

# 15 YEARS OF SEA LION MONITORING: RECENT FINDINGS, LESSONS LEARNED, AND FUTURE DIRECTIONS

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US Army Corps of Engineers  
**BUILDING STRONG**





**Marine Mammal Protection Act**

**CSL abundance and fish predation increase**

**CSL increase at Bonneville**

**CSL removal LOA renewed**

**1972**

**1980's**

**2000**

**2002**



**2006**

**2016**

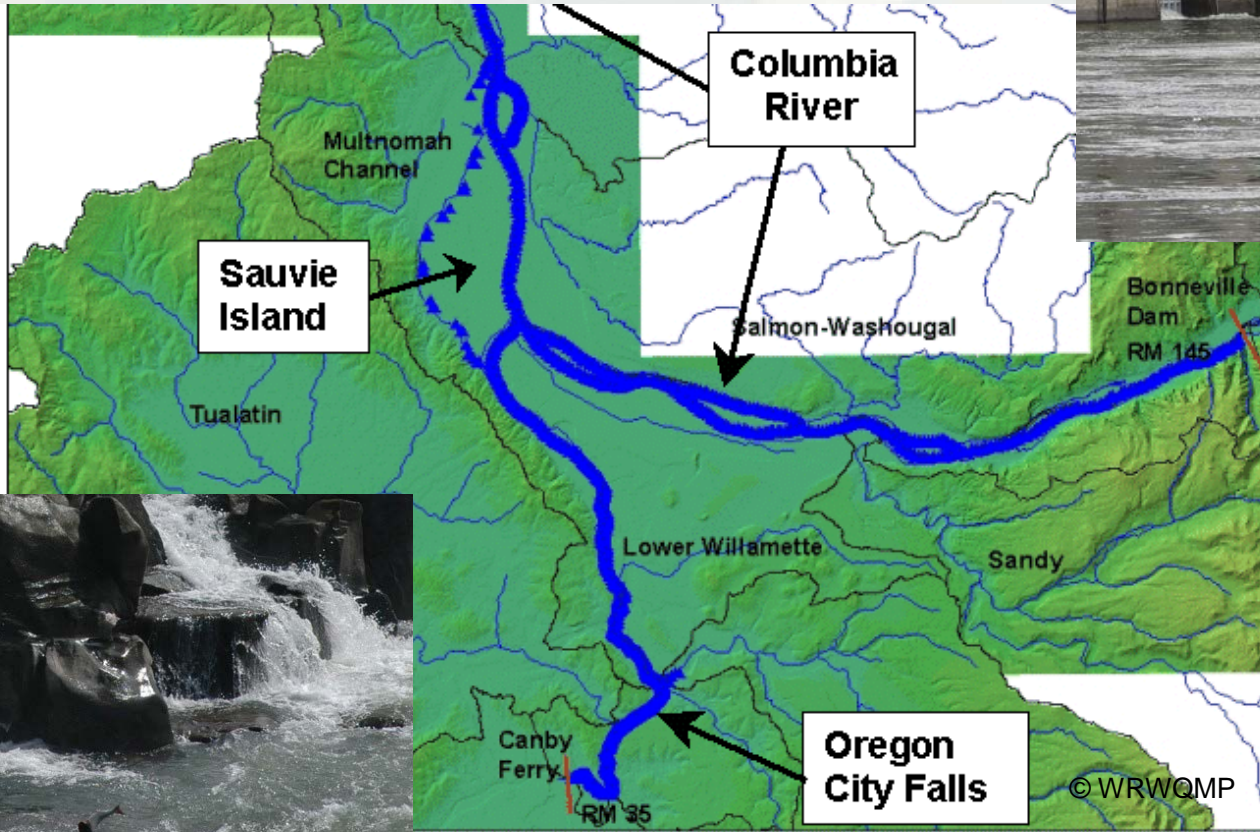
**Ballard Locks**

**USACE Monitoring Program**

**NOAA issues LOA for CSL Removal**



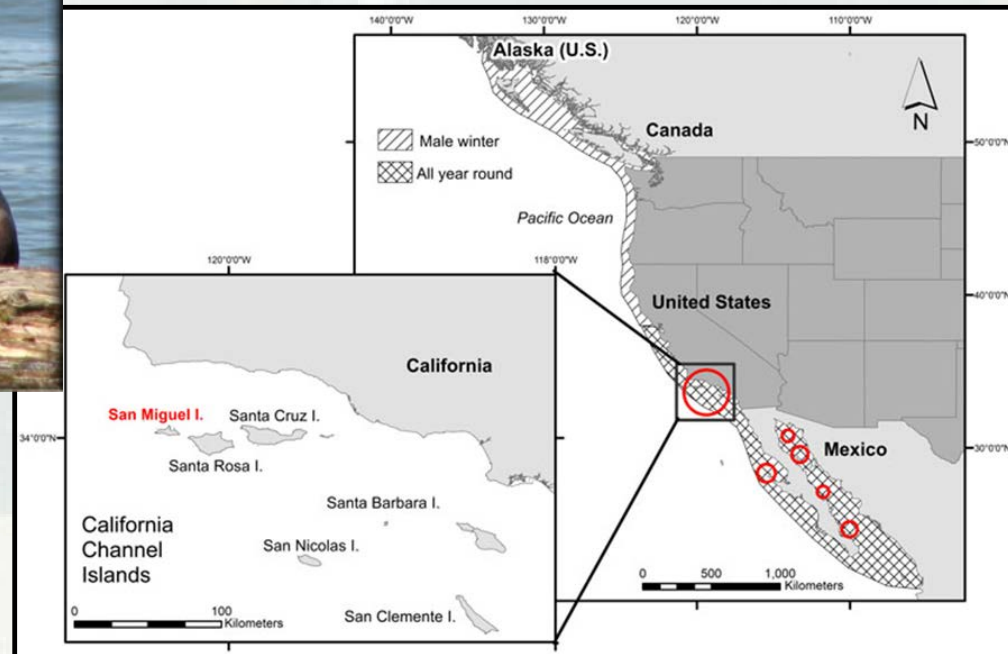
# A Connected System



# Player # 1

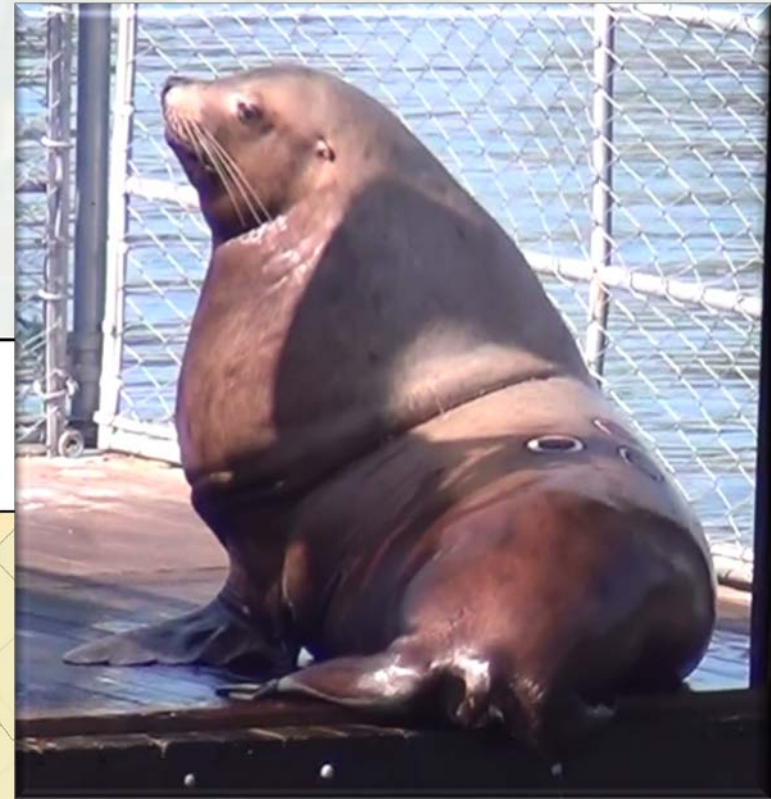
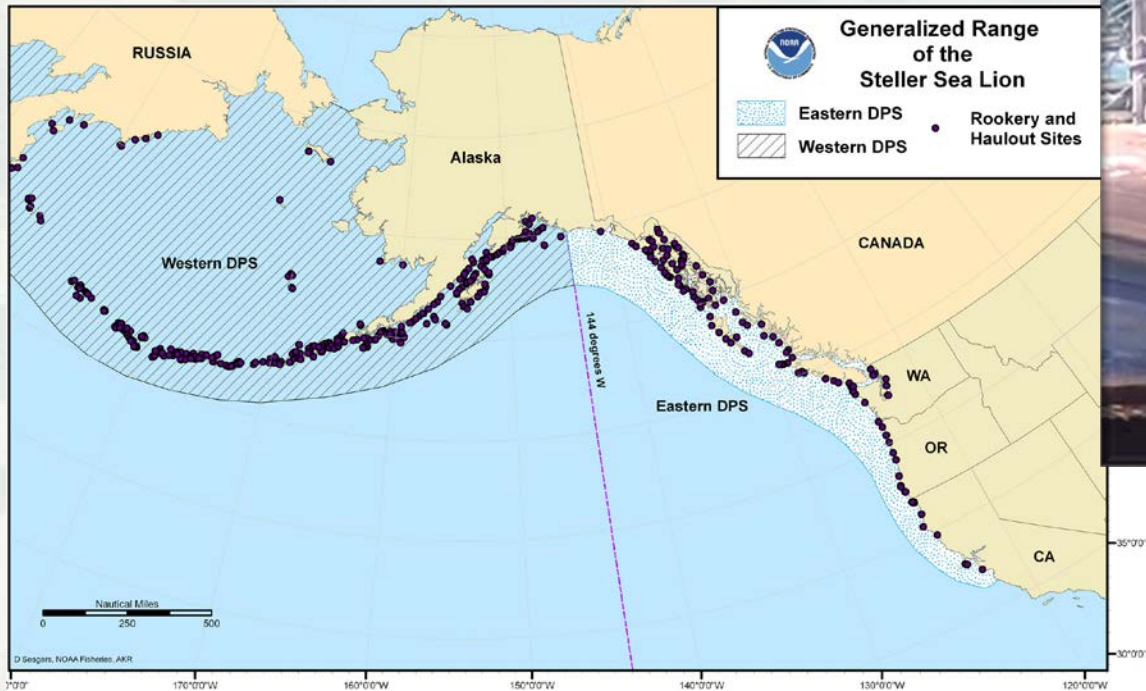


