

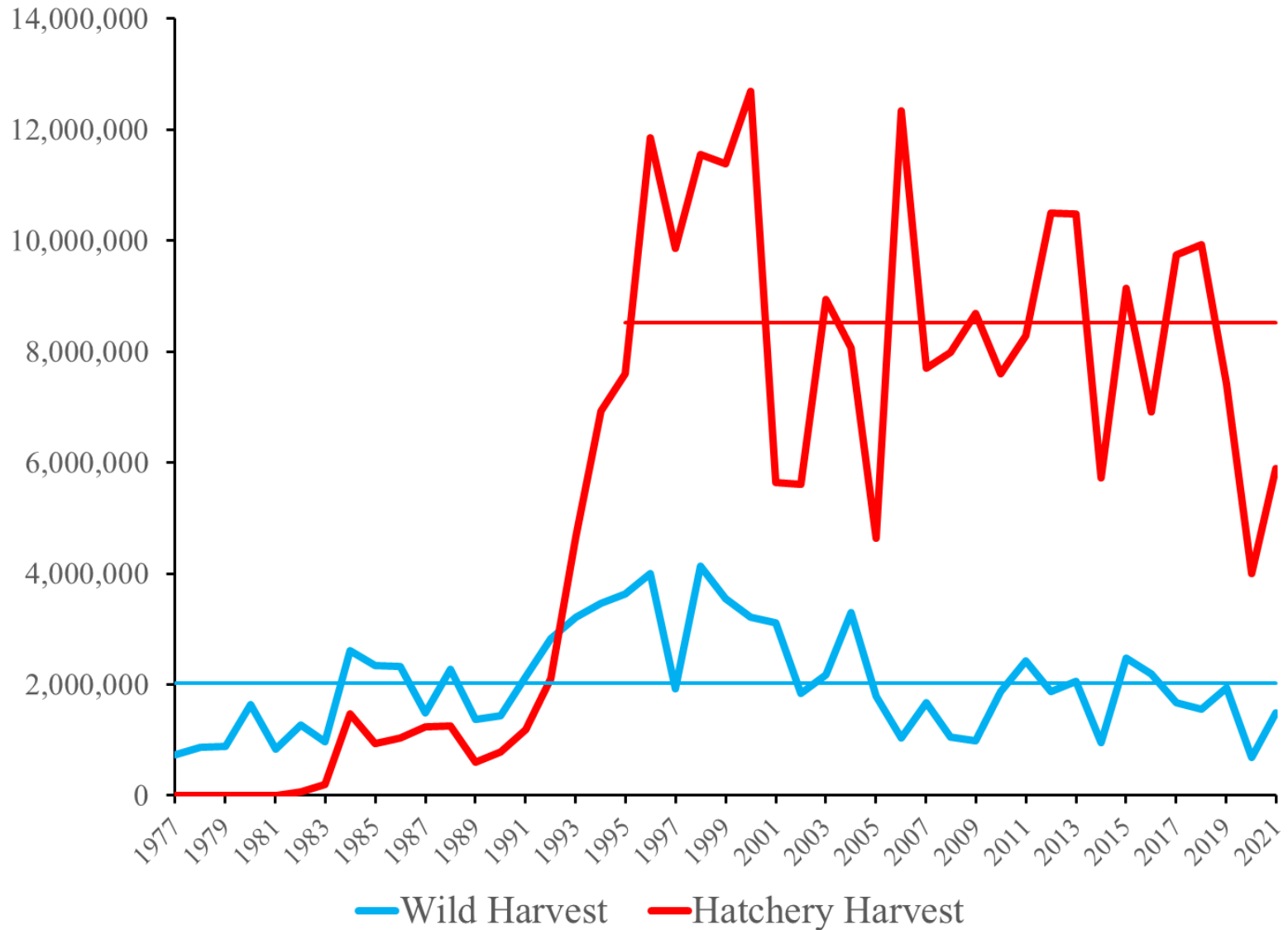
Proportions of hatchery fish in escapements of summer-run Chum Salmon in Southeast Alaska, 2013-2015

