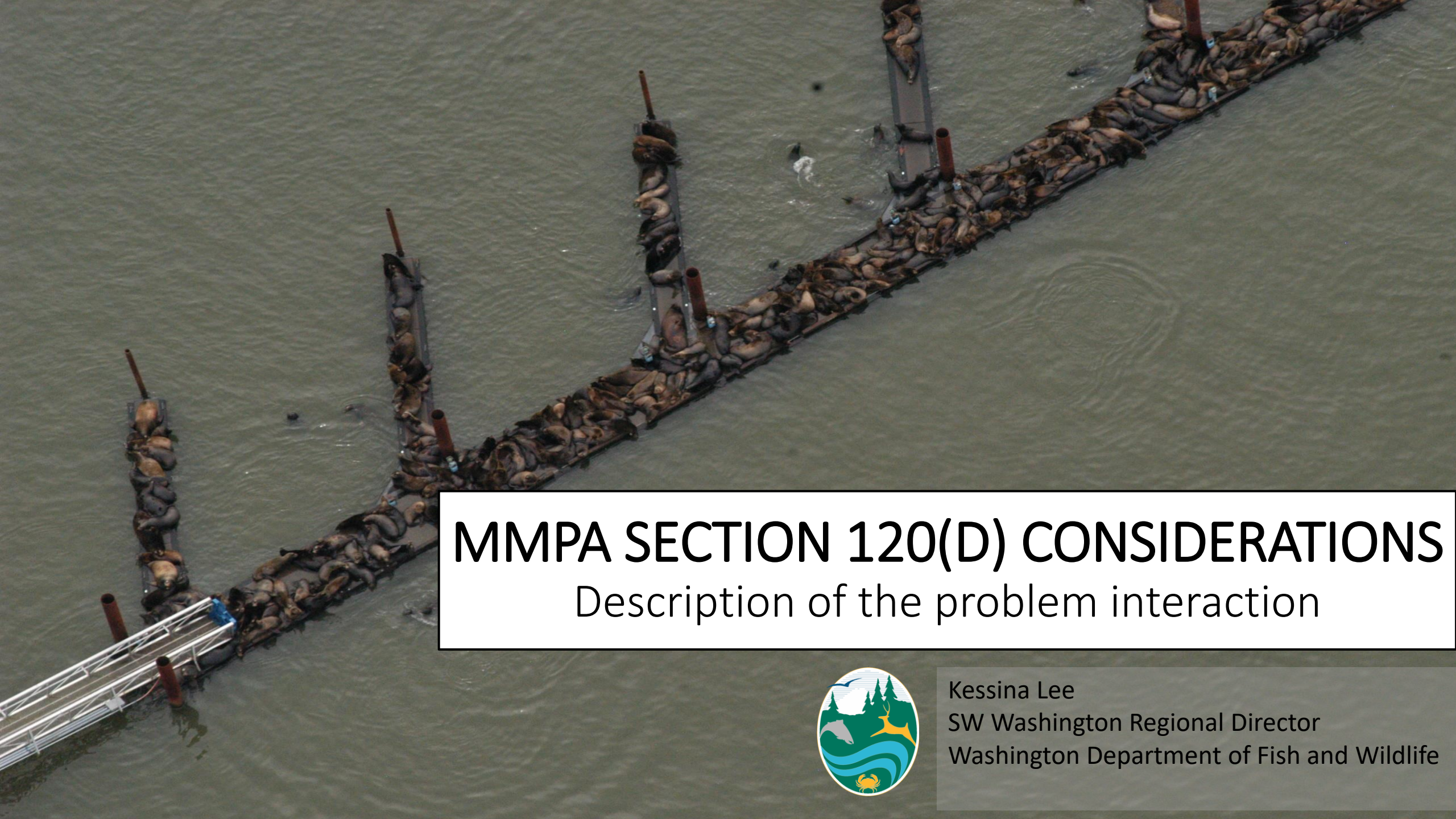

MMPA SECTION 120(D) CONSIDERATIONS

Description of the problem interaction

Kessina Lee
SW Washington Regional Director
Washington Department of Fish and Wildlife

California sea lions

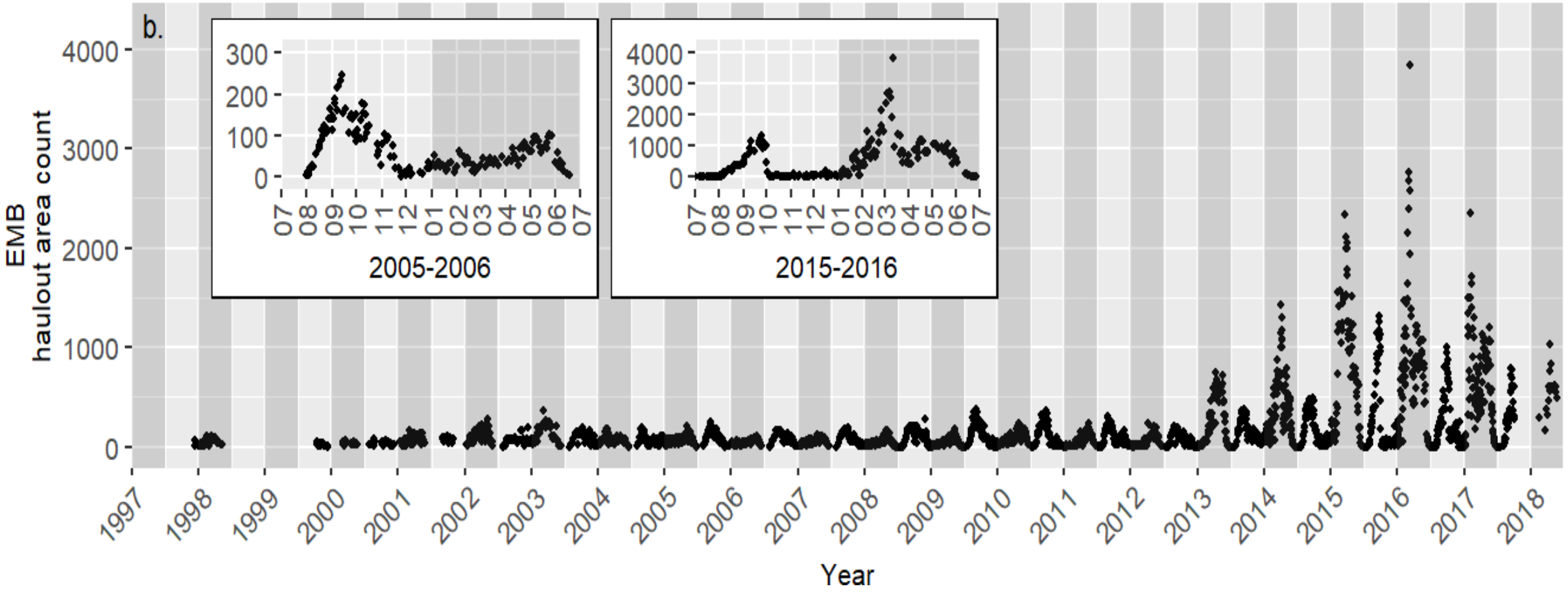

Figure 3. Time series of California sea lion haul-out area counts at the East Mooring Basin (EMB) in Astoria from December 1997 to June 2018. Insets illustrate the changes in magnitude and seasonality of California sea lion occurrence over the study period (x-axis denotes month; note difference in magnitude of counts on the y-axis scale between the two inset figures).

California sea lions at Bonneville Dam

- Between 2002-2018, number has ranged between 30 and 195 annually.
- From 2008-2019, the states have removed 238 CSL from Bonneville Dam.

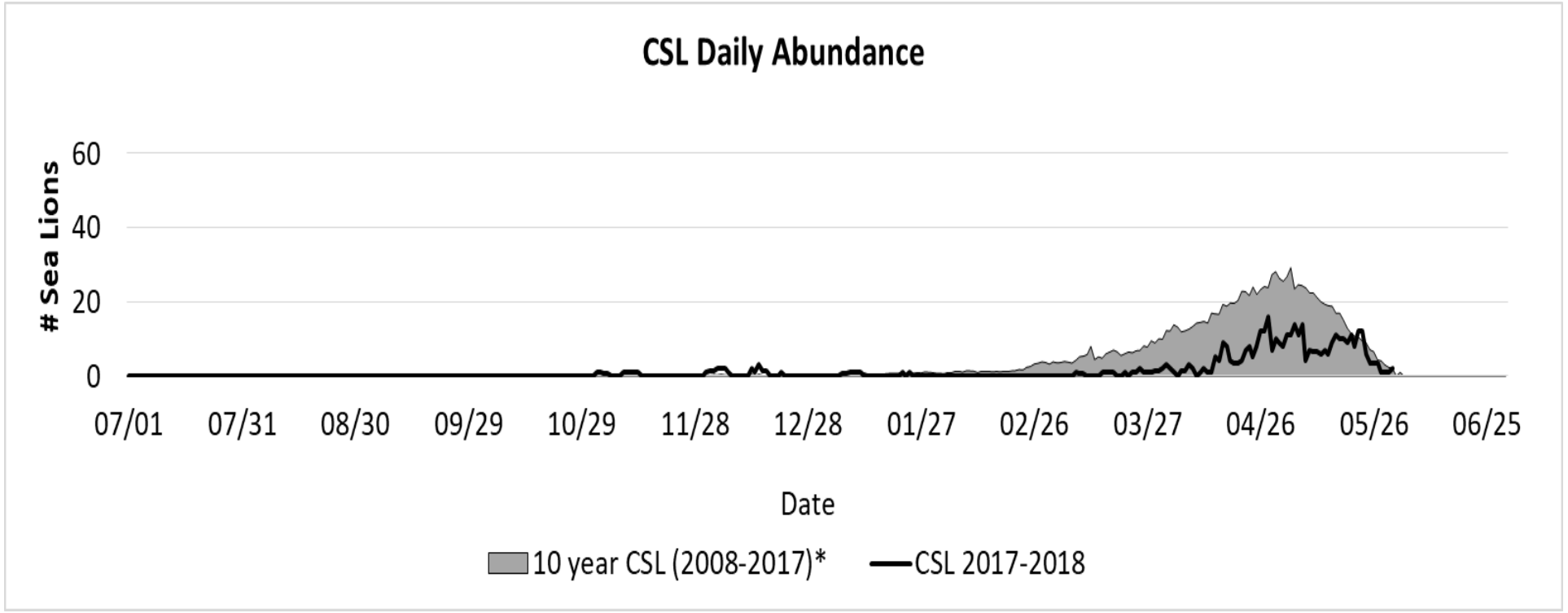

Figure 4. Reproduced from Tidwell et al. (2019). Maximum daily count of CSL at Bonneville Dam from 31 July 2017 through 1 June 2018 compared to the 10-year maximum daily average. For reference: fall and winter sampling period = 15 August – 31 December 2017 and spring period =1 January – 2 June 2018. * Averages from 6/1 - 12/31 begin in 2011, sporadic between years.

Year	Total Hours Observed	California Sea Lions	Steller Sea Lions	Harbor Seals	Total Pinnipeds
2002	662	30	0	1	31
2003	1,356	104	3	2	109
2004	516	99	3	2	104
2005*	1,109	81	4	1	86
2006	3,650	72	11	3	86
2007	4,433	71	9	2	82
2008	5,131	82	39	2	123
2009	3,455	54	26	2	82
2010	3,609	89	75	2	166
2011	3,315	54	89	1	144
2012	3,404	39	73	0	112
2013	3,247	56	80	0	136
2014	2,947	71	65	1	137
2015	2,995	195	69†	0	264
2016	1,974	149	54†	0	203
2017	1,142	92	63†	1	156
2018	1,410	67	66†	1	134

Table 1. Reprinted from Tidwell et al. (2019). Minimum estimated number of individual pinnipeds observed at Bonneville Dam tailrace areas and the hours of observation during the spring sampling period, 2002 to 2018.

* Observations did not begin until March 18 in 2005.
† In 2015, 2016, 2017, and 2018 the minimum estimated number of Steller sea lions (SSL) was 55, 41, 32, and 35 respectively. These counts were less than the maximum number of Steller sea lions observed on one day, so the maximum number observed on one day was used as the minimum estimated number. This difference is driven by a focus on CSLs and lack of brands or unique markers on SSL.

California sea lions at Willamette Falls

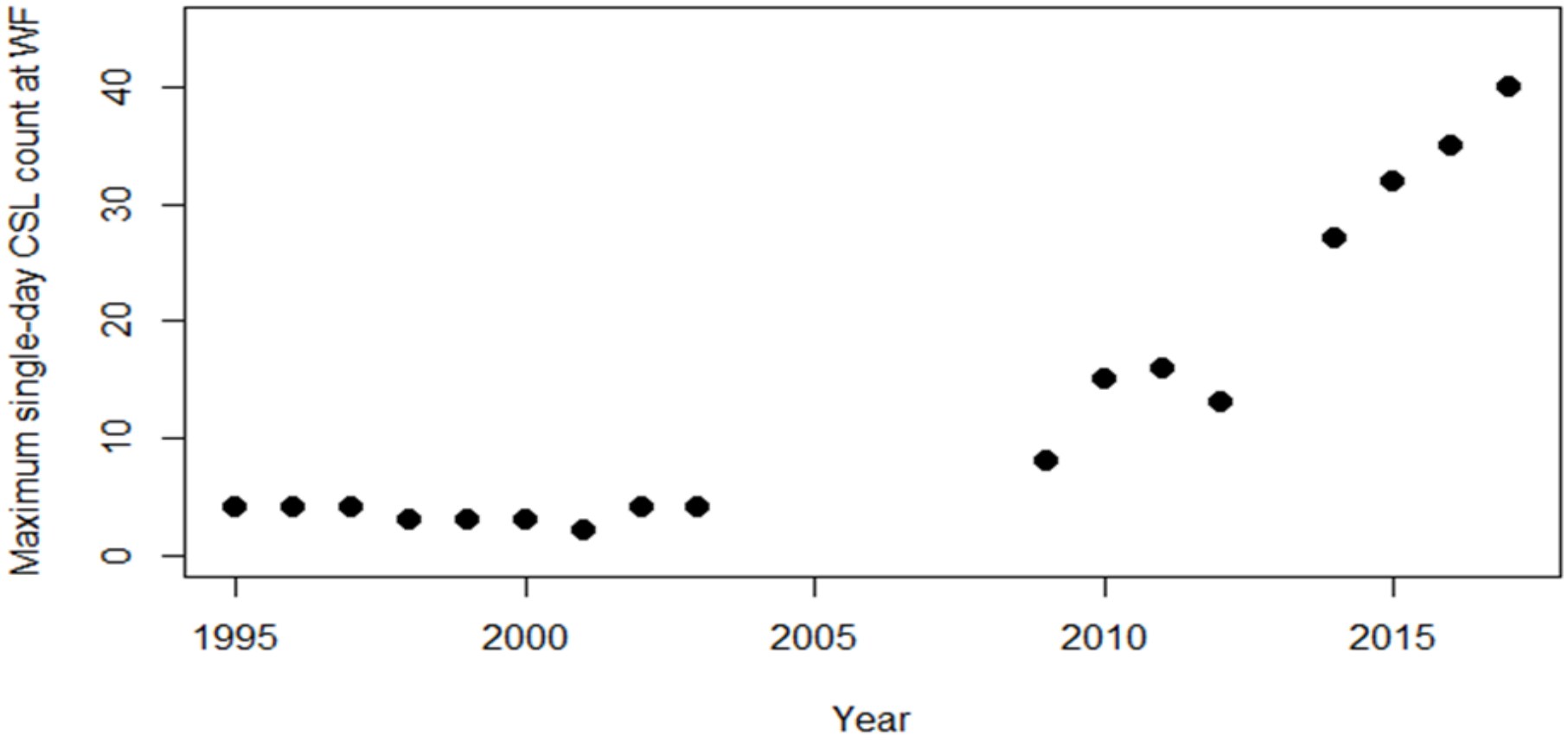

Figure 5. Maximum single-day CSL count at Willamette Falls by year. Monitoring from 1995-2003 and 2014-2017 was conducted by ODFW; monitoring from 2009-2012 was conducted by PSU.