## California Sea Lion (CSL; *Zalophus californianus*)



# Player # 2

## Steller sea lion (SSL; *Eumetopias jubatus*)





# Who Does What?



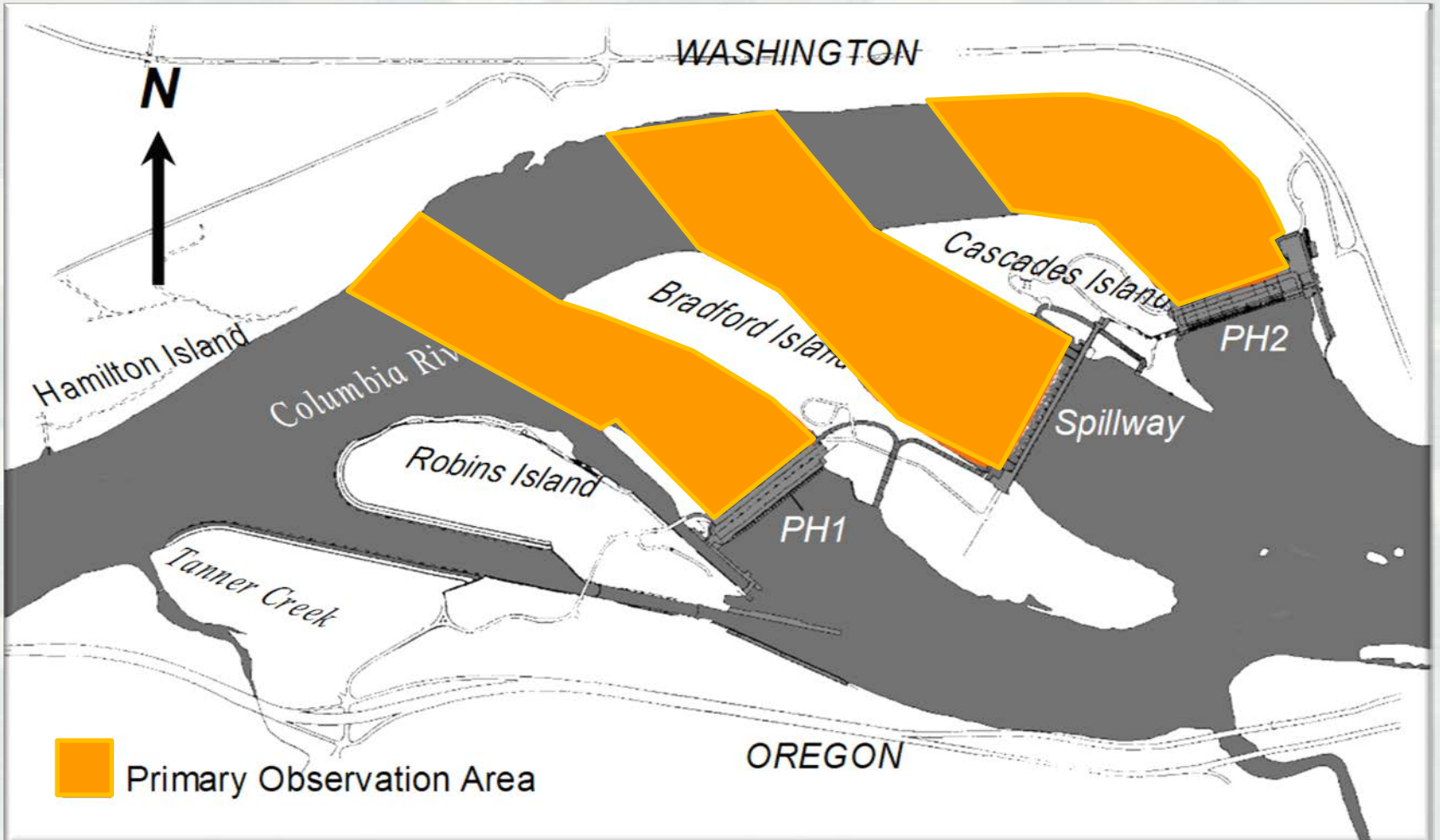
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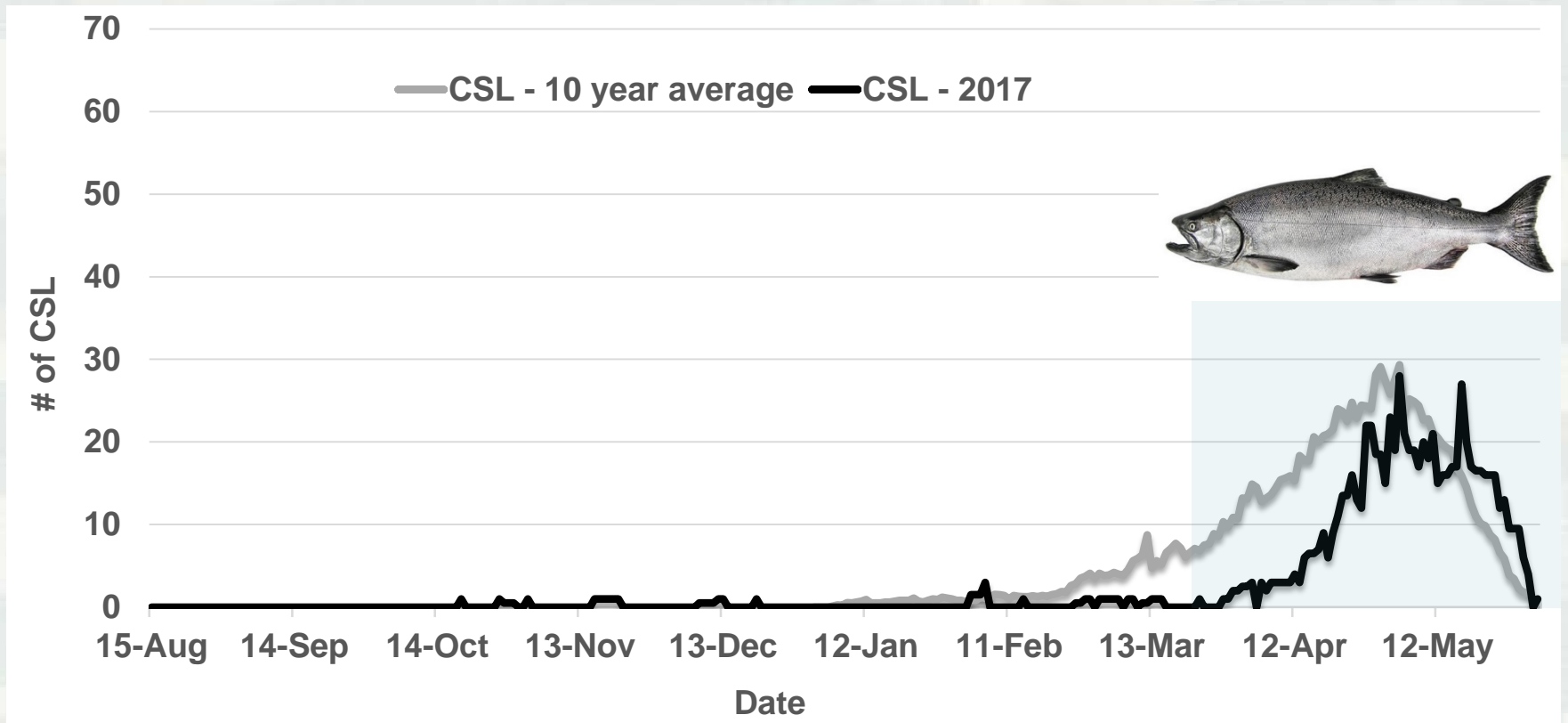
USDA