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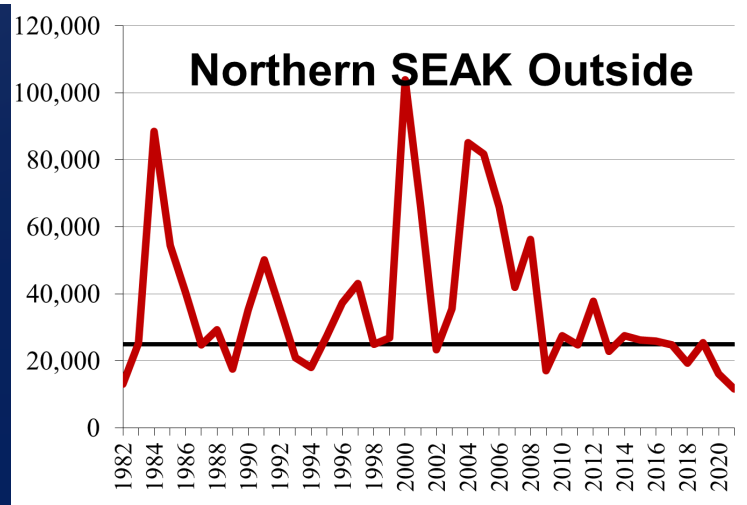
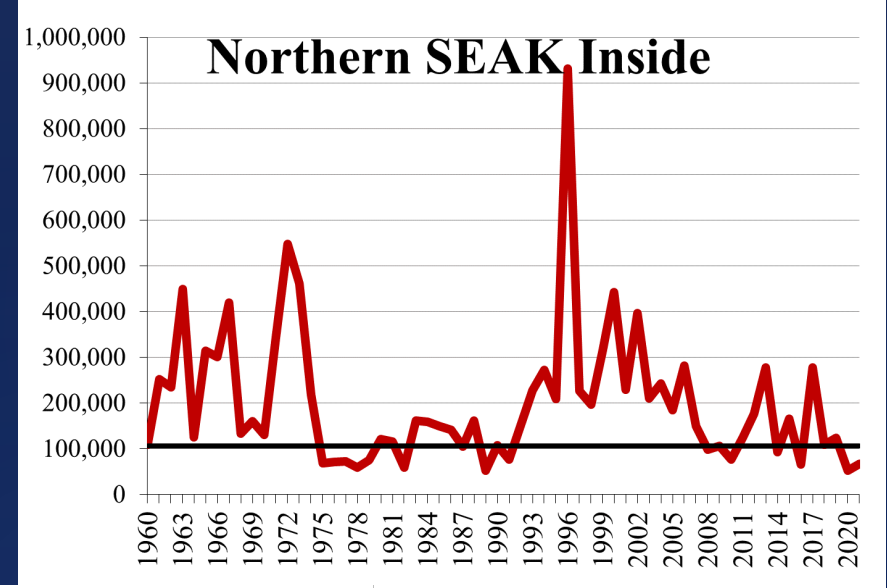
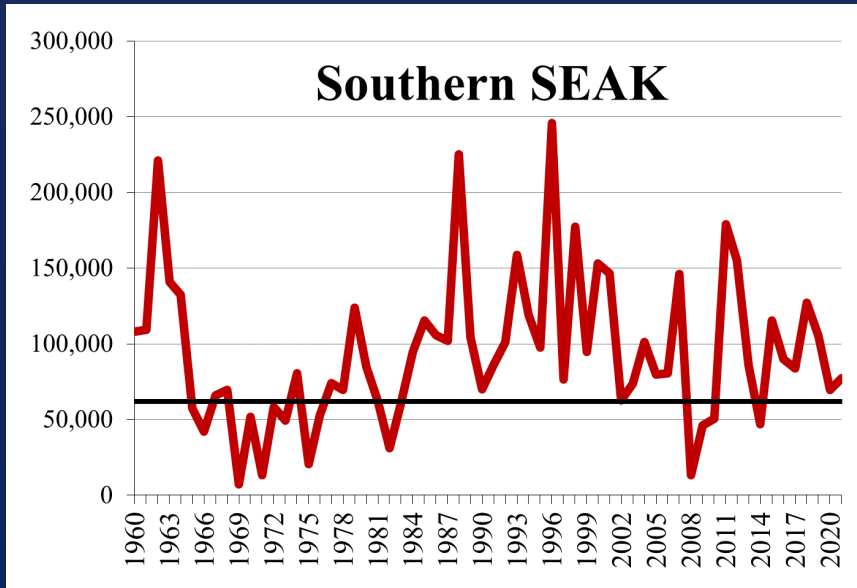
Authors and Acknowledgements

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SEAK Chum Salmon: Hatchery and Wild Harvests 1977-2021



SEAK Summer Chum Salmon Escapements By Management Unit



Red = Estimated Escapement Black = 2011 Escapement Goal Lower Bound

What is the extent and annual variability of straying in SEAK chum salmon escapements?