California sea lions at Willamette Falls

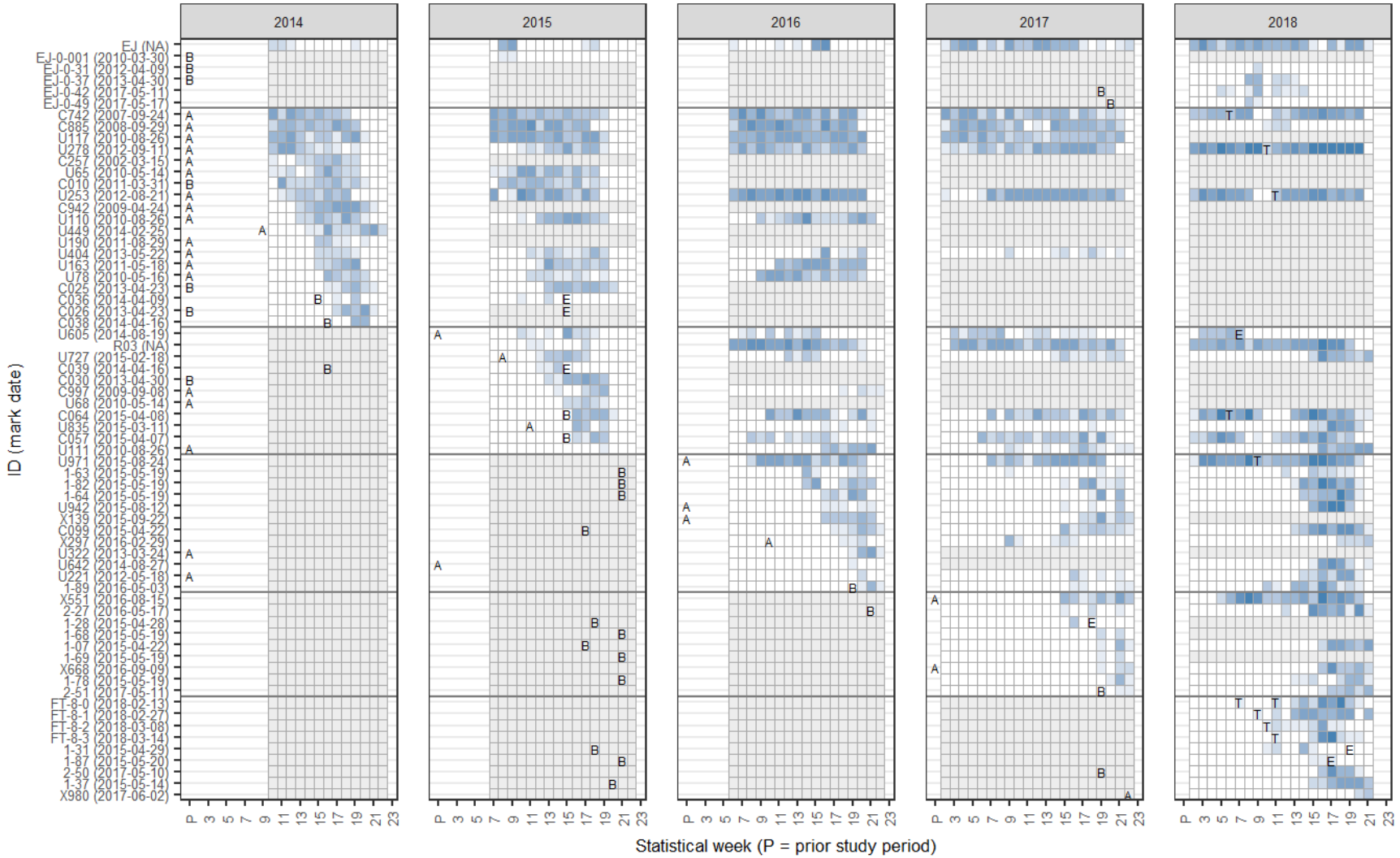

Figure 6. Weekly residency of Steller sea lions and California sea lions at Willamette Falls sorted by year (column) and week of first detection (row). Steller sea lions are indicated by prefix 'EJ' (with first row indicating presence only). Cell color indicates relative frequency of detection (darker hue = more days detected). Cell letters indicate location where it was branded ('A'=Astoria, 'B'=Bonneville), whether it was euthanized ('E') at Bonneville Dam, and/or whether it was translocated ('T') to the coast.

California sea lions at Bonneville Pool

Year	Sea lion interactions reported by tribal fishers or enforcement officers
2013	38
2014	9
2015	17
2016	8
2017	9
2018	3
2019	1

Table 3. Annual summary of reported fisher interactions with sea lions in the Bonneville pool.

California sea lion presence in other tributaries

- Recruitment of CSL and Bonneville Dam and Willamette Falls has been consistently occurring over a period of 15-20 years.
- More recently CSL have been observed expanding their distribution into smaller tributaries of the Columbia River.
- In Oregon, CSL have been observed frequently feeding on salmonids in the Sandy River and Clackamas Rivers since 2010, typically 1-2 animals making daily foraging migrations into the lower reaches of these rivers.
- However in 2017, 6 CSL were observed feeding on salmonids at RM 19 on the Clackamas River.

Tributary	Source of Observation
Grays River, WA	WDFW staff
Skamokawa, WA	WDFW staff
Elochoman River, WA	WDFW staff
Abernathy Creek, WA	WDFW staff
Cowlitz River, WA	WDFW staff and public
Coweeman River, WA	WDFW staff
Kalama River, WA	WDFW staff and public
Lewis River, WA	WDFW staff and public
Washougal River, WA	WDFW staff
Duncan Creek, WA	WDFW staff
Hamilton Creek, WA	WDFW staff
Sandy River, OR	ODFW Staff, Public, Guides
Clackamas River, OR	ODFW Staff, Public, Guides
Scappoose River, OR	ODFW Staff
Clatskanie River, OR	ODFW Staff

Table 4. Confirmed observations of CSL in Washington and Oregon tributaries. The upstream distance of CSL presence in these rivers and creeks varies, but they have at least been observed in the lower reaches and/or at the mouths of these systems.

California sea lion summary

The abundance of CSL has increased since the 1990s, both in the Columbia River basin and at specific upriver locations where fish are vulnerable to predation.

Recruitment at each location has followed a similar pattern:

A small number of animals habituate to a location

↓

Recruitment of additional animals is initially low, but increases (sometimes rapidly)

↓

Habituated animals generally arrive earlier and remain at sites longer

↓

These animals appear to habituate easily and return to these sites year after year.

Steller sea lions

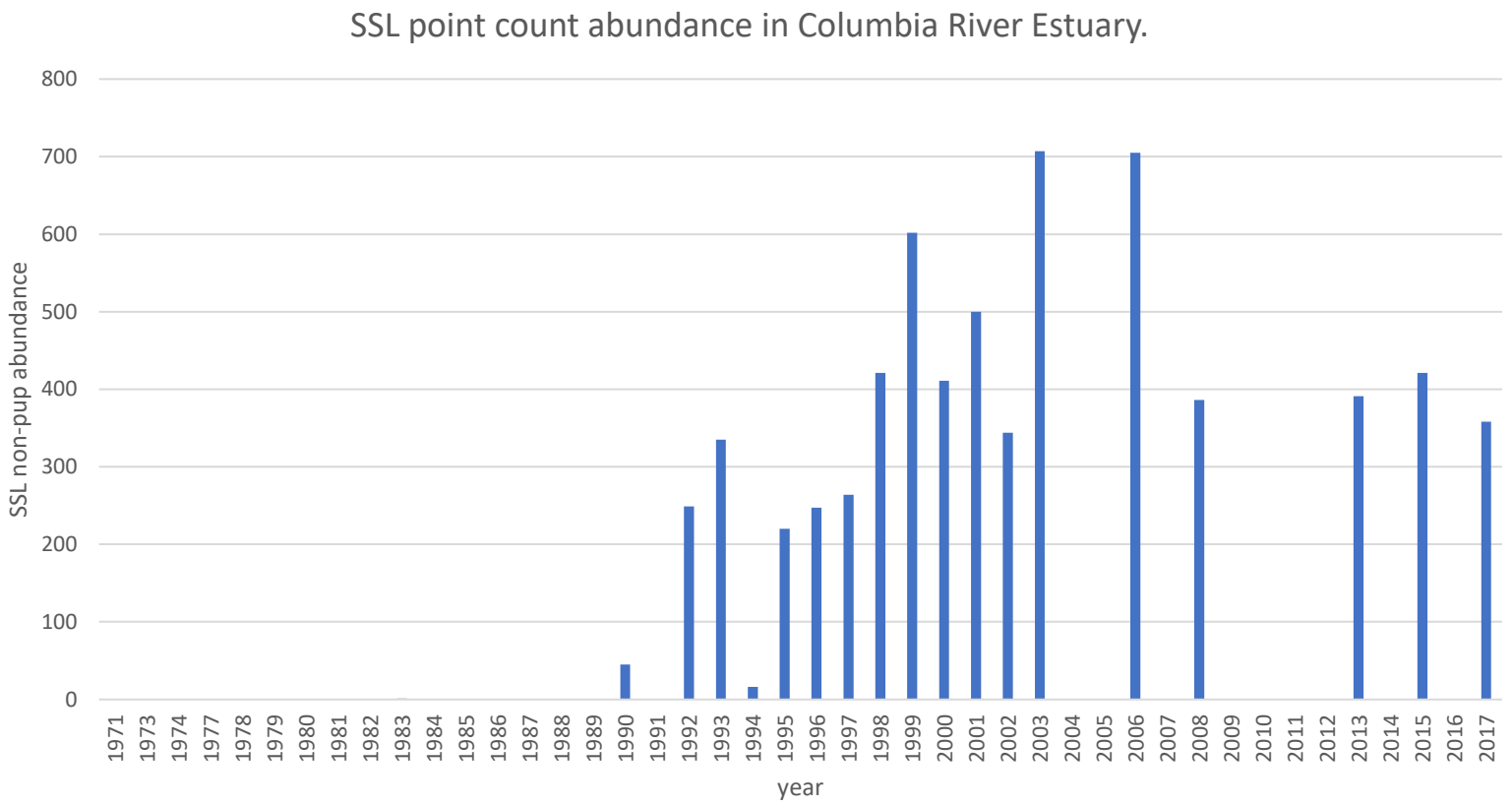

Figure 7. Point count abundance of SSL calculated from aerial photography of the South Jetty in June/Early July. No survey was conducted in years with no data.

Steller sea lions at Bonneville Dam

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Increasing Steller sea lion residency at Bonneville Dam

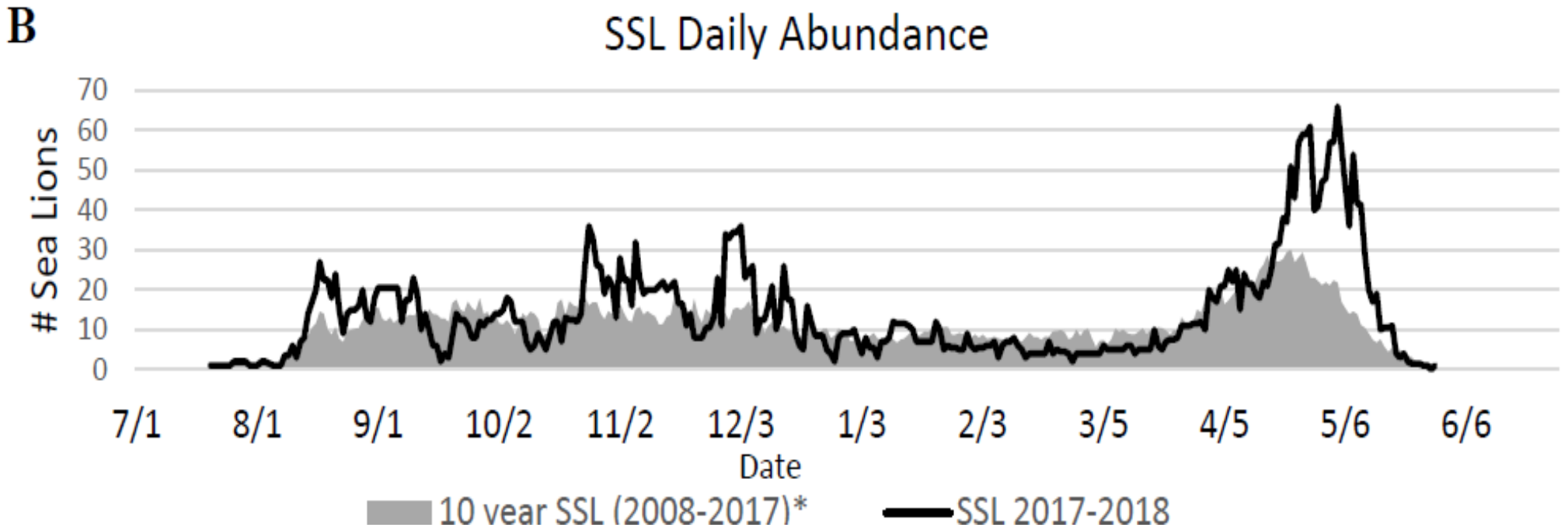

Figure 8. Reproduced from Tidwell et al. (2019). Maximum daily count of SSL at Bonneville Dam from 31 July 2017 through 1 June 2018 compared to the 10-year maximum daily average. For reference: fall and winter sampling period = 15 August – 31 December 2017 and spring period =1 January – 2 June 2018. * Averages for the period 6/1 - 12/31 are calculated since 2011, and do not include years for which sampling was not conducted .