# Study Site

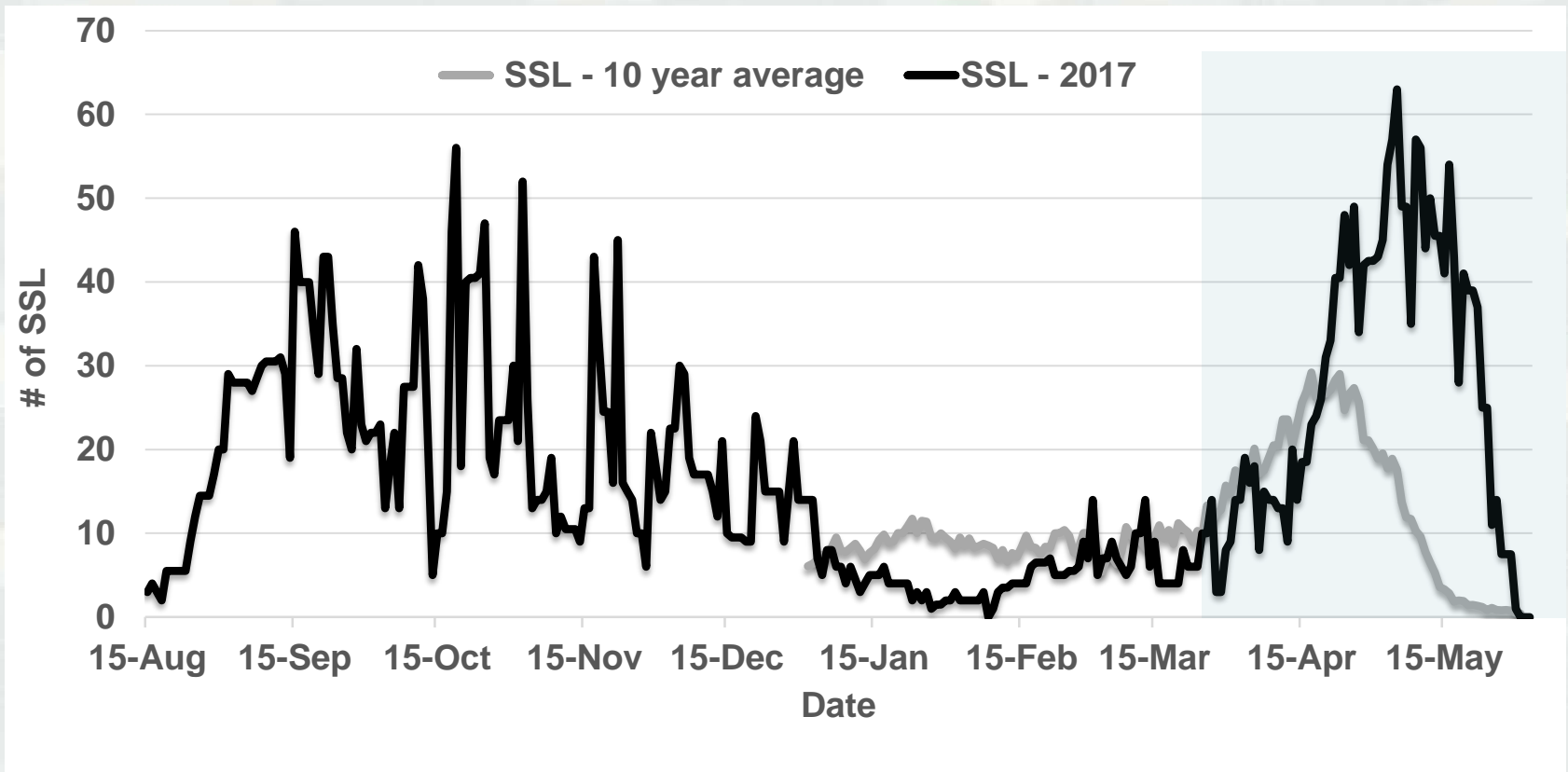


# California Sea Lion Abundance

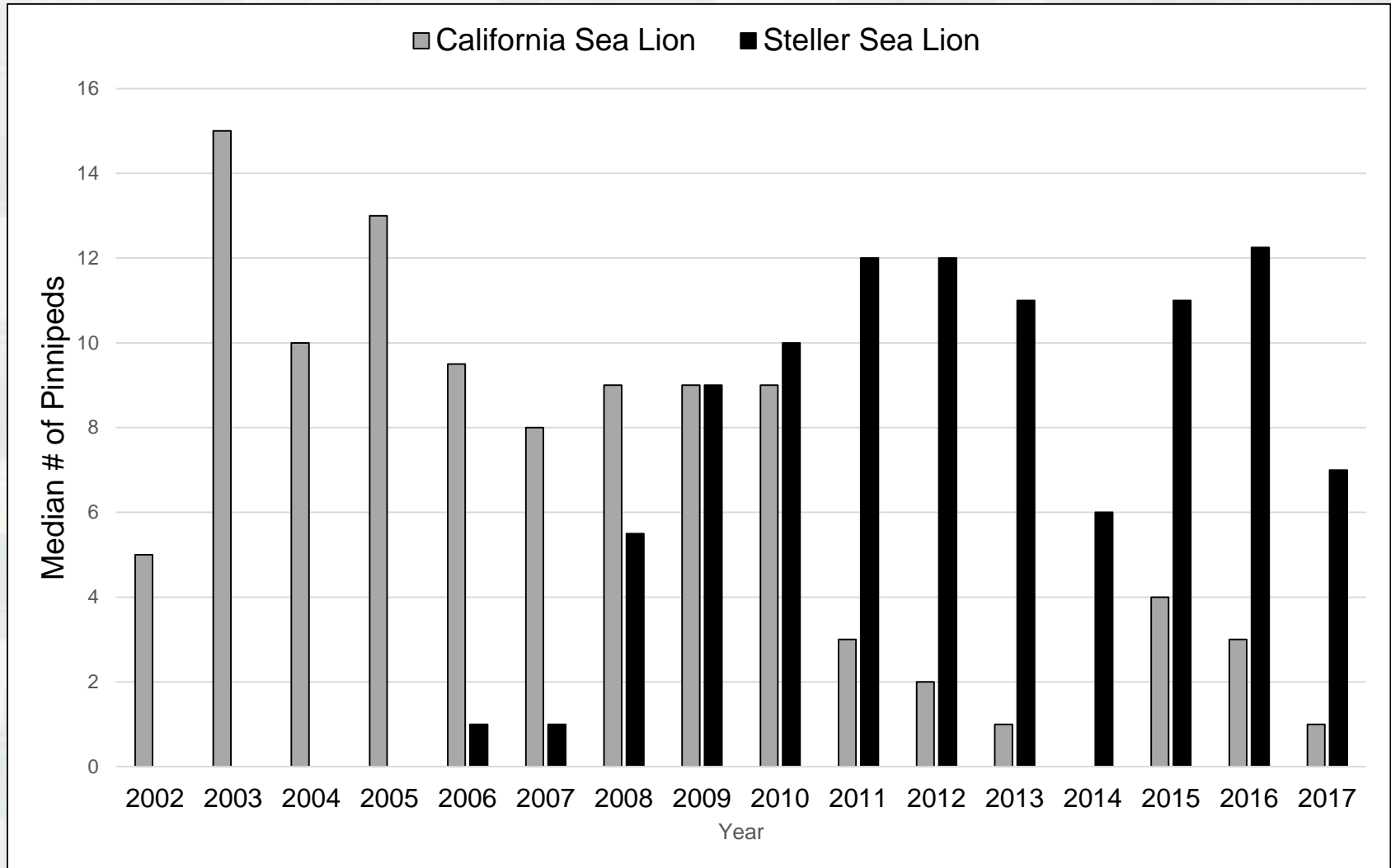




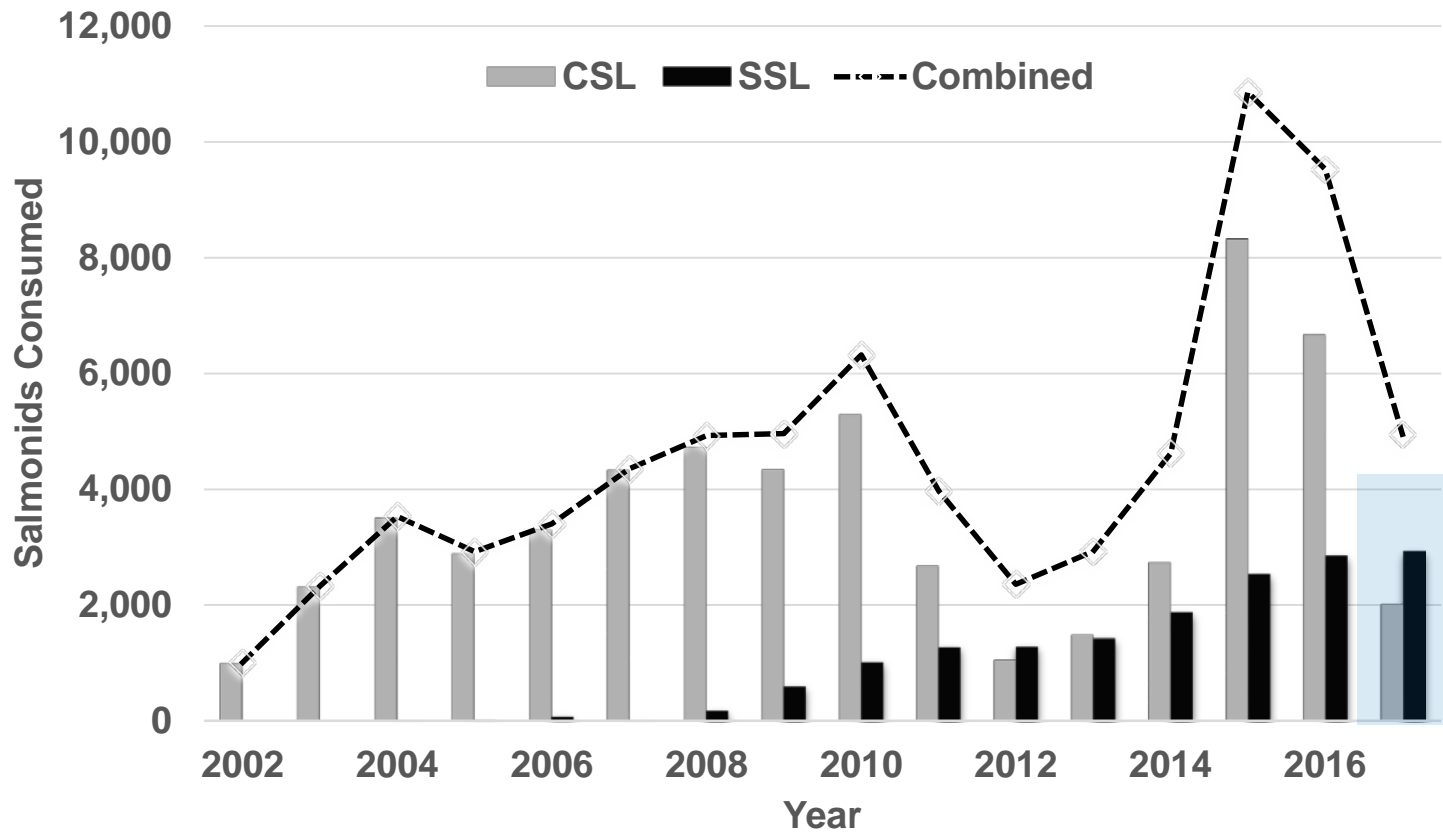