1,200 chum streams

Two runs: summer and fall

Three stock groups

81 escapement index streams

NSI: 66

NSO: 6

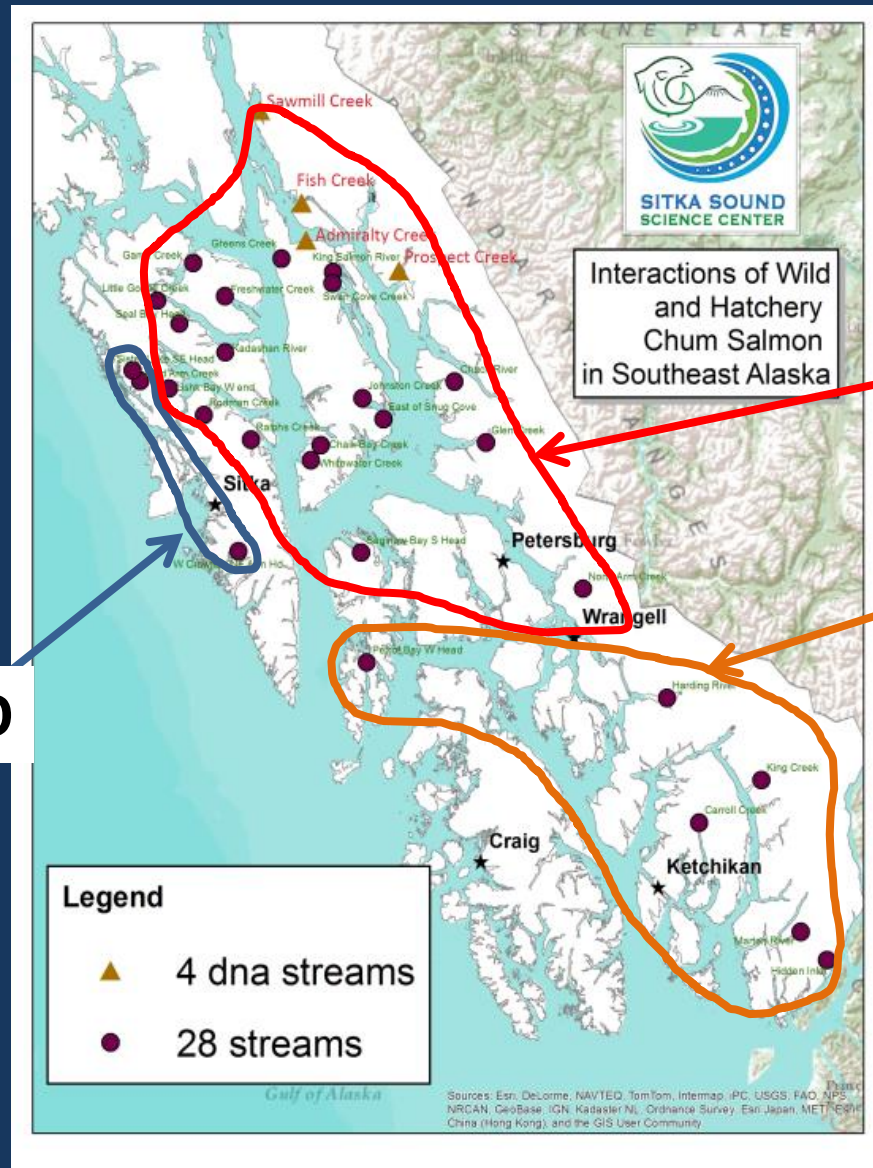
SSE: 9

32 streams selected for study

NSI: 24

NSO: 3

SSE: 5

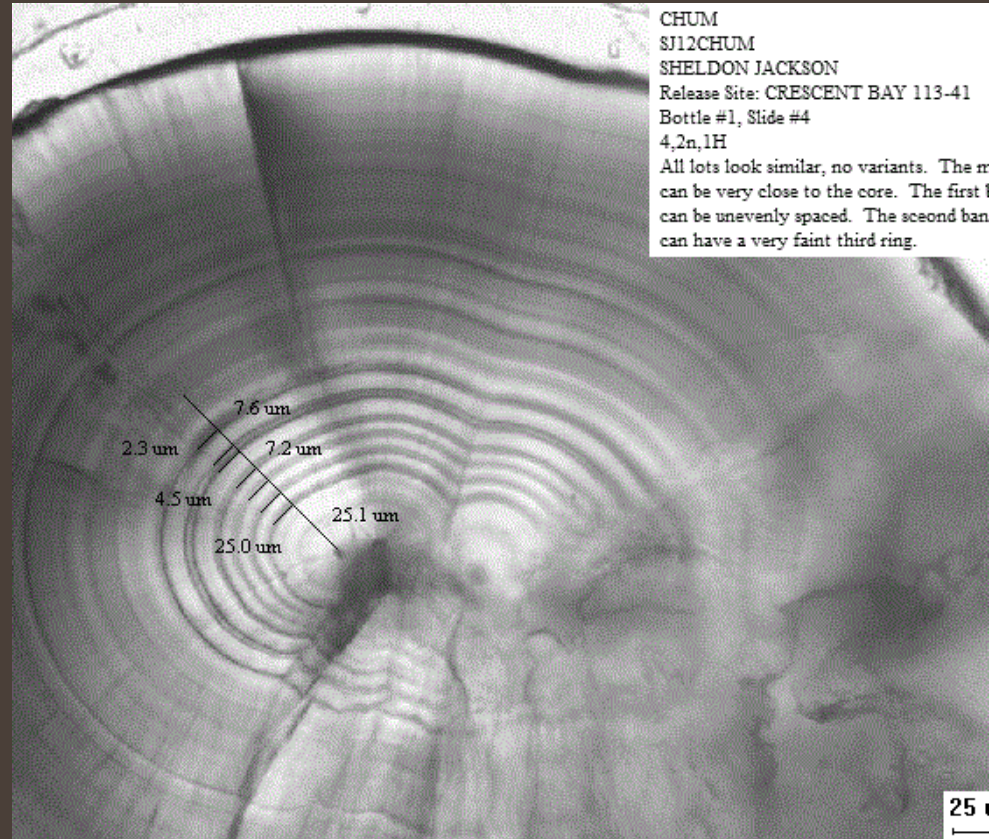


Straying

Hatchery-origin fish in natural spawning grounds

Identified by hatchery-applied mark

Not identifying natural-origin strays



Stream Surveys

- Focused on carcasses and post-spawn fish
- Census of live and dead Chum
- 2 or more sampling events per stream
- Covered full stream length



Goals

192 fish per sampling event

Annual target of 384 individuals

Success depended on environmental factors

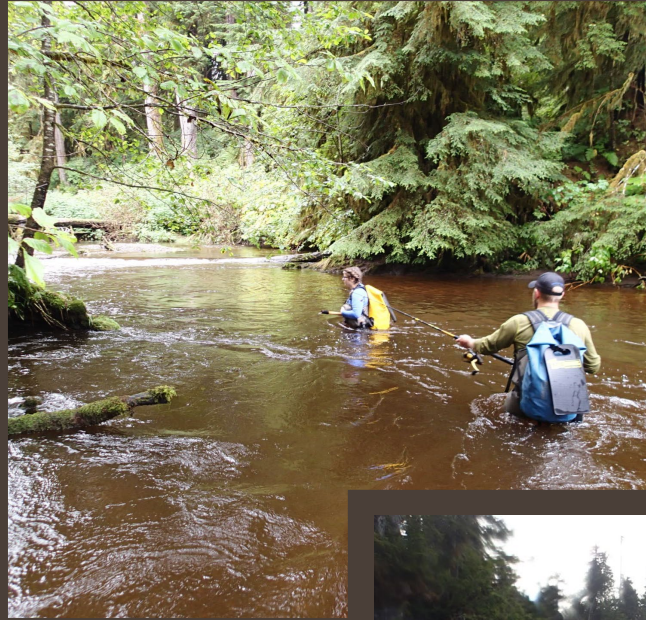


Environmental Factors

Weather Conditions

Stream flow & flooding

Availability of Chum Salmon



Project Success

2 or more sampling
events per stream

192 fish per sampling
event

Annual goal of 384
individual Chum Salmon
sampled

Year	Survey Goal Met	Sampling Event Goal Met	Annual Goal Met
2013	31	27%	47%
2014	32	14%	16%
2015	30	18%	47%