- In the absence of SSL removals, the average number of years an individual has been sighted at the Dam continues to increase and is now higher than that for CSL prior to the start of removals.
- The increased abundance and residency has been coupled with increasing recruitment to the site; over the last three years the USACE has noted increasing abundance of sub-adult animals not previously observed.

Number of Years Observed	All Identified SSL	All Identified CSL
12	1	0
11	3	0
10	0	0
9	0	0
8	1	0
7	3	0
6	3	0
5	3	0
4	3	14
3	2	28
2	11	14
1	4	11
Totals	34	67

Table 2. Reproduced from Tidwell et al. (2019). The number of years that CSL and SSL identified in 2018 were observed at Bonneville Dam, the number of these animals that were listed for removal, and the number that were removed.

Steller sea lions in the Willamette River

- The abundance of SSL has increased over the past decade in the Lower Willamette River below Willamette Falls.
- CSL tend to forage directly at Willamette Falls; SSL are more dispersed throughout the 28 miles of the lower Willamette River, an area not currently monitored.
- Estimates are minimum numbers as majority of animals are unmarked.

Year	Observation dates	SSL max count (date)
2014	2/25-5/29	2 (N/A)
2015	2/3-5/28	2 (multiple dates FEB)
2016	2/1-5/29	1 (multiple dates 2/4-4/16)
2017	1/9-6/11	4 (3/28/2017)
2018	1/8-6/3	11 (2/26/2018)
2019	AUG (2018)-3/19/19	10 (1/18/19, 2/15/19)

Table 5. SSL abundance at Willamette Falls (weekly max count) for 2014-2018 and max count to date in 2019

Steller Sea Lion Summary

The abundance of SSL has increased at Bonneville Dam since ~2010 and at Willamette Falls since ~2017.

Recruitment at each location has followed the same pattern as for CSL:

A small number of animals habituate to a location.

Recruitment of additional animals is initially low, but increases (sometimes rapidly).

Habituated animals generally arrive earlier and remain longer.

These animals appear to habituate easily and return to these sites year after year.

Summary of current timing and abundance of SSL and CSL occupancy

- In general, within the geographic scope of the application, the **interaction between SSL and/or CSL and ESA-listed salmon and other at-risk fish species is currently occurring over an 11 month period**, with a short break in July.
- The specific timing of the interaction varies depending on the location, species, and year.
- It is difficult to determine the maximum number of animals involved as many are unmarked and are transitory between foraging sites.
- Minimum estimates of CSL have ranged from 67-195 at Bonneville Dam and 27-41 at Willamette Falls during the past 5 years.
- The minimum estimates of SSL abundance have ranged from 54-69 at Bonneville Dam and 1-11 at Willamette Falls during the last 5 years.
- The number of animals of each species within the geographic scope of the application that are not accounted for at Bonneville Dam and Willamette Falls is likely <50.
- Thus we estimate the minimum number of animals within the geographical scope of the application to be 144-286 CSL and 105-130 SSL. However observations of marked and unmarked SSL suggest these minimum estimates are biased low.

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California sea lion feeding habits

CR Estuary:

- South Jetty (2003-05, 2007)
- East Mooring Basin (2002-04, 2015-18)

Upper CR:

- Bonneville Dam (2006-08, 2010, 2015-16, 2018)
- Phoca Rock (2016)
- Willamette Falls (2016-18)

	Prey Species	Number	FO %
Columbia River Estuary	Other Prey	1602	97.0
	Salmonids	394	24.0
	Pacific Lamprey	235	14.3
	Sturgeon	4	0.2
Upper Columbia River	Salmonids	84	90.3
	Other Prey	20	21.5
	Pacific Lamprey	17	18.3
	Sturgeon	6	6.5

Steller sea lion feeding habits

CR Estuary:

- South Jetty (2004, 2006-07)

Upper CR:

- Bonneville Dam/Phoca Rock (2007-08, 2010-12)
- Willamette Falls (2018)

	Prey Species	Number	FO %
Columbia River Estuary	Other Prey	309	98.0
	Salmonids	83	26.3
	Pacific Lamprey	46	14.6
	Sturgeon	0	0.0
Upper Columbia River	Sturgeon	86	83.5
	Salmonids	17	16.5
	Other Prey	3	3.0
	Pacific Lamprey	2	2.0

California sea lion feeding habits at Willamette Falls

	Observed predation					% of observations				
Prey	2014	2015	2016	2017	Total	2014	2015	2016	2017	Total
Salmonids	959	1139	1001	753	3852	86.7%	85.2%	83.8%	82.7%	84.7%
Lamprey	126	175	182	145	628	11.4%	13.1%	15.2%	15.9%	13.8%
Other/unk.	18	21	11	12	62	1.6%	1.6%	0.9%	1.3%	1.4%
Sturgeon	3	2	0	0	5	0.3%	0.1%	0.0%	0.0%	0.1%
Total	1,106	1,337	1,194	910	4547	100%	100%	100%	100%	100%

Observed predation by California sea lions at Willamette Falls, 2014-2017

Steller sea lion feeding habits at Willamette Falls

Prey	2014 (2/25-5/29)	2015 (2/3-5/28)	2016 (2/1-5/29)	2017 (1/9-6/11)	2018 (1/8-6/3)
Chinook salmon	0	0	2	0	10
Unknown salmonid	0	0	7	0	8
Steelhead	1	2	0	1	1
Lamprey	0	0	0	0	4
Sturgeon	3	12	8	69	79
Unknown/other fish	0	0	0	5	2
Total	4	14	17	75	104

Summary of all Steller sea lion predation events observed below Willamette Falls by year (approximate dates of effort in parentheses).

California and Steller sea lion feeding habits summary

- Within the geographic scope of this application, the data indicate that the majority of the diet of individual CSL and SSL consists of adult salmonids, lamprey, and/or white sturgeon.

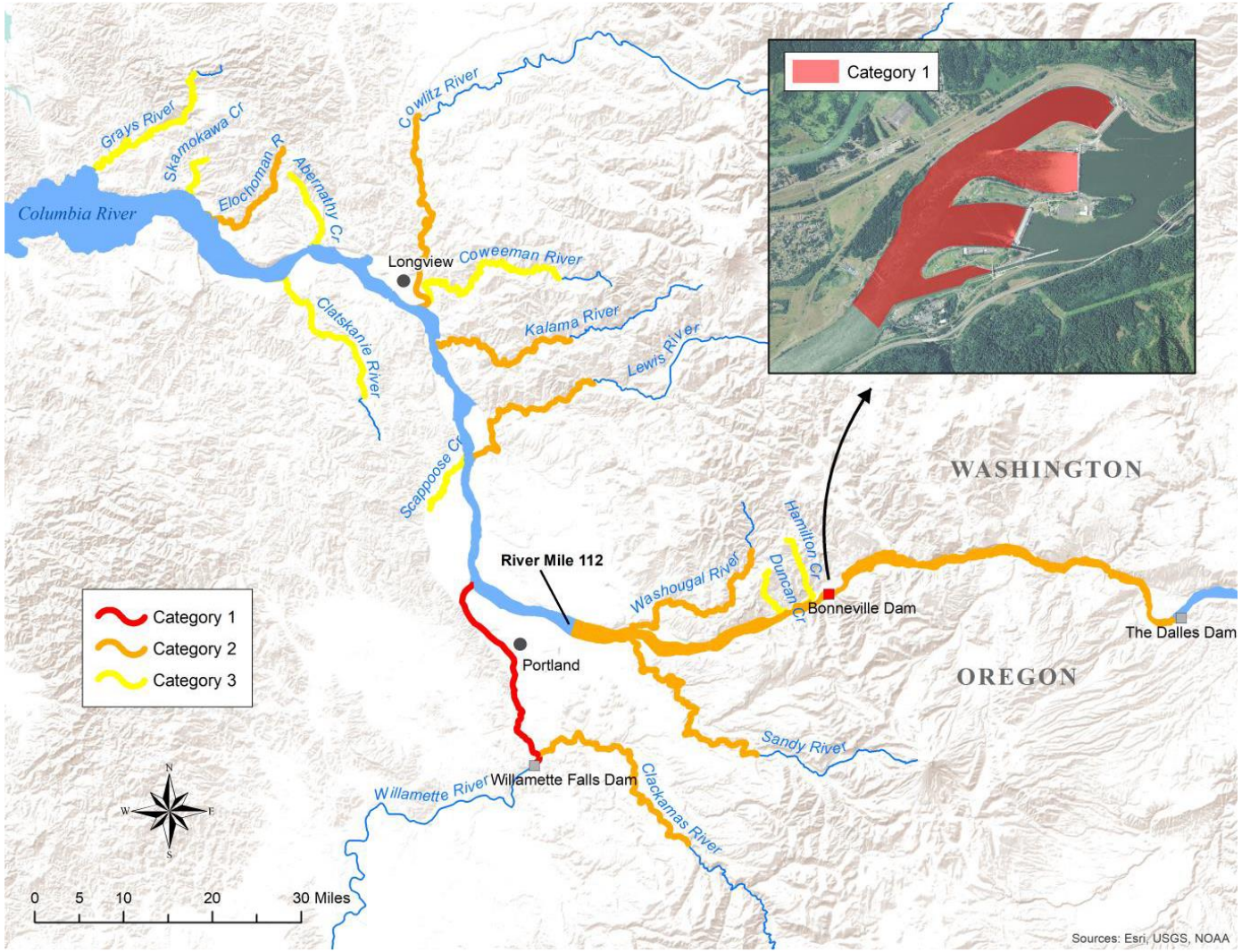
- The proportion of each of these fish species in the diet varies depending on location and sea lion species.

Spatial categorization of the problem interaction

Category 1: High numbers (>20) of CSL and SSL present for majority of the year. Immediate and ongoing conservation risk for fish stocks.

Category 2: Low to moderate numbers present periodically. Conservation concern for fish stocks if left unmanaged.

Category 3: CSL and SSL have not been documented but contain ESA spawning habitat.



MMPA SECTION 120(D) CONSIDERATIONS

Marine Mammal Protection Act Section 120(f)
Pinniped-Fishery Interaction Task Force
Meeting May 2020

Steve Jeffries, WDFW
Bryan Wright / Mike Brown, ODFW
Doug Hatch, CRITFC
Kyle Tidwell, USACE
Kessina Lee, WDFW

PAST EFFORTS TO NON-LETHALLY DETER PINNIPEDS

PAST EFFORTS TO NON-LETHALLY DETER PINNIPEDS

Marine Mammal Non-Lethal Deterrents:

Summary of the Technical Expert Workshop on Marine Mammal Non-Lethal Deterrents, 10-12 February 2015, Seattle, Washington

Workshop Steering Committee:
Kristy J. Long (Chair)
Monica L. DeAngelis
Laura K. Engleby
Deborah A. Fauquier
Amanda J. Johnson
Scott D. Kraus
Simon P. Northridge

United States Department of Commerce
National Oceanic and Atmospheric Administration
National Marine Fisheries Service

NOAA Technical Memorandum NMFS-OPR-50
July 2015

ACTIVE – ACOUSTIC DETERRENTS (ADD < 180 dB; AHD > 180 dB)		
Species	**Deterrent**	**Highlights from Studies**
California sea lion (CSL); Steller sea lion	ADDs	• Controlled study with gillnet/pinger – initial reactions of avoidance, with defensive and agonistic behaviors; normal behavior returned shortly after; took fish readily from pingered nets; pingers did not prevent contact with net 36
	AHD	• Behavioral changes/adjustments to deal with sounds; temporarily deter • Leave area when AHD on and return when it's off • Possibly more effective on "new" animals vs. "repeat" ones • Increased effectiveness when used in combination with other measures (vessel hazing, seal bombs) 81-82
	Explosives (seal bombs, cracker shells)	• Variable responses 82 • Initial startle; temporary avoidance of area; eventual tolerance of noise 82 • Change.org 2011 seal bomb prohibition petition – fishermen put bombs into bait fish and feed to sea lions; M/SI 83
ACTIVE – TACTILE (MANUALLY APPLIED, PROPELLED)		
California sea lion (CSL); Steller sea lion	Rubber projectiles, paint balls	• Deterrence effect variable; limited; temporary 82
	Rubber batons (bullets) or buckshots	• Deterrence effect variable; limited; temporary 82