# Steller Sea Lion Abundance



# Yearly Median Abundance of Each Species



# Total Salmonid Predation

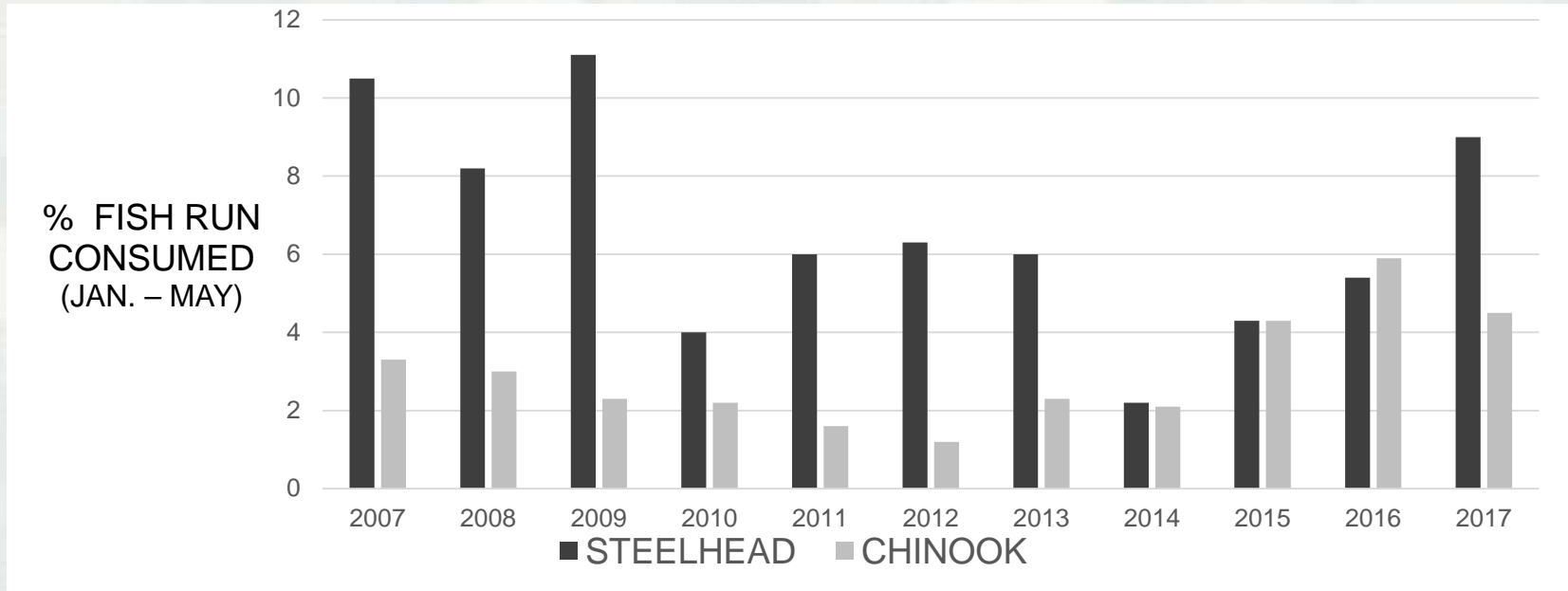


## 2017:

- CSL consumed 2,142 (1,831 – 2,419)
- SSL consumed 3,242 (2,841 – 3,624)
- Combined take = 5,384 (4,671 – 6,042)
- 4.9% of the total salmonid run