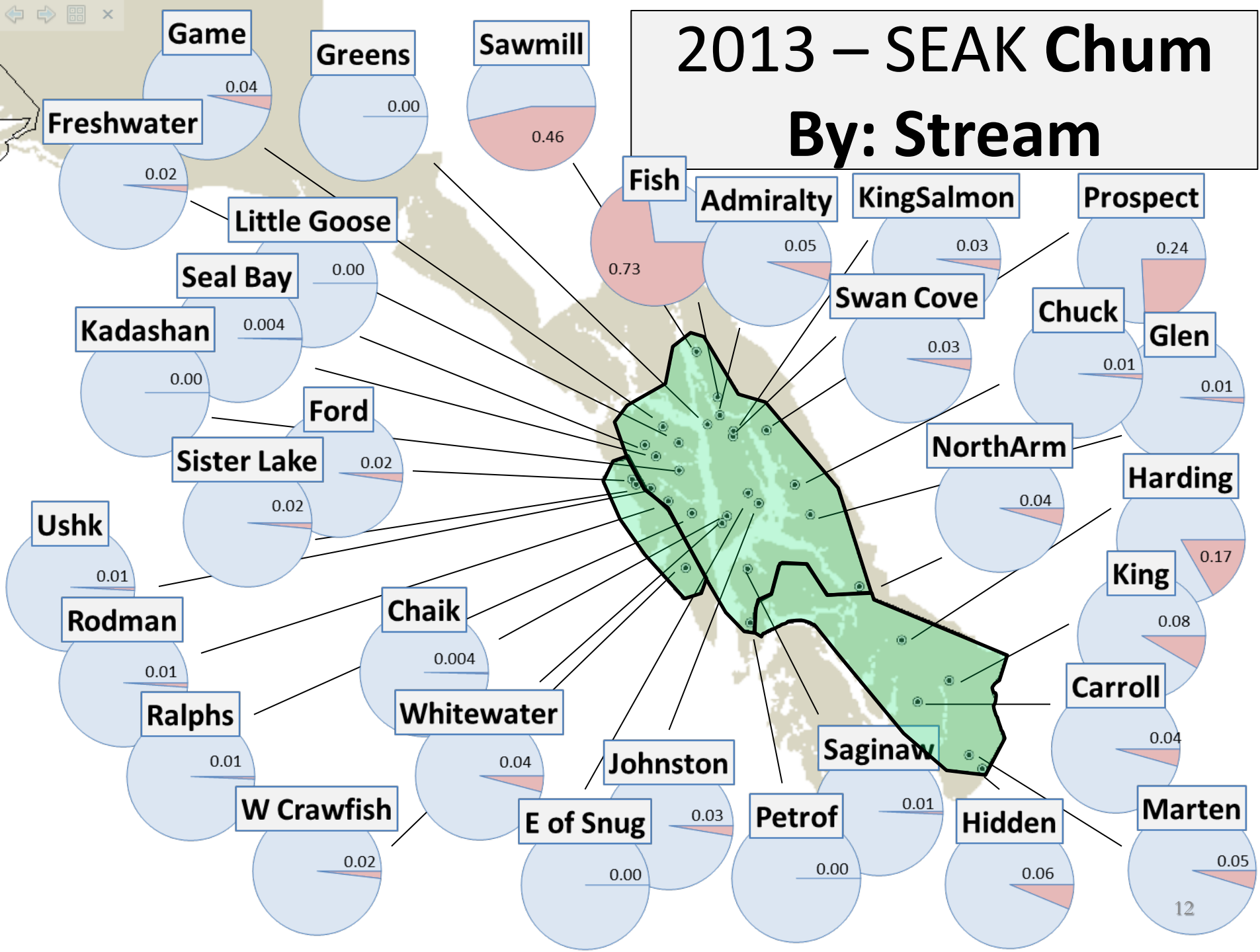
Summary



- 5 field crews conducting surveys
- Highly dependent on the environment
- Collected what was available