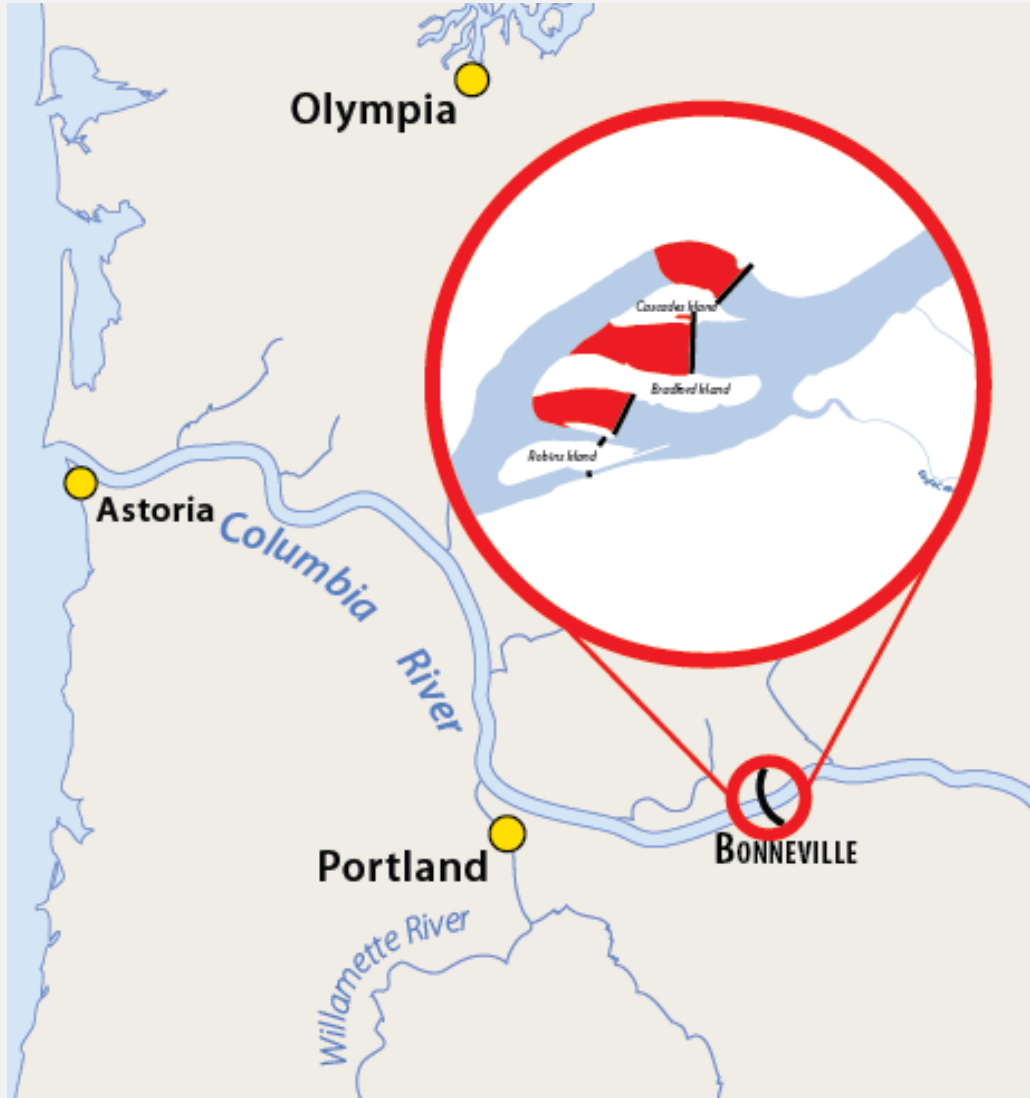
ACTIVE – CHEMOSENSORY (TASTE, SMELL AVERSION)		
California sea lion (CSL)	Tainted bait (lithium chloride)	• In one study – definite aversion to tainted fish [96] • In another study – differing responses from two animals (possible explanations for this include amount of food eaten and speed of initial response to tainted bait) [97] • Field studies inconclusive; ingestion of tainted fish and responses difficult to measure [98]
ACTIVE – VISUAL (VESSEL CHASING)		
California sea lion; Steller sea lion	Boat hazing	• Field use – responses variable and temporary; animals learn to swim under boat; resist leaving area [82] • Most effective when used in combination with other techniques like underwater firecrackers [82]
PASSIVE - VISUAL (FLASHING LIGHTS, FLAGS, PREDATOR SHAPES)		
California sea lion	Predator (killer whale) model	• News article – indicated the predator model appeared to be effective; length of time used not given; not a controlled study; other deterrence methods were being used at the same time [100] • When tested in field at Ballard Locks – short-lived or no deterrence effect; not practical [101]
PASSIVE - PHYSICAL BARRIER (ANTI-PREDATOR NETTING, ELECTRIC FIELDS,		
California sea lion	SL exclusion device	• SLEDs installed at entrances to fish ladders generally prevented CSL from entering; CSL continued feeding at the ladder entrance [82]
	Electric field	• CSL were extremely sensitive to a mild, underwater field of pulsed DC electricity; with food present, strong deterrence occurred at pulse widths ranging from 160 to 440 µS [105]

Table 4. Summary of ODFW hazing efforts at Willamette Falls from 2010-2013.

	Effort			Deterrents			Animals Exposed to Hazing	
Year	Start	End	Days	Shell Crackers	Rubber projectiles	Seal bombs	CSLs	SSLs
2010	3/26	4/30	8	~800	~30	~400	NA	0
2011	2/7	4/26	49	6,863	135	2,771	860	0
2013	2/4	4/29	81	10,976	601	8,042	1,871	45

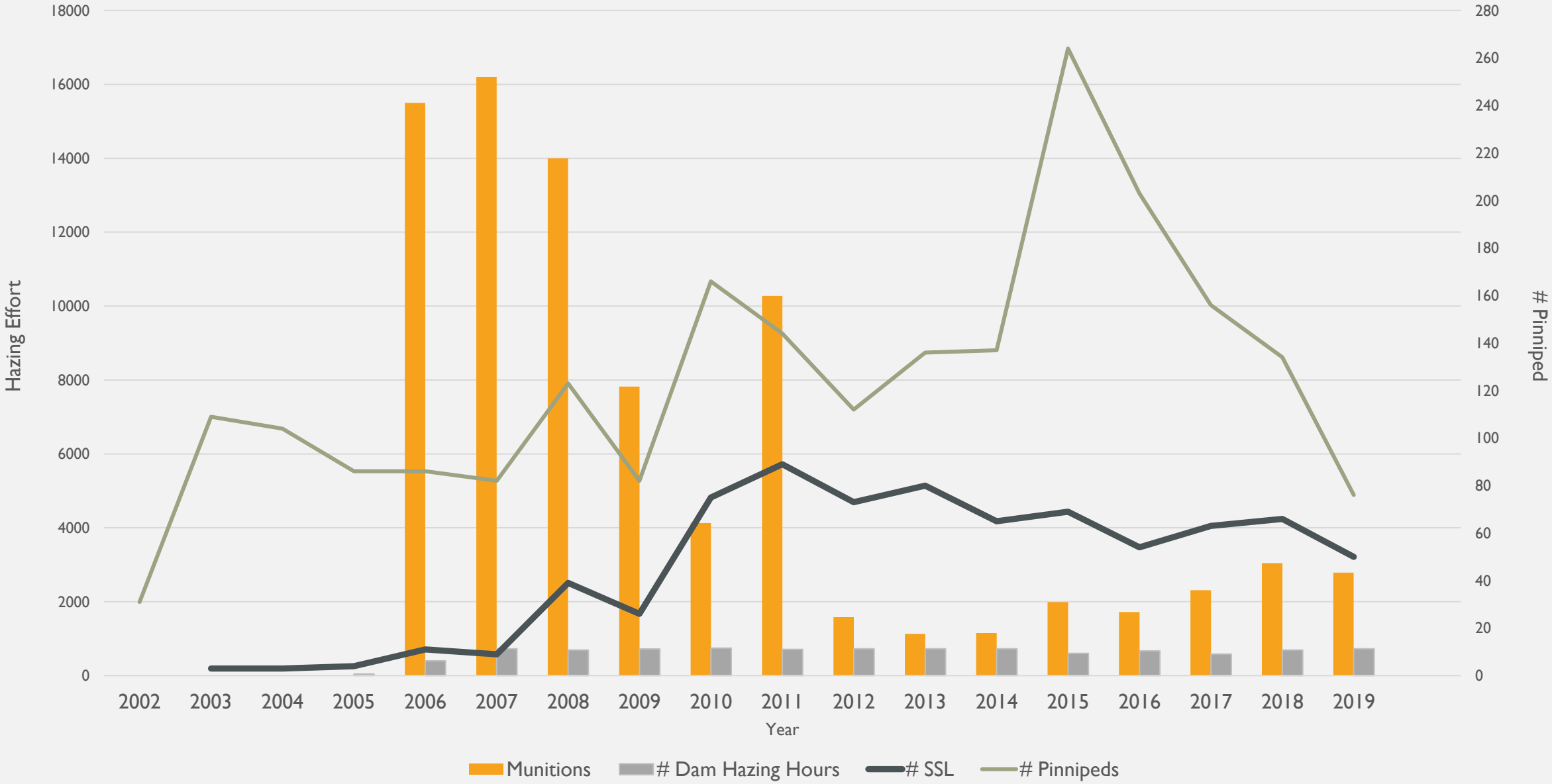
BOAT-BASED HAZING METHODS

- Conducted during daylight hours (started in 2006)
- From Bonneville Dam to roughly 6 miles downstream (3/4 time in BRZ)
- Vessel chase, seal bombs, cracker shells
- Use maximum of 5 munitions per animal per hazing event (since 2012)
- Approach the animal(s) from upstream and place munitions between boat and animals
- After 1000 fish / per day are counted at Bonneville – no more seal bombs used in the tailrace BRZ
- Coordinate with USACE Control Room and Fisheries Field Unit and USDA Wildlife Services staff
- Stay 30 m from all project structures and 50 m from fishway entrances.
  - No seal bomb use within 100m of fishways, floating orifices, Corner collector flume, or smolt outfall.
- Data Recorded
  - Time and location of initial encounter, species, direction of movement, fish kill information, numbers and types of munitions used, location and direction at the end of the encounter