# Run Impact by Pinnipeds



## 2017

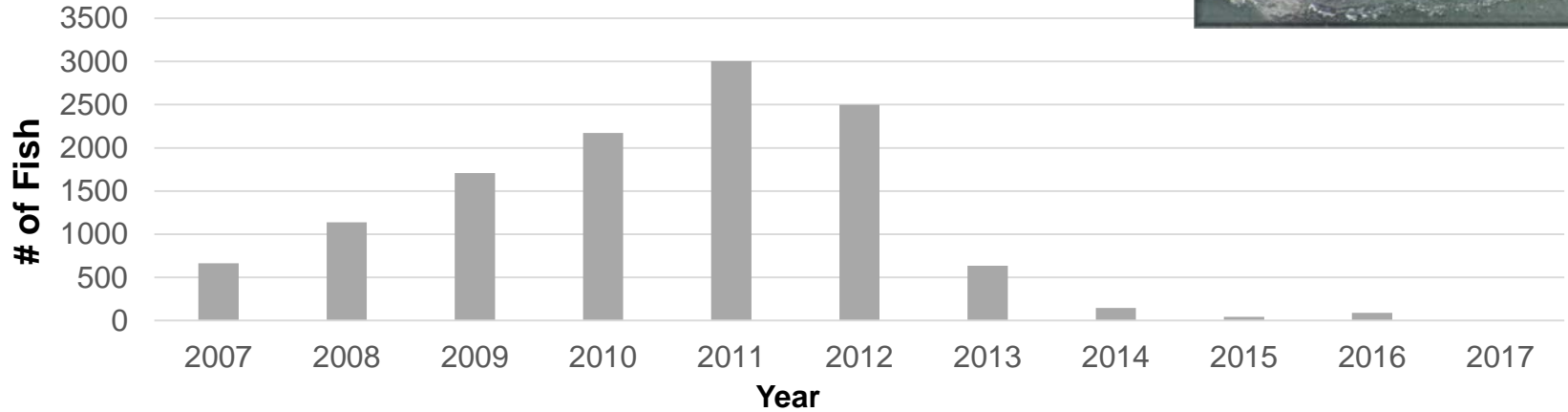
Fish Species	Passage (Jan - May)	Consumption Estimate	% of Run Consumed (Jan - May)
Spring Chinook	101,734	4,951 (CI 4,276 - 5,585)	4.6%
All Steelhead	3,241	322 (CI 144 - 454)	9.0%



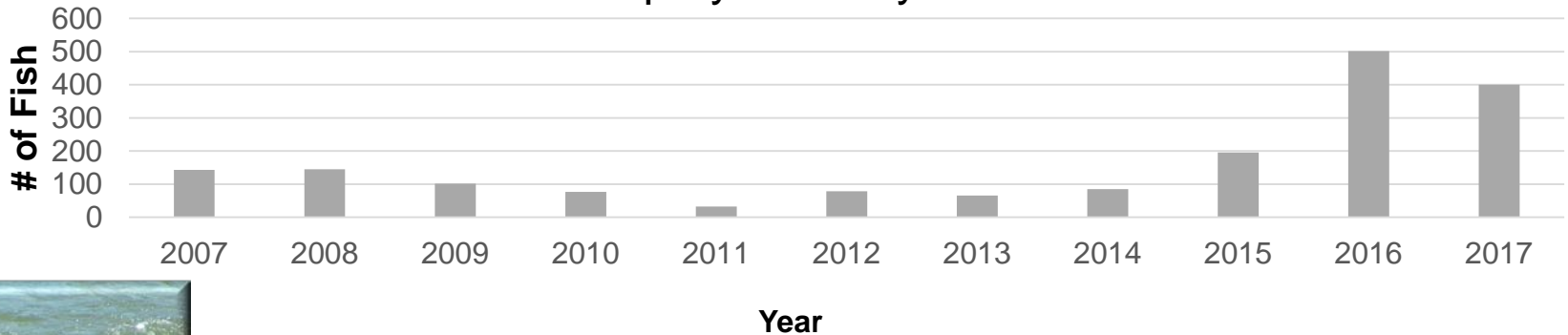
# Other Prey Species?



## White Sturgeon Killed by Sea Lions



## Pacific Lamprey Killed by Sea Lions



# Deterrent efforts: Lessons Learned

## Relocation of CSL



## Acoustic Deterrent Devices



## Non-Lethal Tactile and Acoustic deterrents



# Non-lethal harassment: Lessons Learned



# Deterrents and Their Efficacy

- 2006: Sea lion excluder devices (SLEDs)