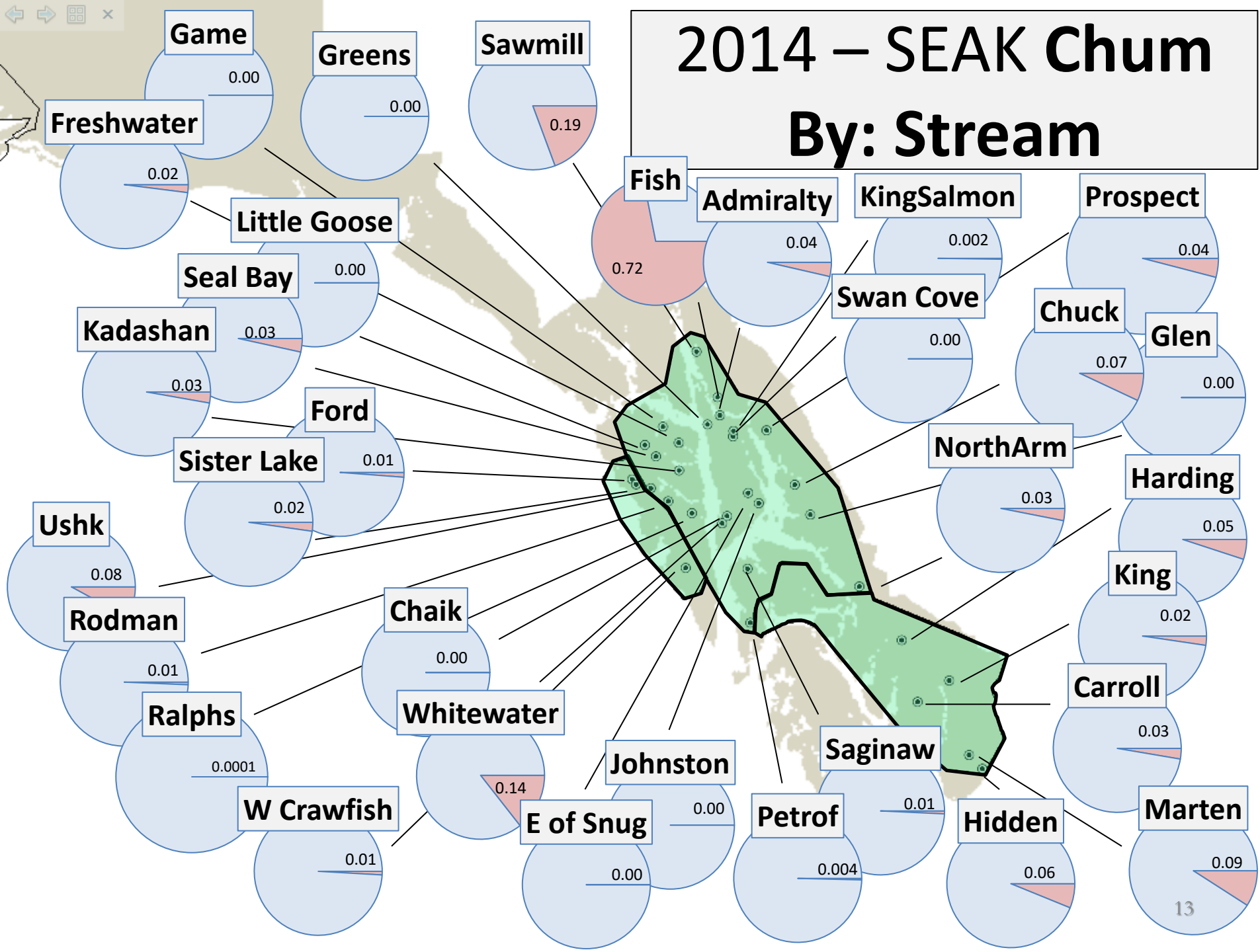
2013 – SEAK Chum

By: Stream



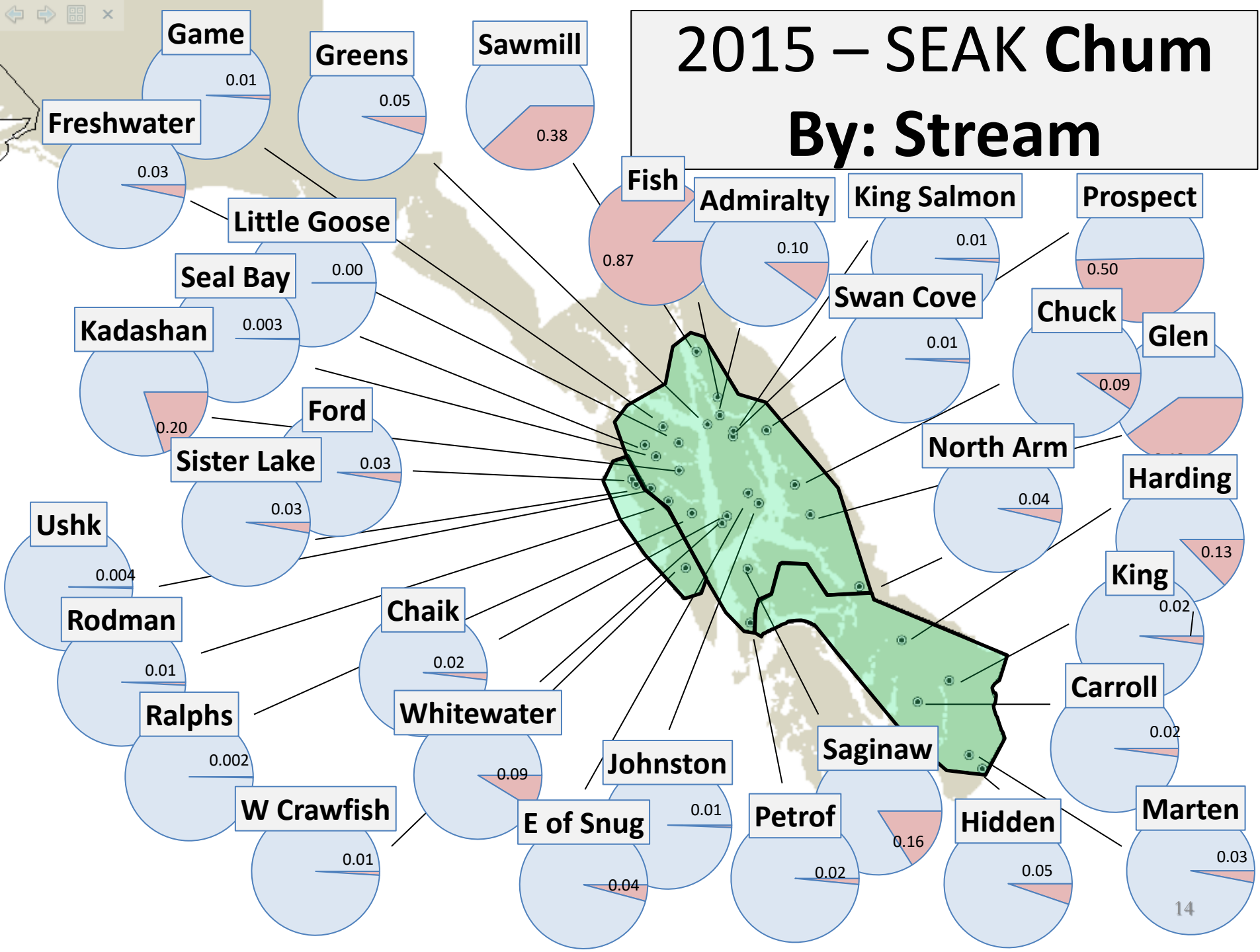
2014 – SEAK Chum

By: Stream



2015 – SEAK Chum

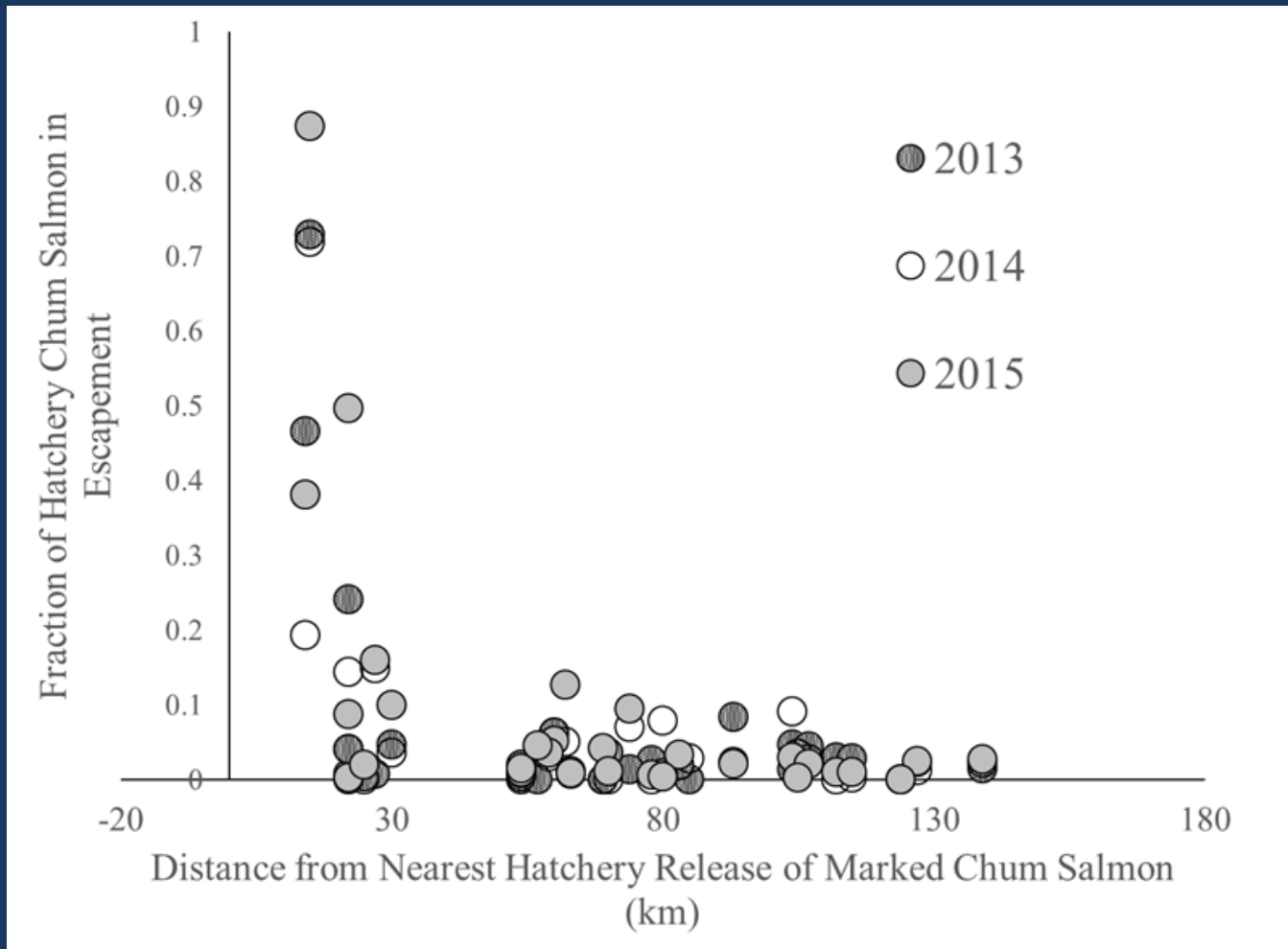
By: Stream



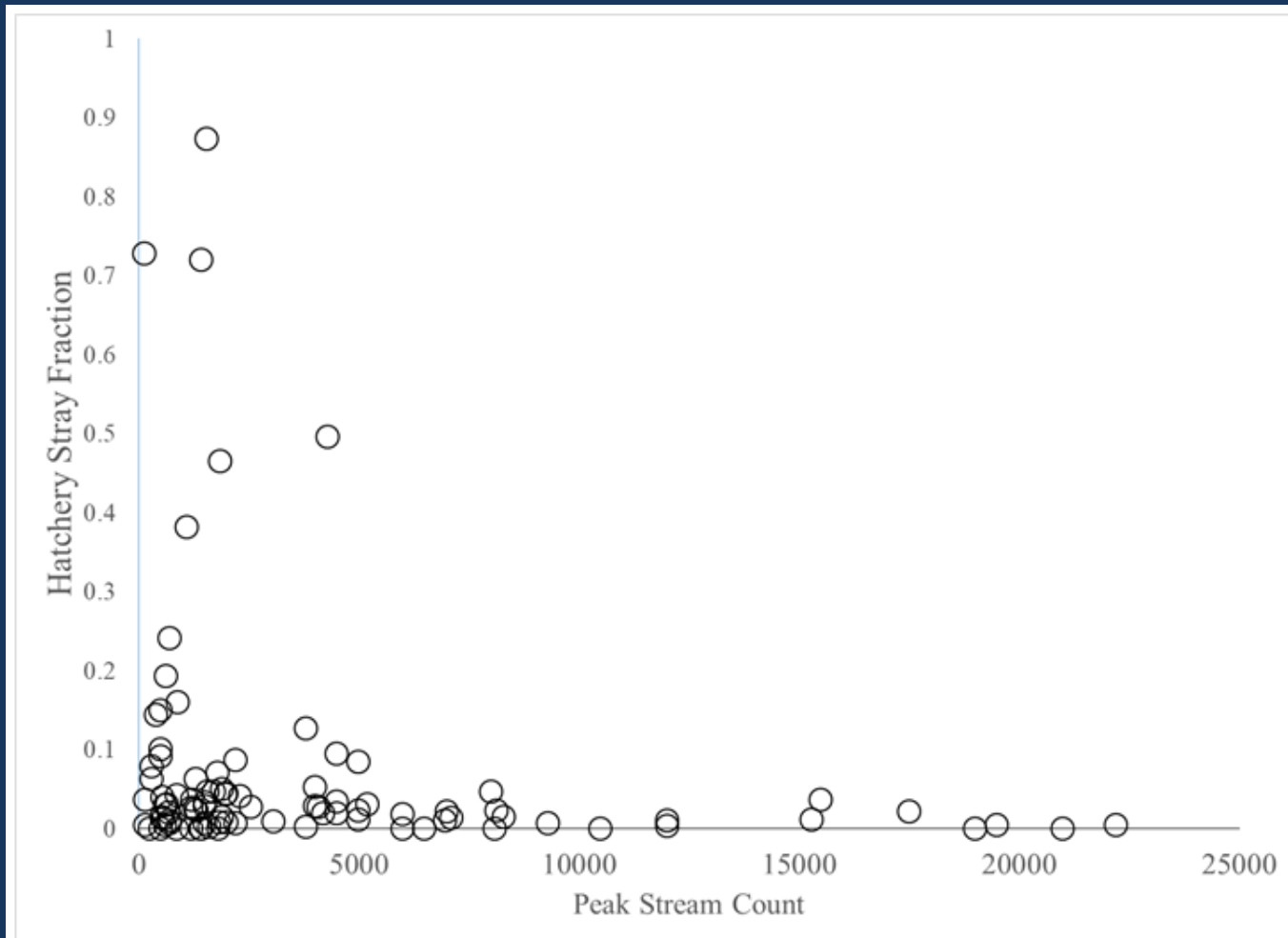
Summary of Annual Observations

- 96 stream/year observations
- 14 with no hatchery fish
- 72 pHOS < 0.05
- 9 pHOS 0.05- 0.10
- 15 pHOS > 0.10
- Highest observation 0.85 (Fish Creek)

Relationship of hatchery fractions to distance from the nearest release site in SEAK summer chum escapements, 2013-2015.