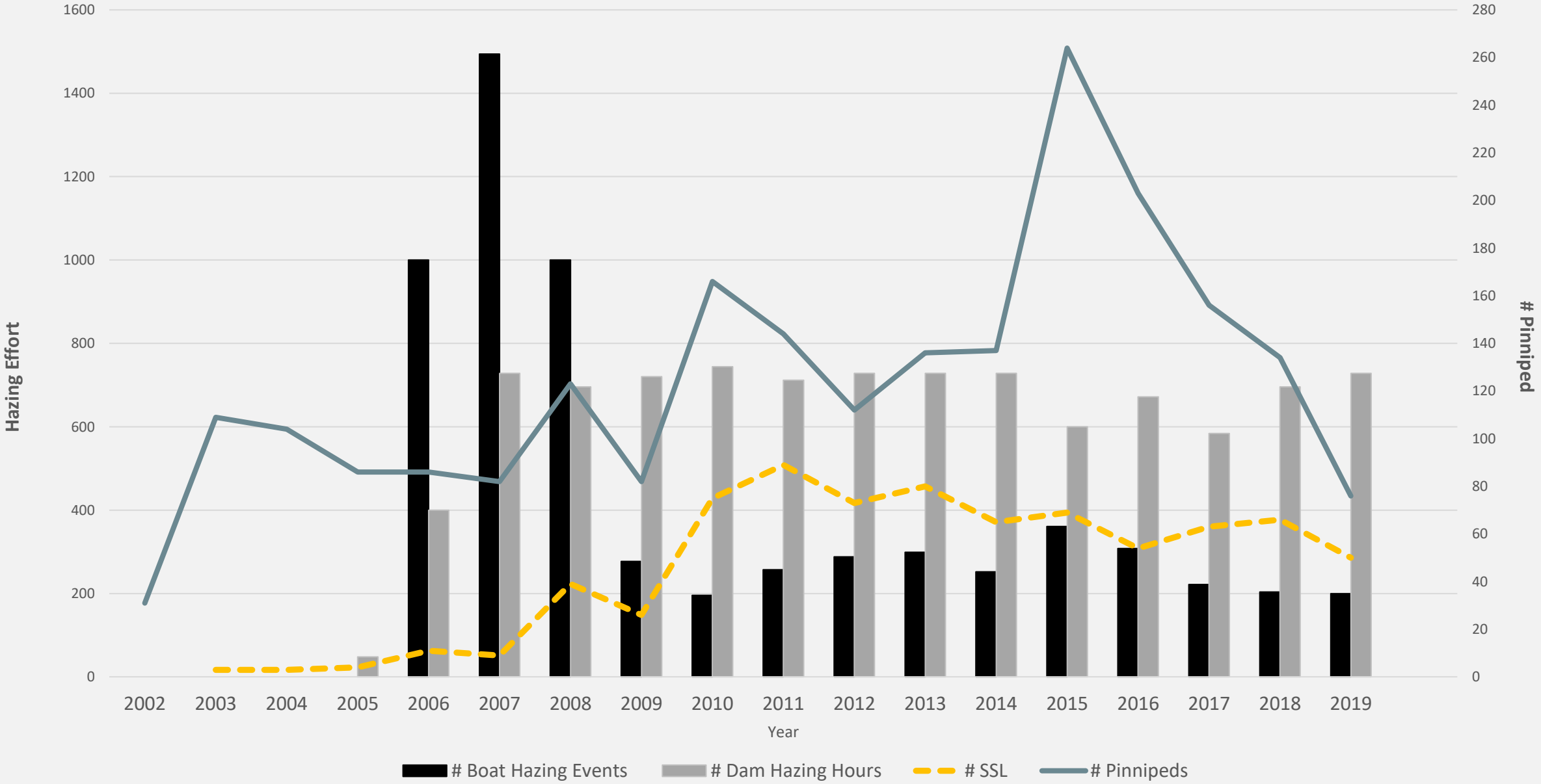


BOAT-BASED HAZING AT BONNEVILLE

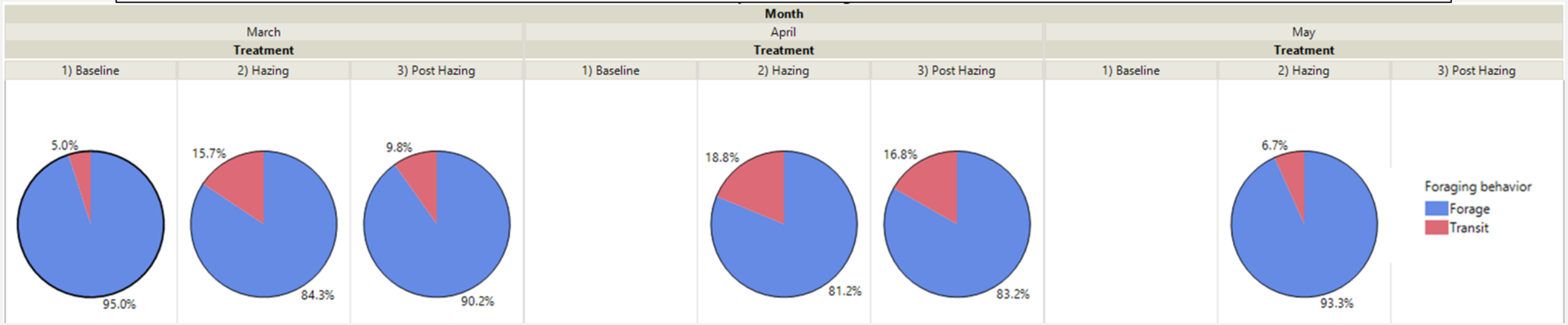
2002-19 BONNEVILLE HAZING EFFORT AND ABUNDANCE



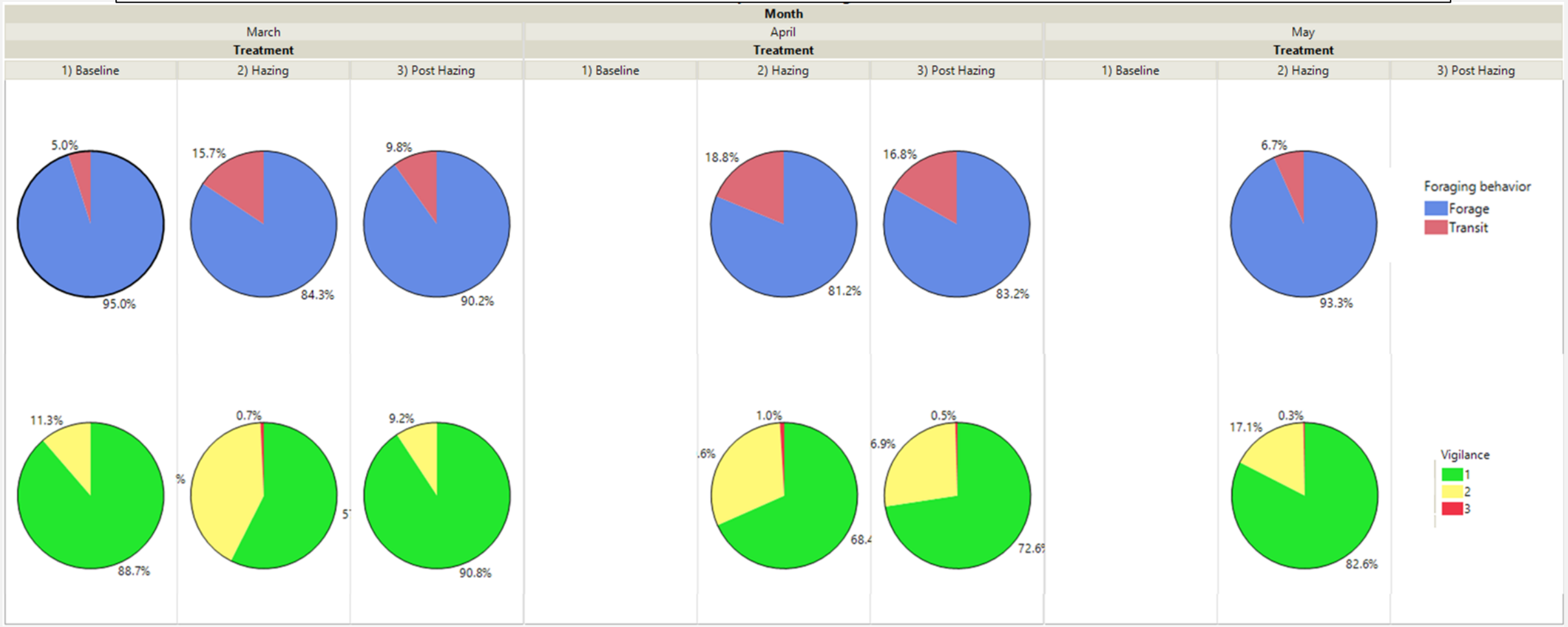
2002-19 BONNEVILLE HAZING EFFORT AND ABUNDANCE



BEHAVIORAL RESPONSE TO HAZING SSL AT BON



BEHAVIORAL RESPONSE TO HAZING SSL AT BON



SUMMARY

- Conducted non-lethal hazing at Bonneville Dam since 2005 using approximately 100,000 munitions.
- SSL became habituated at Bonneville Dam during periods of intense hazing.
- Hazing generally has an immediate effect of moving animals but these animals move back to their pre-haze locations within hours of the action.
- Due to ineffectiveness, hazing was not included in the terms and conditions of the current Willamette Falls LOA.
- Goal of doing removals quickly will be better for salmon and for sea lions, with less recruitment necessitating fewer removals over time.

Are CSL/SSL causing undue injury to fish stocks?

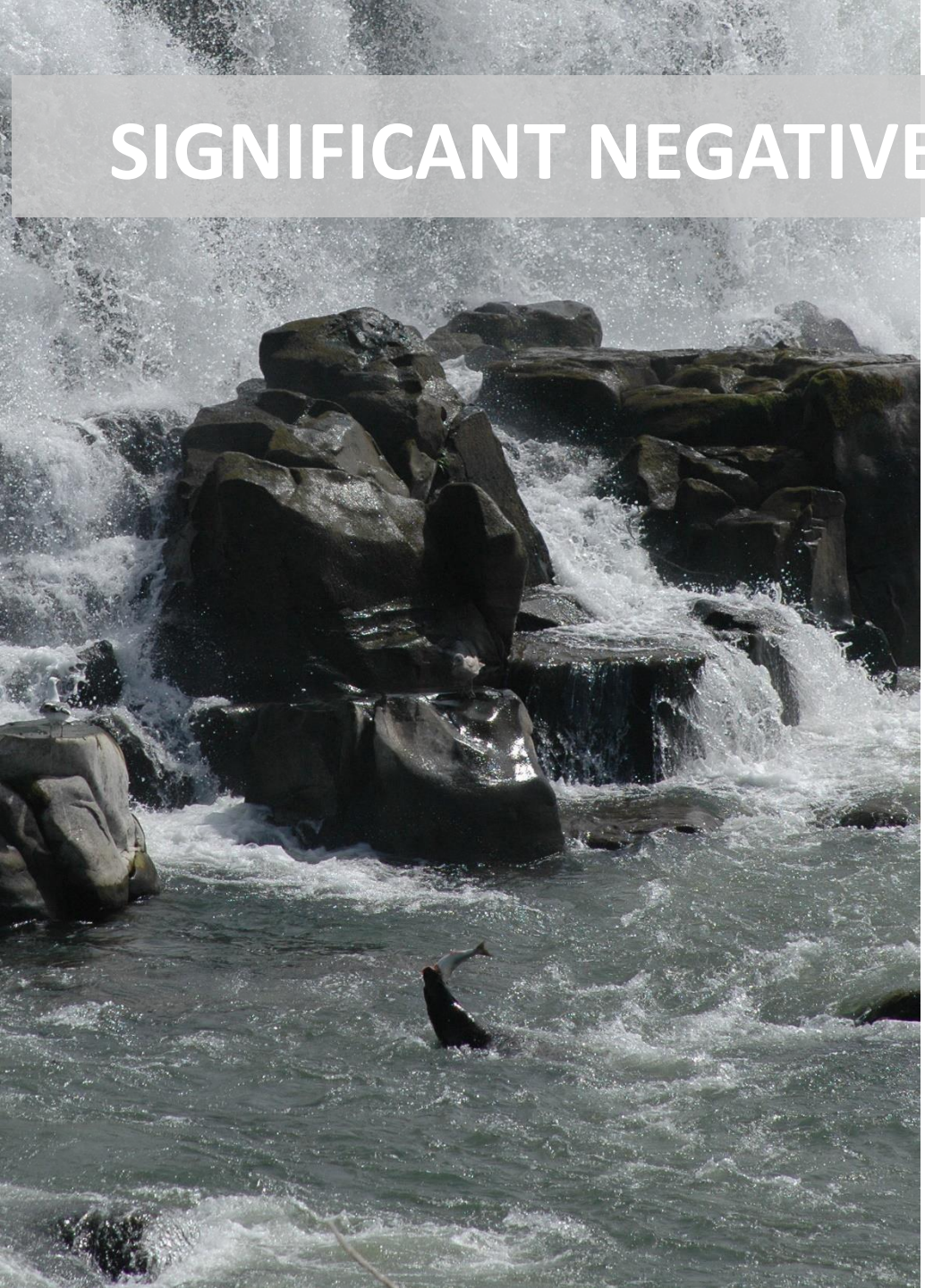
COLUMBIA BASIN | FISH STOCK STATUS

ESA-listed Columbia Basin salmonids	Status
Upper Columbia R. Spring Chinook	Endangered
Snake R. Spring/Summer Chinook	Threatened
Lower Columbia R. Steelhead	Threatened
Mid-Columbia R. Steelhead	Threatened
Snake R. Steelhead	Threatened
Lower Columbia R. Chinook	Threatened
Upper Willamette R. Chinook	Threatened
Upper Willamette R. Steelhead	Threatened
Upper Columbia R. Steelhead	Threatened
Snake R. Fall Chinook	Threatened
Columbia R. Chum	Threatened
Lower Columbia R. Coho	Threatened
Snake R. Sockeye	Endangered
Southern DPS of Eulachon	Threatened

SECTION 120F

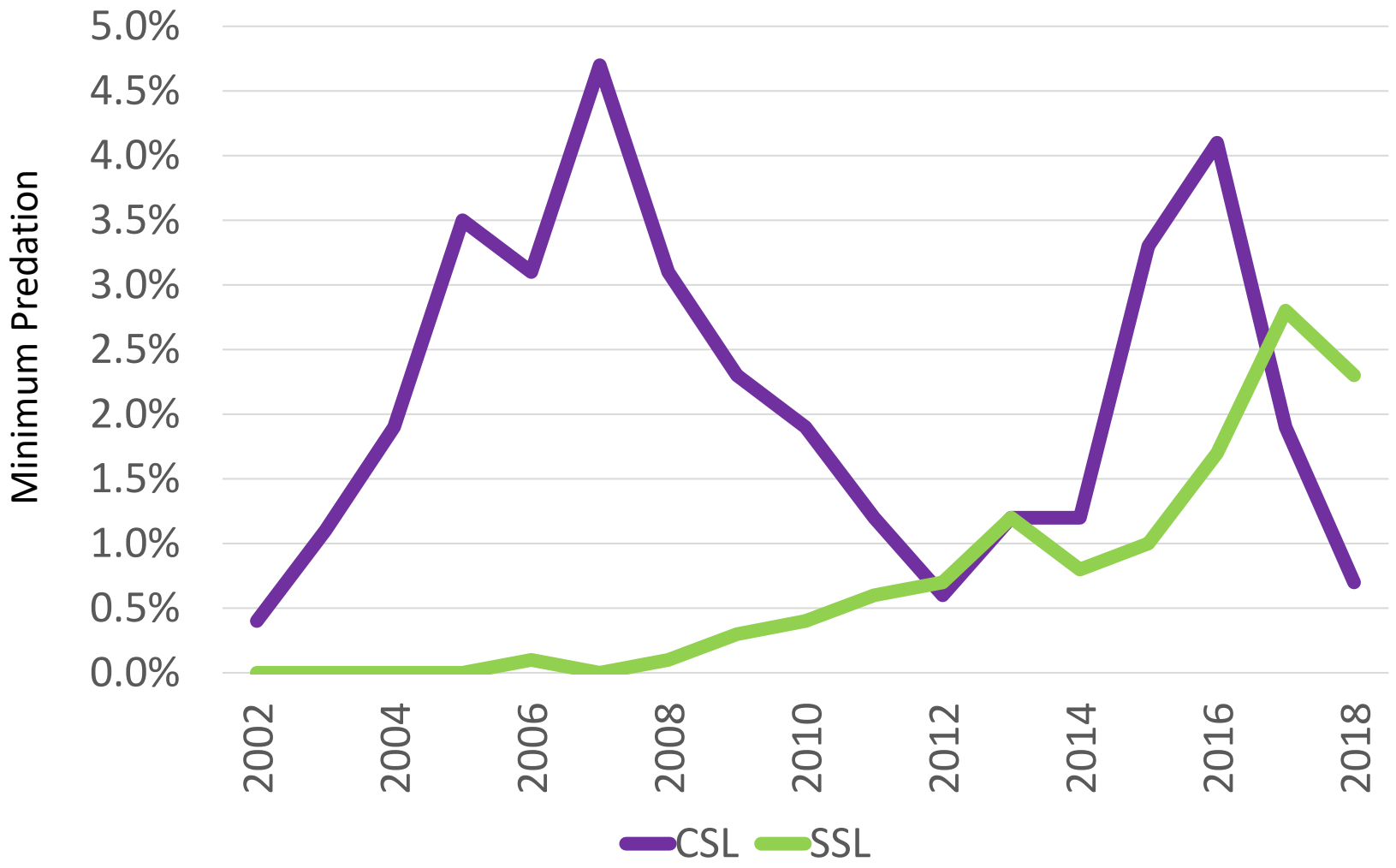
Any sea lion located in the mainstem of the Columbia River upstream of river mile 112 and downstream of McNary Dam, or in any tributary to the Columbia River that includes spawning habitat of threatened or endangered salmon or steelhead **is deemed to be having a significant negative impact**.

