorter than 14 days balances reduced burden against a small possibility of spreading the virus. CDC will continue to evaluate new information and update recommendations as needed. See Options to Reduce Quarantine for Contacts of Persons with SARS-CoV-2 Infection Using Symptom Monitoring and Diagnostic Testing for guidance on options to reduce quarantine.

Confirmed and suspected cases of reinfection of the virus that causes COVID-19

Cases of reinfection of COVID-19 have been reported but are rare. In general, reinfection means a person was infected (got sick) once, recovered, and then later became infected again. Based on what we know from similar viruses, some reinfections are expected.

Last Updated Mar. 12, 2021
Content source: National Center for Immunization and Respiratory Diseases (NCIRD), Division of Viral Diseases