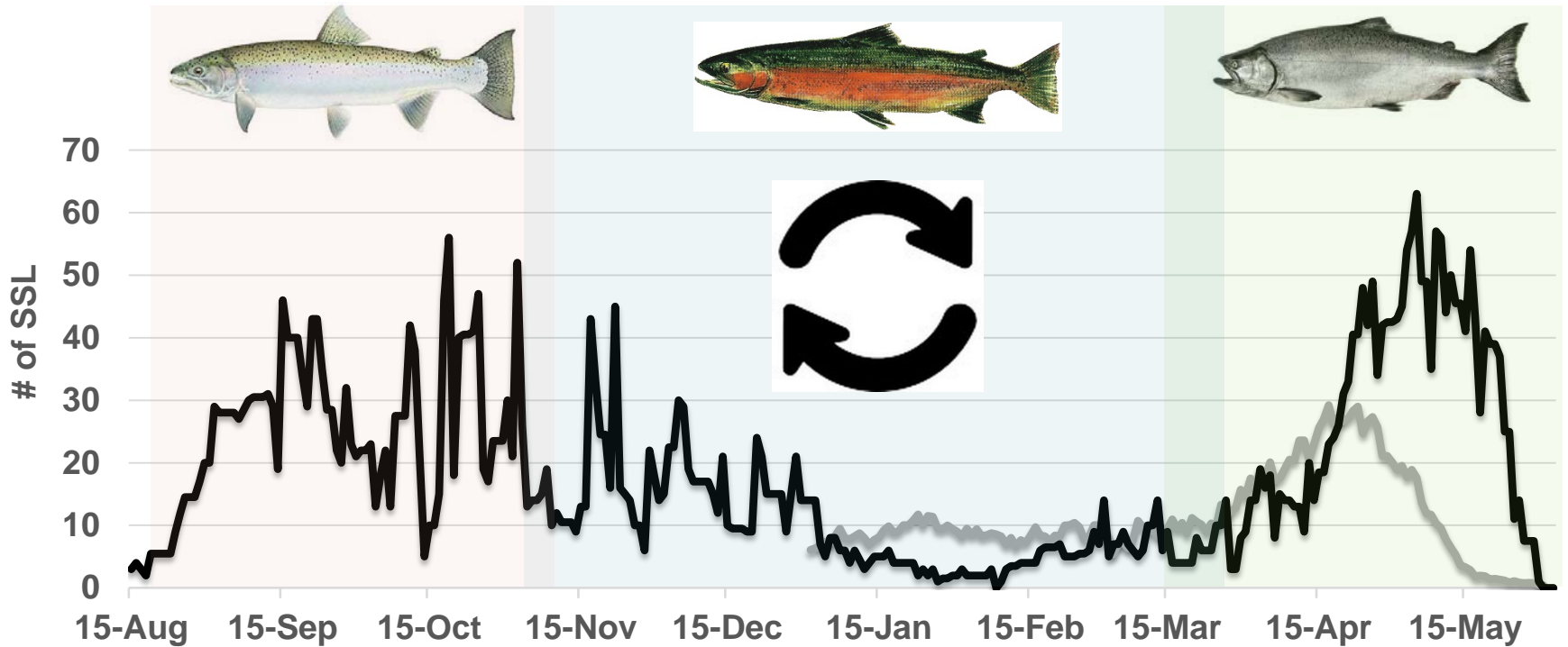
# California Sea Lion Removal Program 2008-2017

- Removal criteria
  - Observed five days
  - Observed eating a salmon
  - Exposed to hazing
- 800 authorized for removal
- 270 Branded CSL
  - 15 sent to zoos/aquariums
  - 185 euthanized



# Temporal Expansion = Expanded Impacts

— SSL - 10 year average    — SSL - 2017



# Lessons learned

- Willamette Falls issues are congruent with Bonn
- CSL removal program may be working
  - ▶ Need to find and test new non-lethal deterrents
- Project configuration & operations can affect depredation
  - ▶ Prioritize ladder attraction to minimize tailrace residence
- Spring Chinook consumption rates are alarming
- Steelhead life history increases potential depredation
  - ▶ Prioritize operation of benign downstream passage routes
  - ▶ Steelhead consumptions rates are at a tipping point?
- Removal criteria are difficult to meet
  - ▶ Branding should be prioritized
  - ▶ Lessons learned should be applied to SSL management



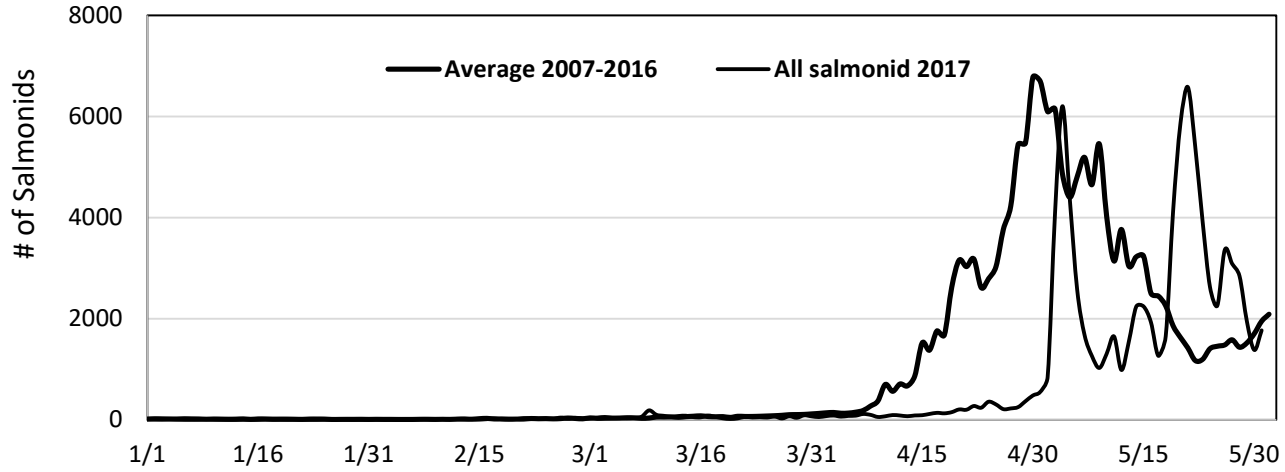
# Collaborators



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### Salmonid Passage at Bonneville Dam



### Combined Pinniped Predation of Salmonids