SIGNIFICANT NEGATIVE IMPACT

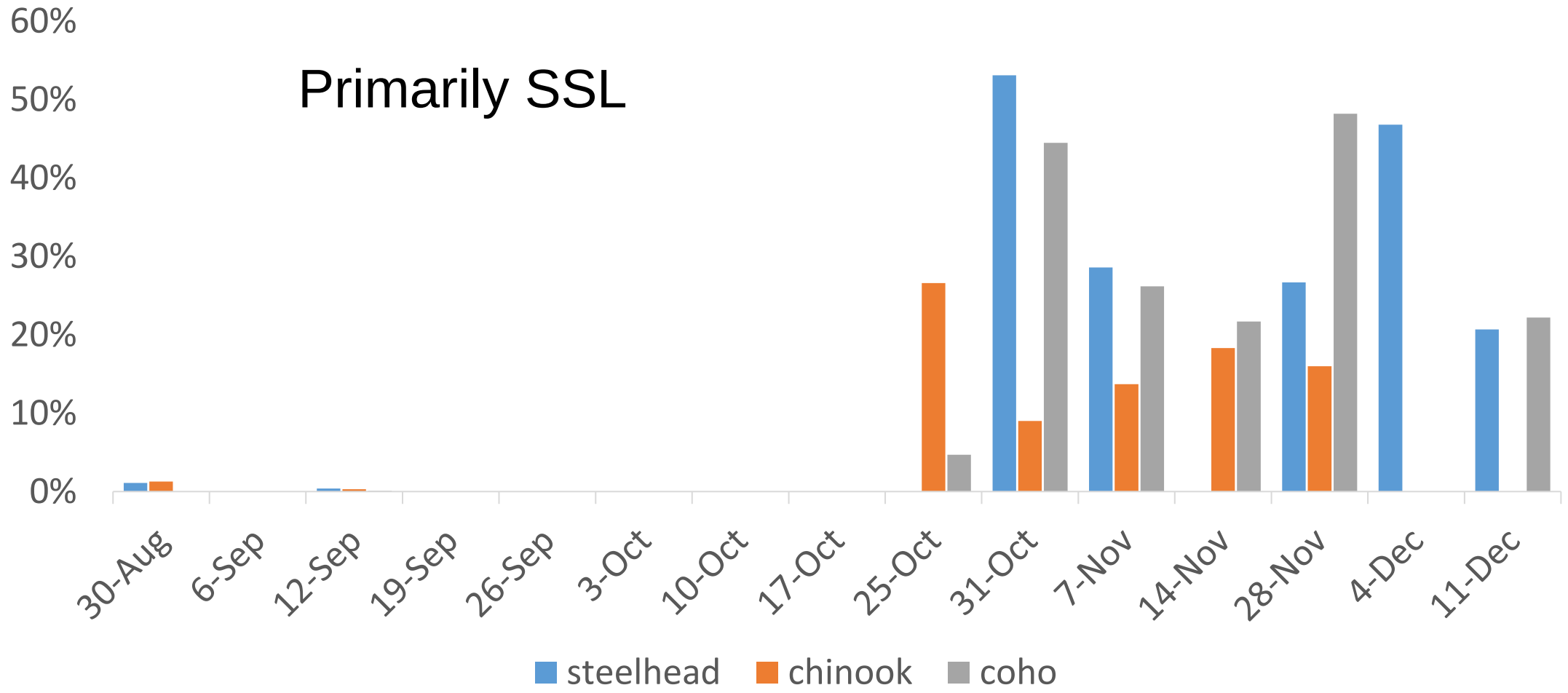


Designation based on experience at Ballard Locks, Bonneville, and Willamette Falls over last 30 years

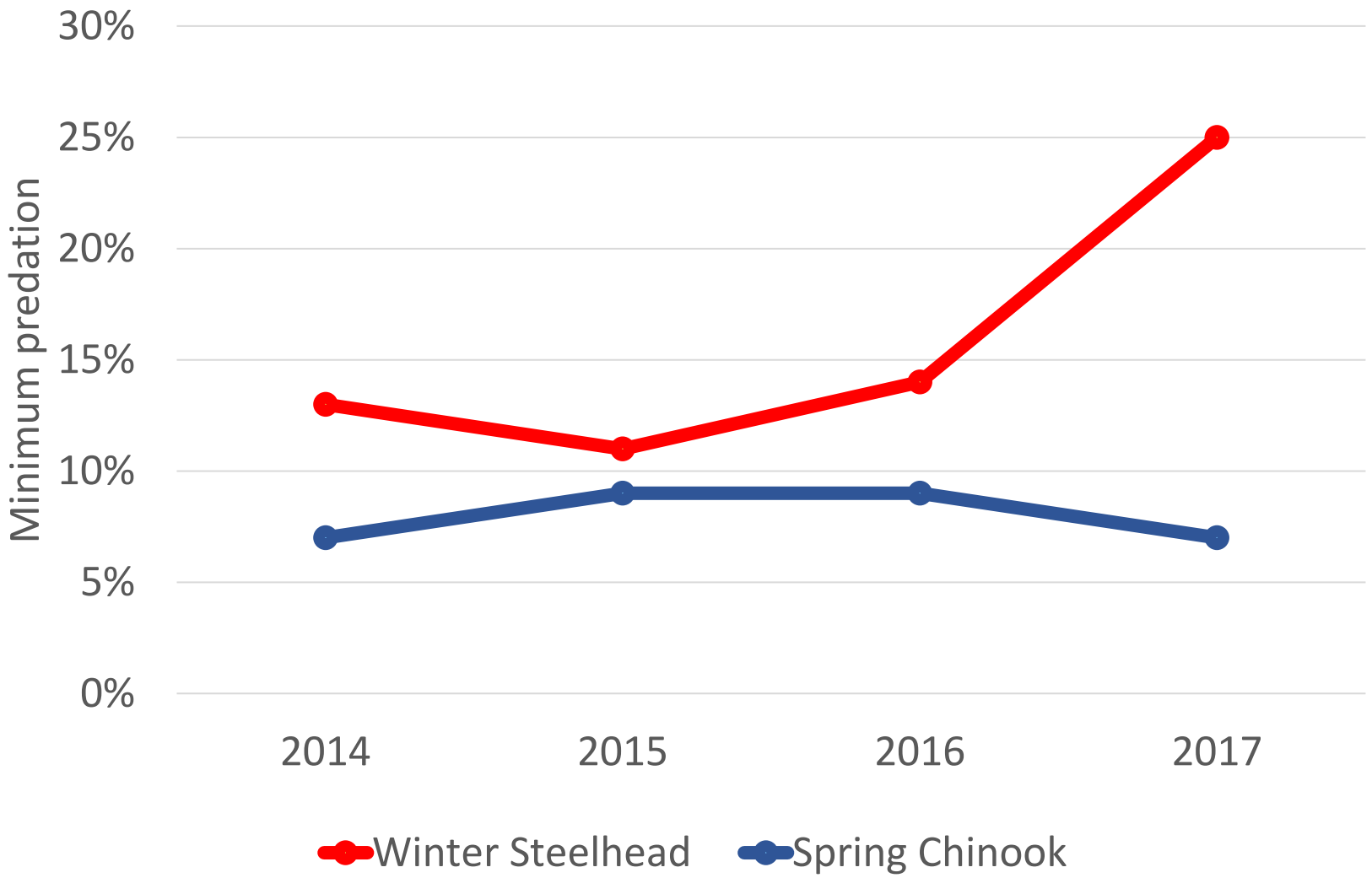
BONNEVILLE DAM SPRING PREDATION ON SALMONIDS



BONNEVILLE DAM FALL PREDATION ON SALMONIDS



WILLAMETTE FALLS **PREDATION RATES**



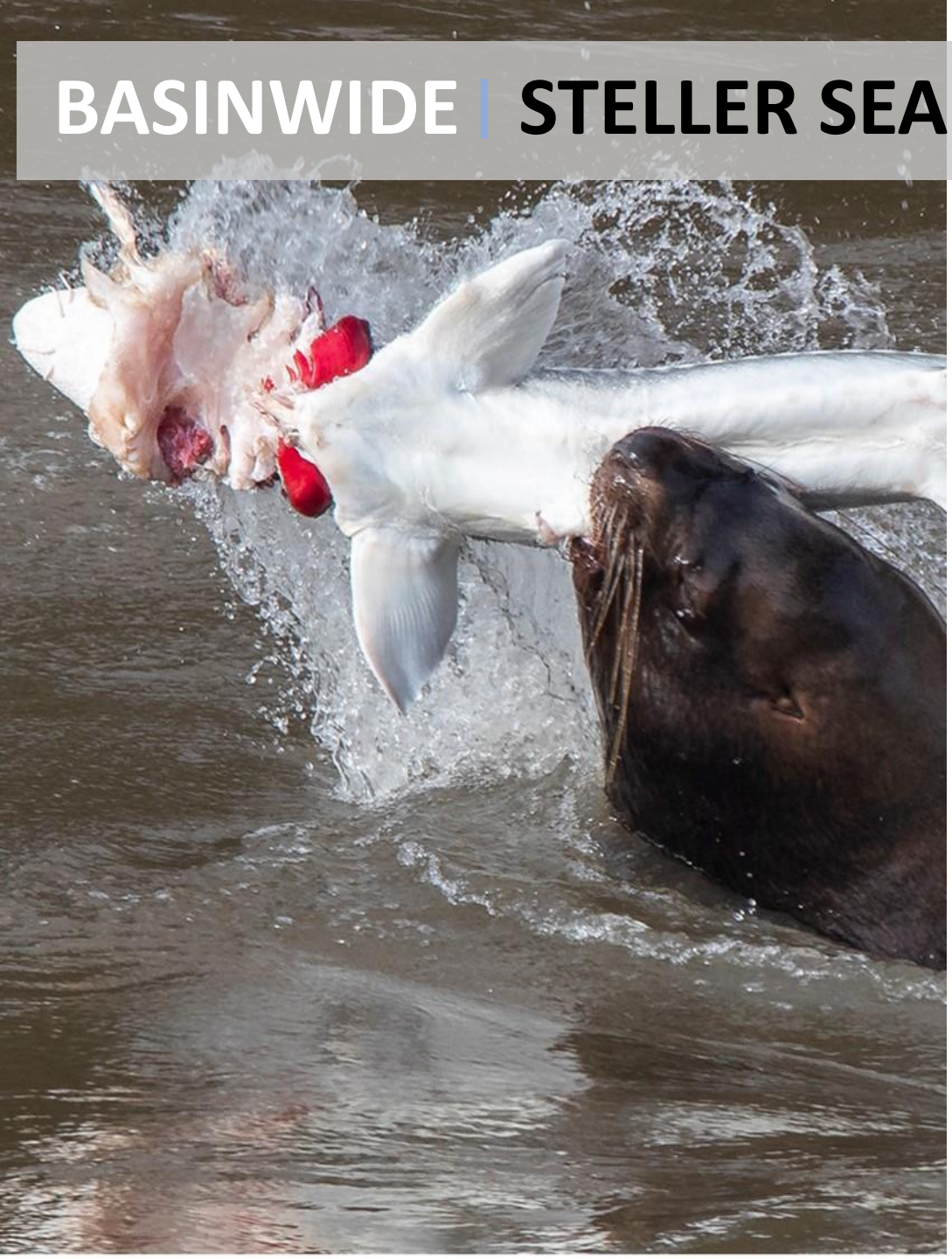
WILLAMETTE WINTER STEELHEAD | EXTINCTION RISK

Scenario		Single Population		
		North Santiam	South Santiam	Molalla
Without Sea Lions		2%	5%	0%
With Sea lions	lowest observed predation (2015)	8%	16%	0%
	average predation (2016)	27%	34%	2%
	highest observed predation (2017)	64%	60%	21%

MCKENZIE SPRING CHINOOK | EXTINCTION RISK

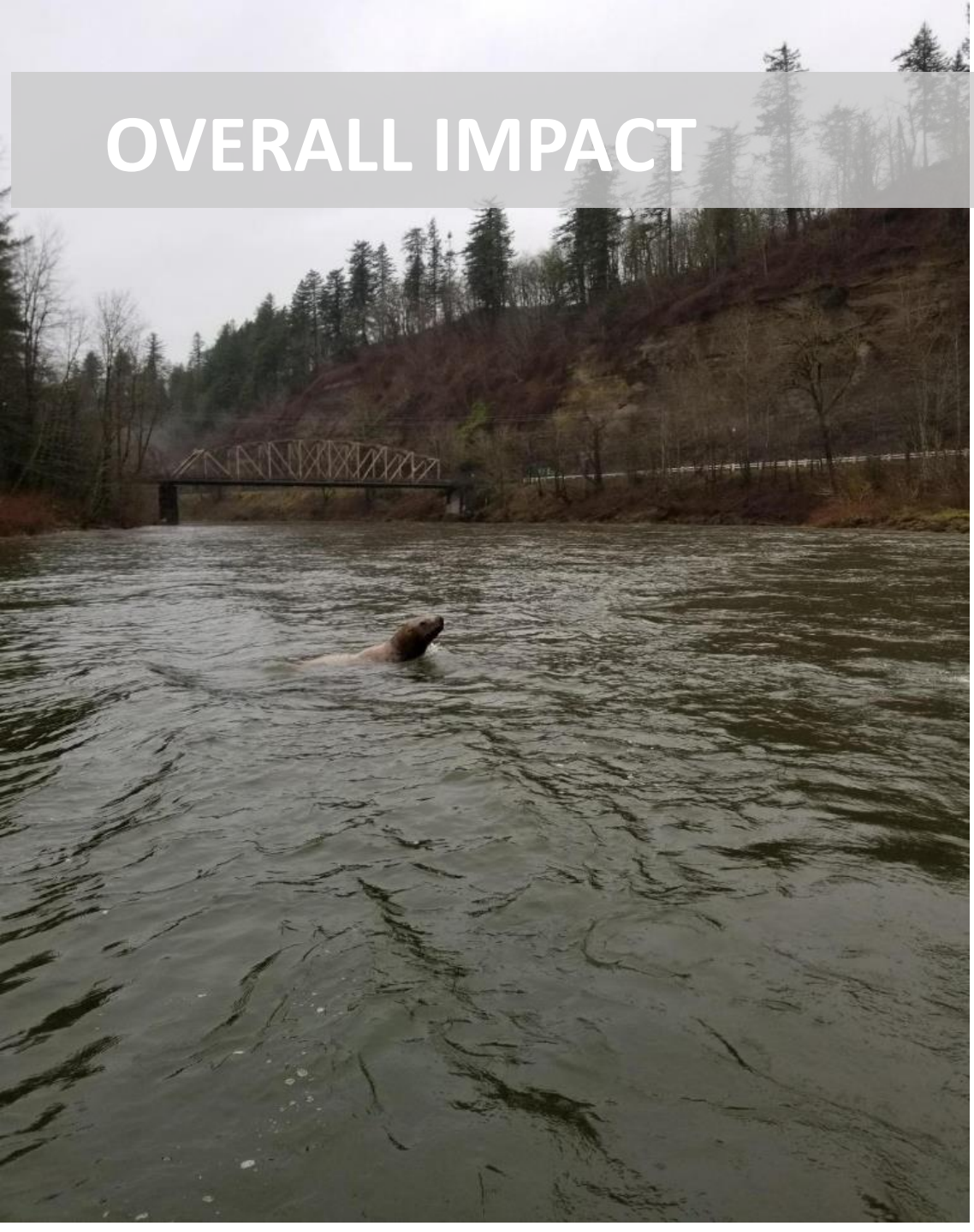
Scenario		Single Population
		McKenzie
Without Sea Lions		20-30%
With Sea lions		
	highest observed predation (2015/16)	33-45%