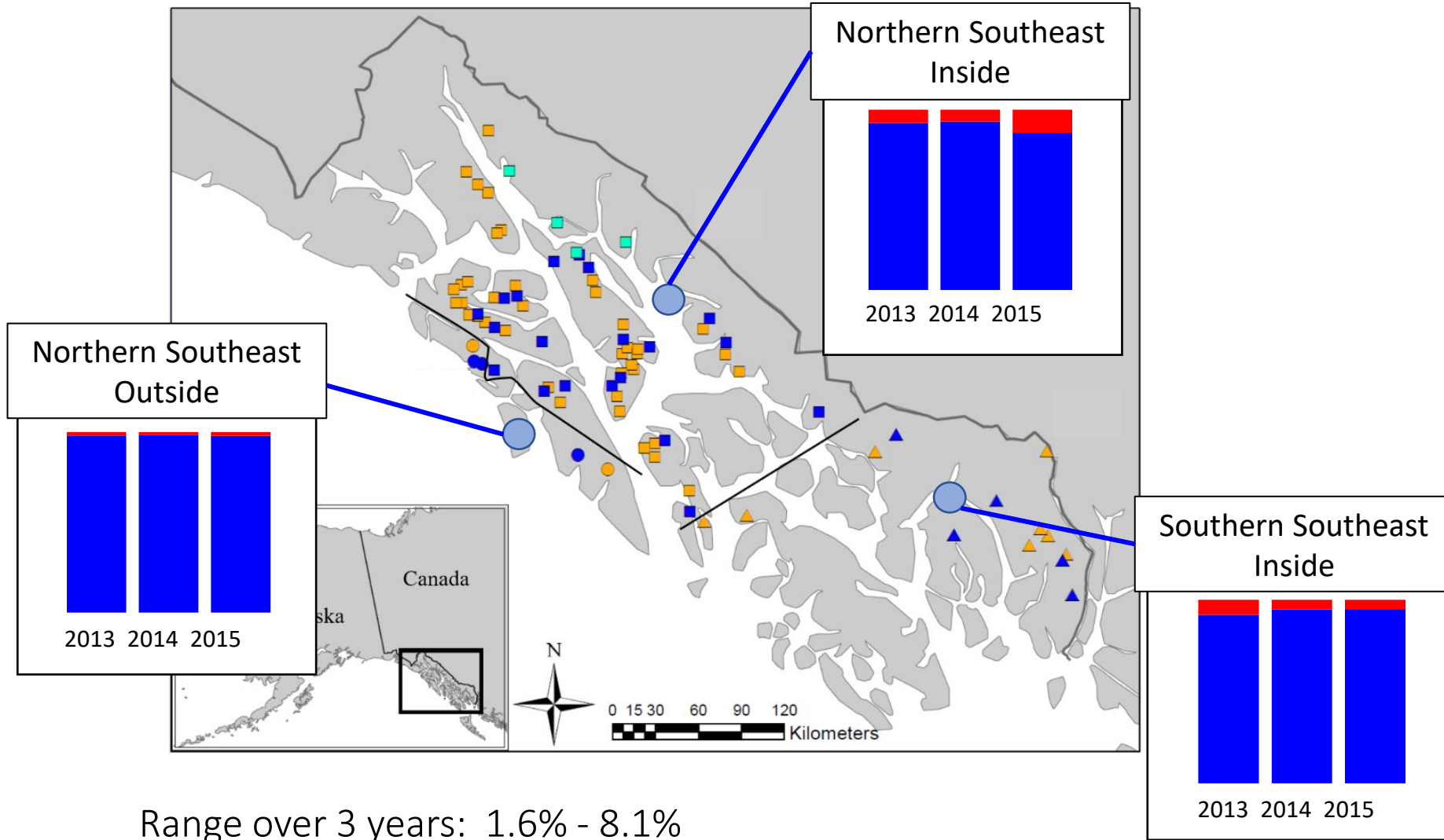


Relationship of hatchery fractions to peak stream counts in SEAK summer chum escapements, 2013-2015.