BASINWIDE | STELLER SEA LIONS & STURGEON



- Target spawners
- Displace spawners

OVERALL IMPACT



- Extends beyond Bonneville and W Falls
  e.g., Clackamas, Mainstem Columbia
- Occurs outside of the daylight hours

SECTION 120F

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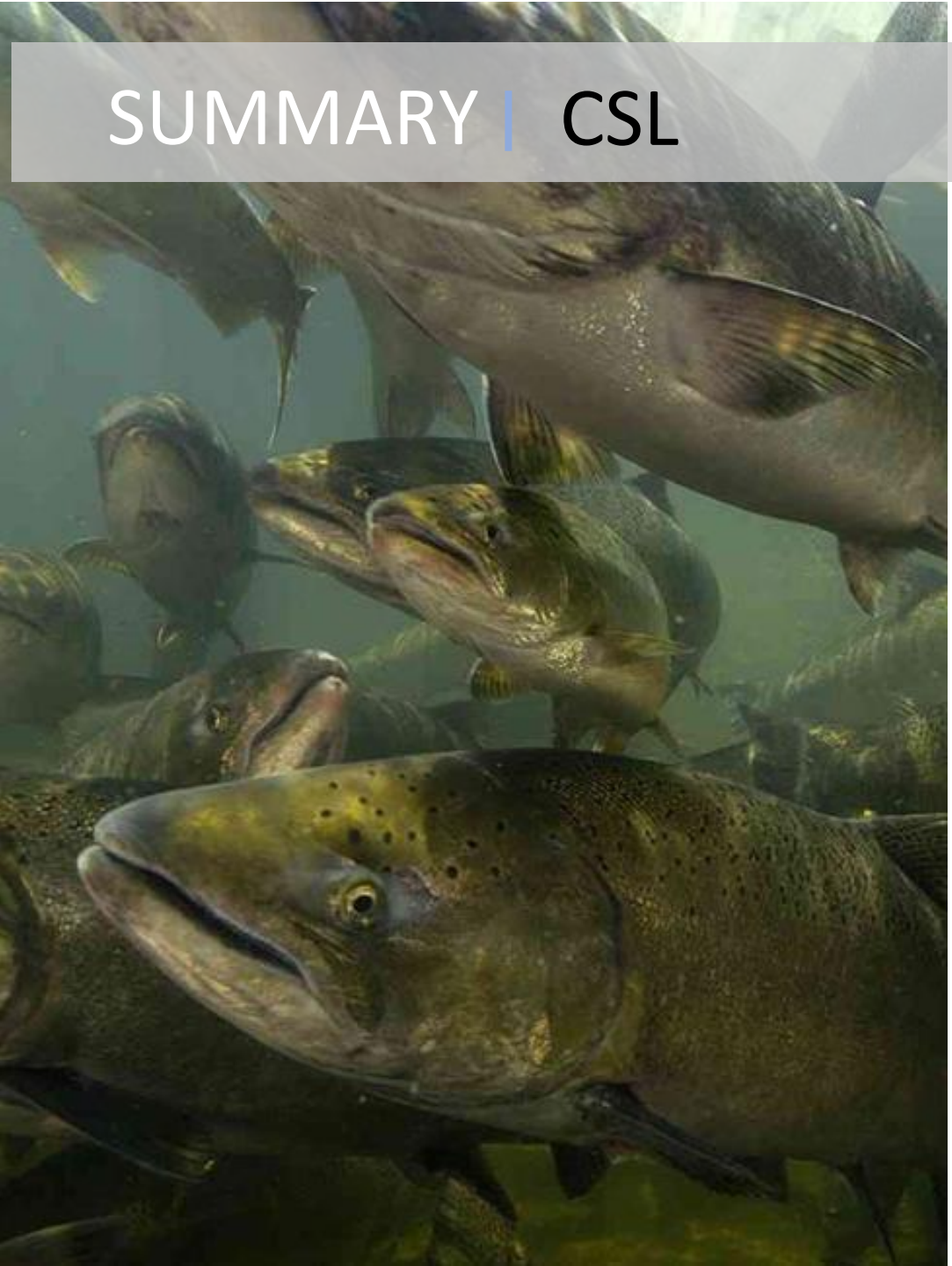
SUMMARY | CSL



California sea lion

250-300,000

Population abundance

CSL in the

~144-286

Geographic scope of Application

Months Present

10

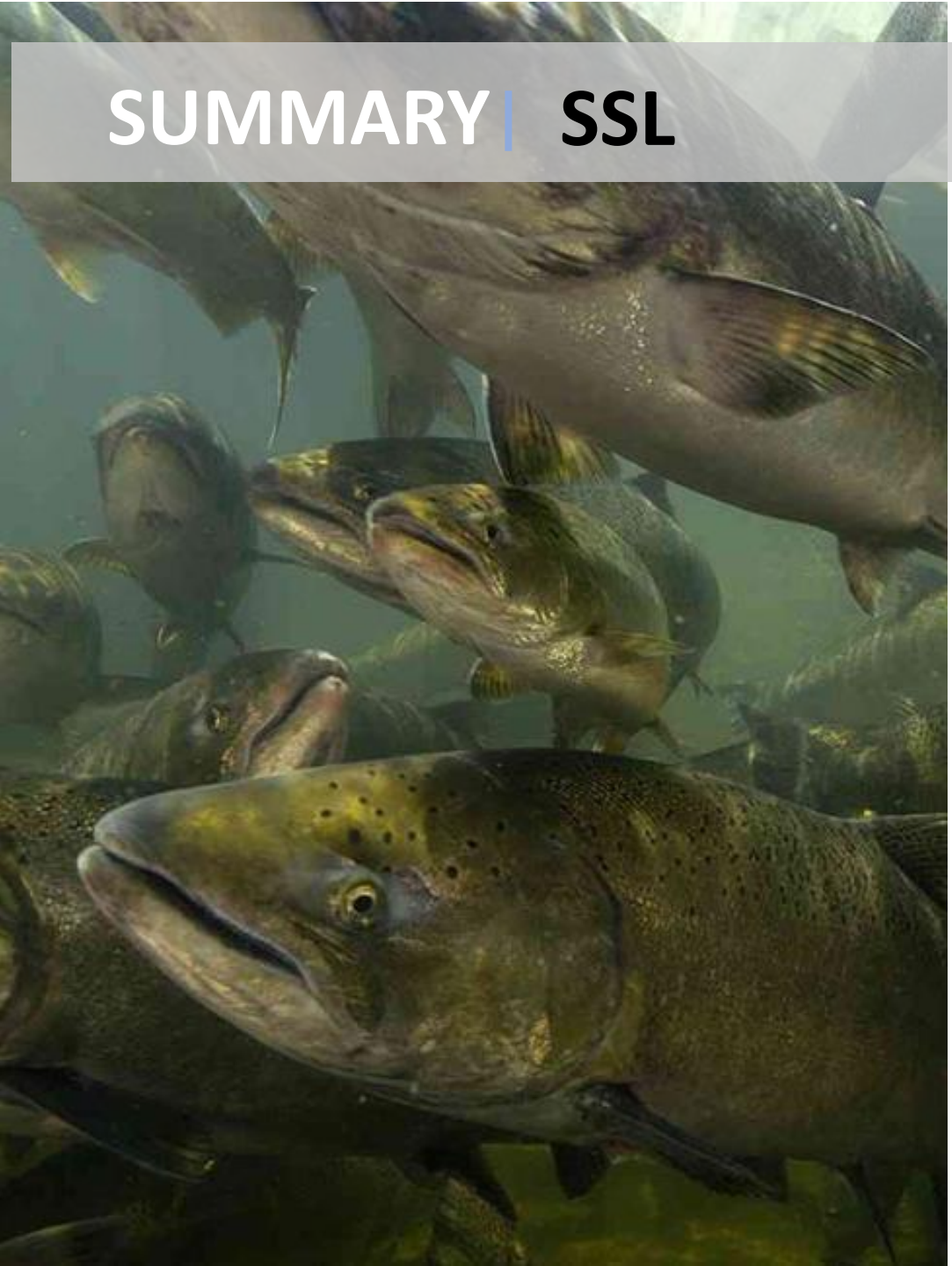
Per Year

Most Common

Salmon

Prey Item

SUMMARY | SSL



Easter Stock Steller Sea lion

~72,000

abundance

Sea lions in the

~105-130

Geographic scope of Application

Months Present

11+

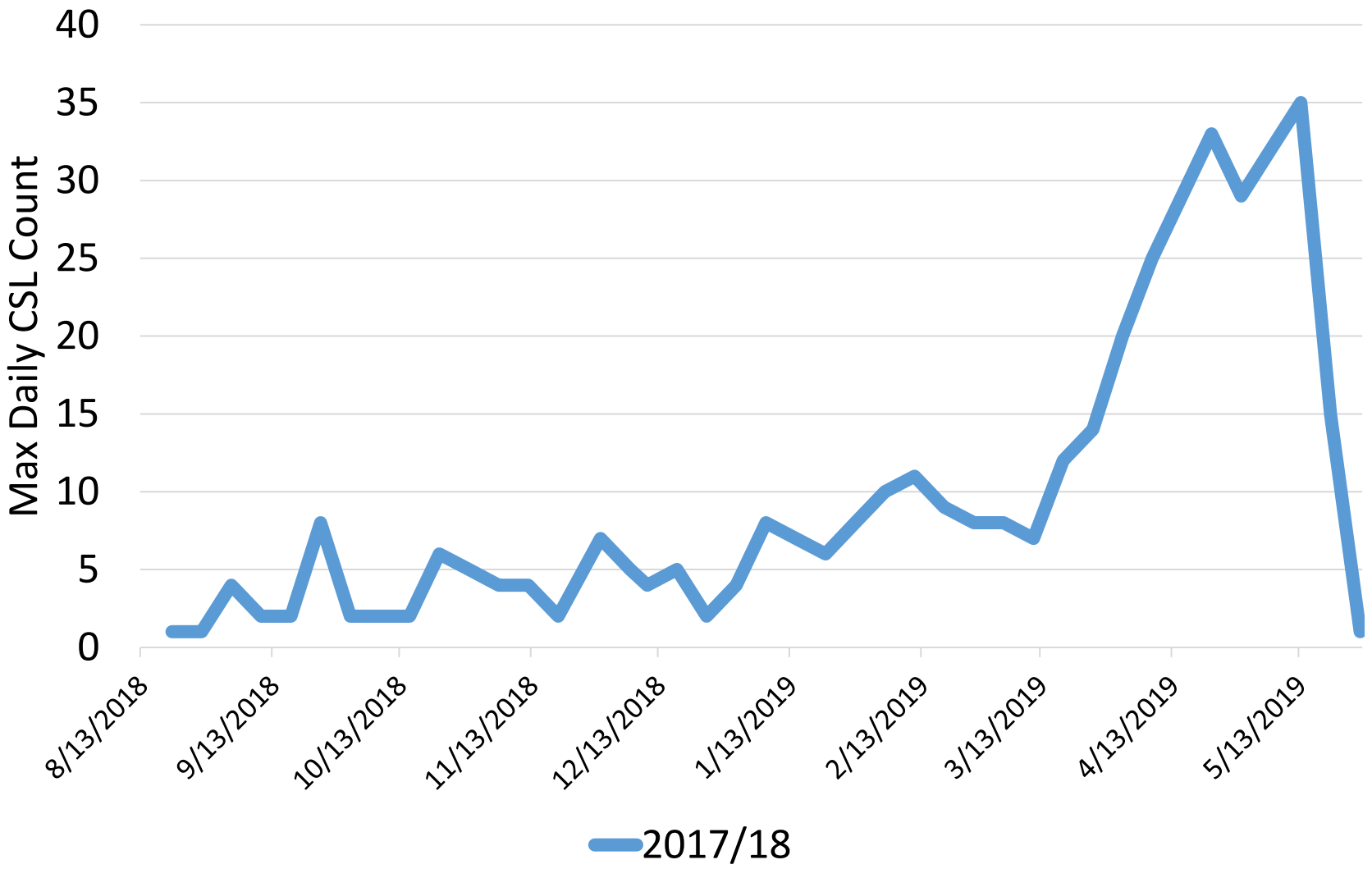
Per Year

Most Common

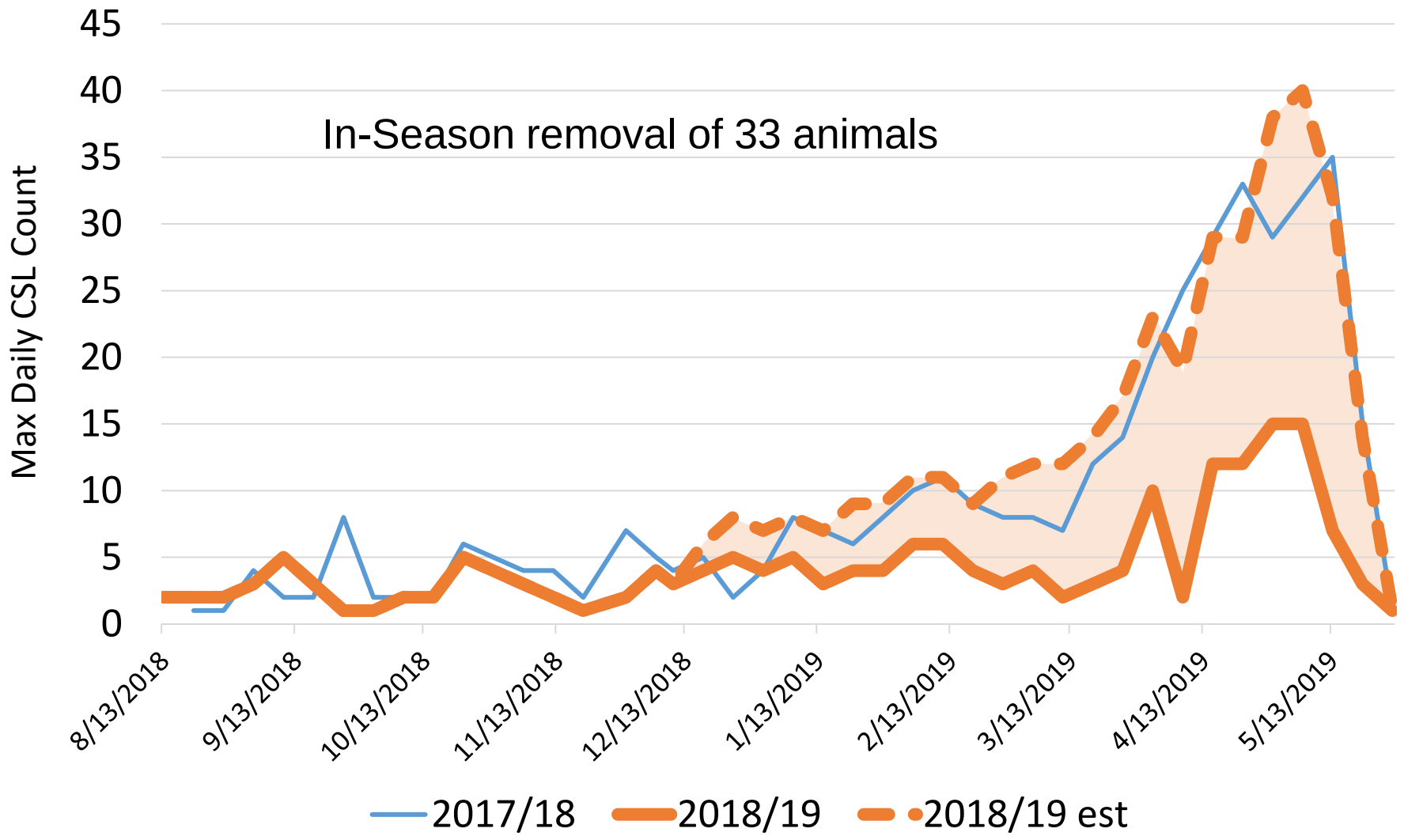
Salmon & Sturgeon

Prey Item

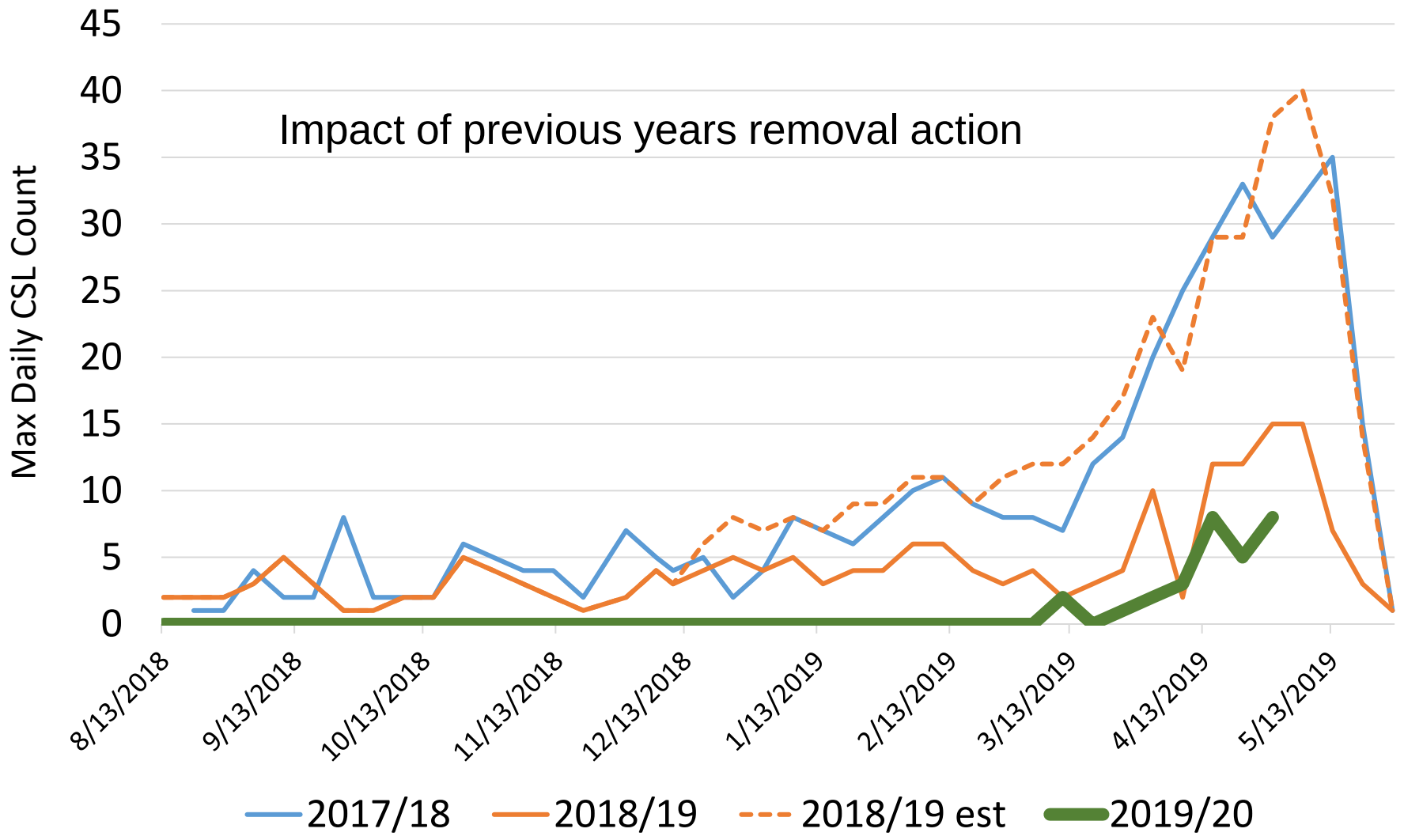
WILLAMETTE FALLS | REMOVAL DECREASES CSL PRESENCE

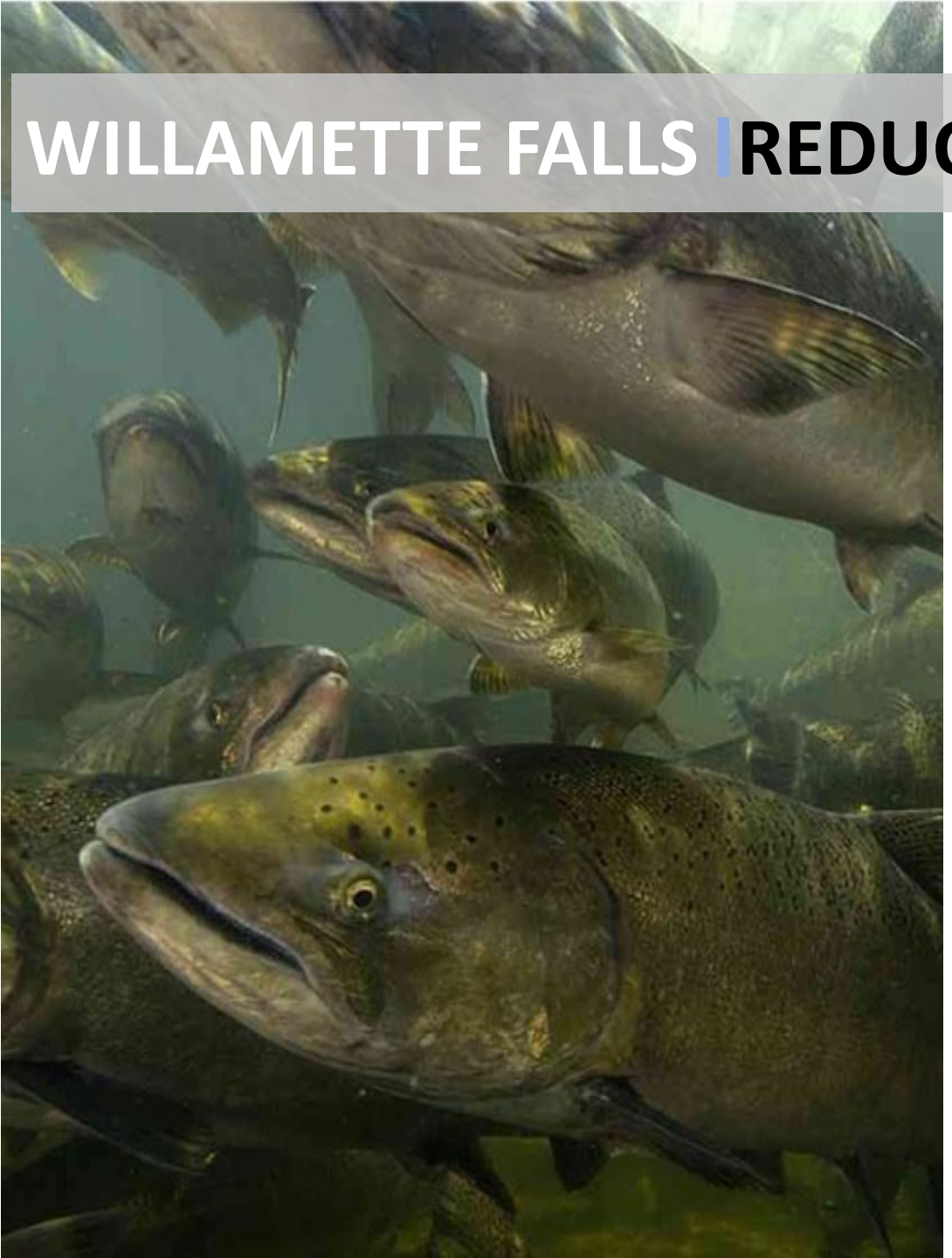


WILLAMETTE FALLS | REMOVAL DECREASES CSL PRESENCE

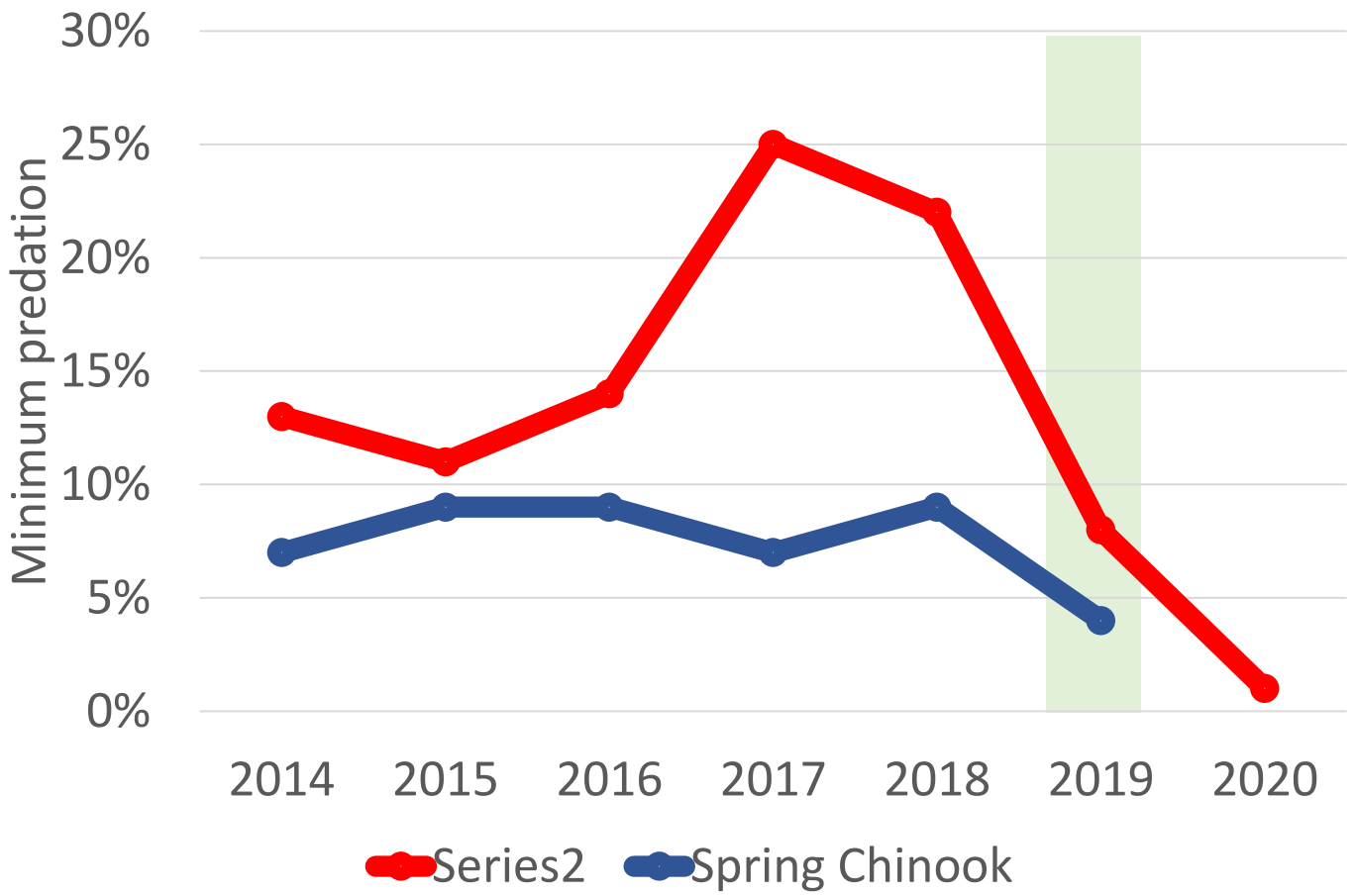


WILLAMETTE FALLS | REMOVAL DECREASES CSL PRESENCE





WILLAMETTE FALLS | REDUCED PRESENCE = LOWER PREDATION



Do CSL pose a risk to human safety?