SEAK hatchery proportions in Chum escapement

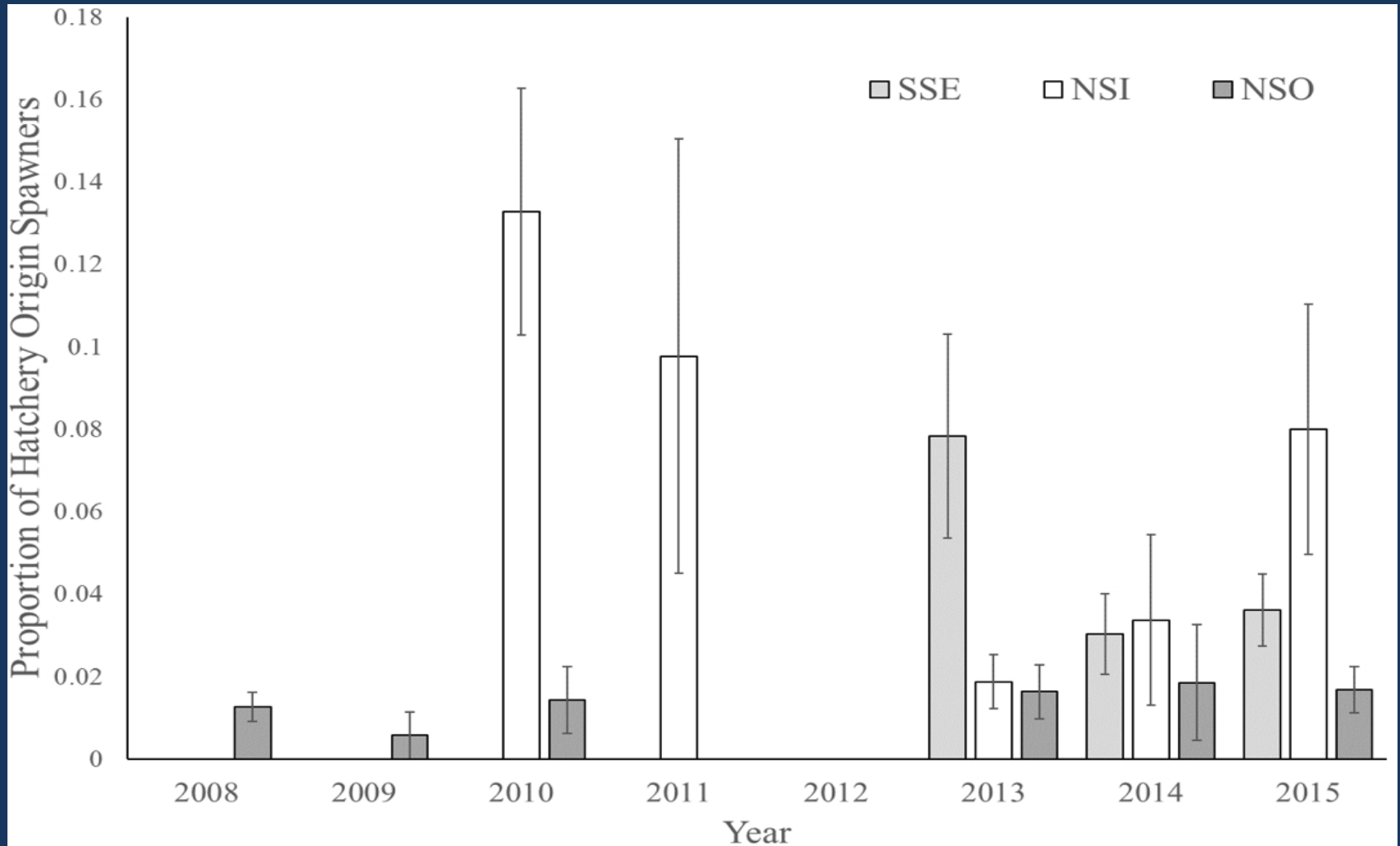
By Area 2013-2015



Estimated Hatchery Fraction (pHOS) SEAK Summer Chum For Management Unit and Regional Escapements 2013-2015

Management unit	Number of streams sampled	2013	2014	2015
SSE	5	0.078	0.030	0.036
NSI	24	0.019	0.034	0.081
NSO	3	0.016	0.018	0.017
SEAK Region	32	0.032	0.031	0.060

Comparison of Estimated proportions and standard errors of pHOS with Previous Studies (Piston and Heint 2012a,b)



Stray Donor Rate

The fraction of a salmon population that strays from the natal location to one or more non-natal locations.

Hatchery Stray Donor Rate

$$= \text{HOS} / (\text{HOS} + \text{HC} + \text{HE})$$

HOS = hatchery strays in wild escapements

HC = hatchery catch

HE = hatchery escapement

Donor Stray Rate Calculation for SEAK Hatchery Chum Salmon

1. Aggregate stream escapement estimates and hatchery (catch plus escapement) estimates for 2013-2015.
2. Use 3-year average pHOS of 0.041
3. Assume Index Stream Counts (ISC) represent 10-30% of index stream escapements ($\text{Prop}_{\text{index}}$).
4. Assume Index Stream escapements represent 25-50% of all SEAK summer chum escapements ($\text{Prop}_{\text{total}}$)
5. Estimate Total SEAK Escapement (TSE) = $\text{ISC} / \text{Prop}_{\text{index}} / \text{Prop}_{\text{total}}$
6. $\text{HOS} = \text{TSE} * \text{pHOS}$
7. Donor Rate = $\text{HOS} / (\text{HOS} + \text{HC} + \text{HE})$

Donor Stray Rate Calculation for SEAK Hatchery Chum Salmon

3-Year Total Index Counts	Prop _{index}	Index Streams Total Escapement	HOS In Index Streams	Prop _{total}	Hatchery Donor Rate
826,557	10%	8,265,570	330,623	25%	4.8%
826,557	30%	2,755,190	110,208	25%	1.6%
826,557	10%	8,265,570	330,623	50%	2.4%
826,557	30%	2,755,190	110,208	50%	0.8%
		Percent Hatchery in Sampled Streams	Total 3-year Hatchery Return		
		4.1%	28,000,000		

Total index escapement / proportion in index x proportion hatchery strays = number of hatchery strays in index streams.

Number of strays in index streams / 25% to expand for all SEAK escapement / total hatchery return = donor rate

Hatchery Stray Donor Rates: Comparison of SEAK and PWS Chum Salmon

SEAK: 0.8% - 4.8%
(three-year aggregate)

PWS: 1.0%-3.5%
(2013-2015, Knudsen et. al. 2021)

Conclusions (1)

- Proportion hatchery strays in streams is affected by distance from hatchery release sites and size of natural spawning escapement.
- Proportion of hatchery strays can be highly variable between years at the stream and management unit level.
- Hatchery origin chum salmon can be expected at low levels in most chum salmon spawning streams in SEAK, and at higher levels in systems with relatively small escapements closer to hatchery release sites.

Conclusions (2)

- At the management unit and regional levels, the proportion of hatchery strays in the escapement was typically <0.04 , and did not exceed 0.08 in this study.
- Donor rate of SEAK hatchery chum salmon was estimated to be 1.6% to 4.8%, consistent with estimates of donor rates of hatchery chum salmon in PWS.
- The relatively low estimates of pHOS at the management unit level are unlikely to reduce managers' ability to assess trends in wild Chum Salmon abundance and to determine if escapement goals are met.