Overview of Pinniped Predation: Regulatory and Logistical Challenges of Sea Lion Removal

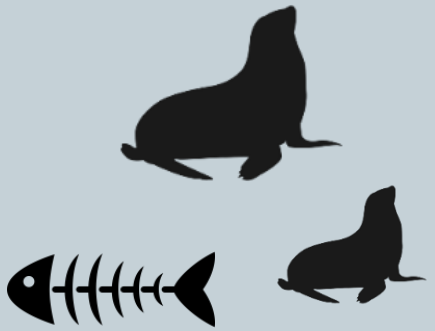
CHRISTINE KOZFKAY
DON WHITNEY

IDAHO DEPARTMENT OF FISH AND GAME



Overview

- Sea lions in Columbia River
- Predation impacts
- Legislation and permitting under MMPA
- 2019 removal efforts
- Current and future costs/needs



California vs. Stellar Sea Lion

California sea lion male (dark brown) with adult male Steller sea lions. Photo: Pat Gearin, NMML

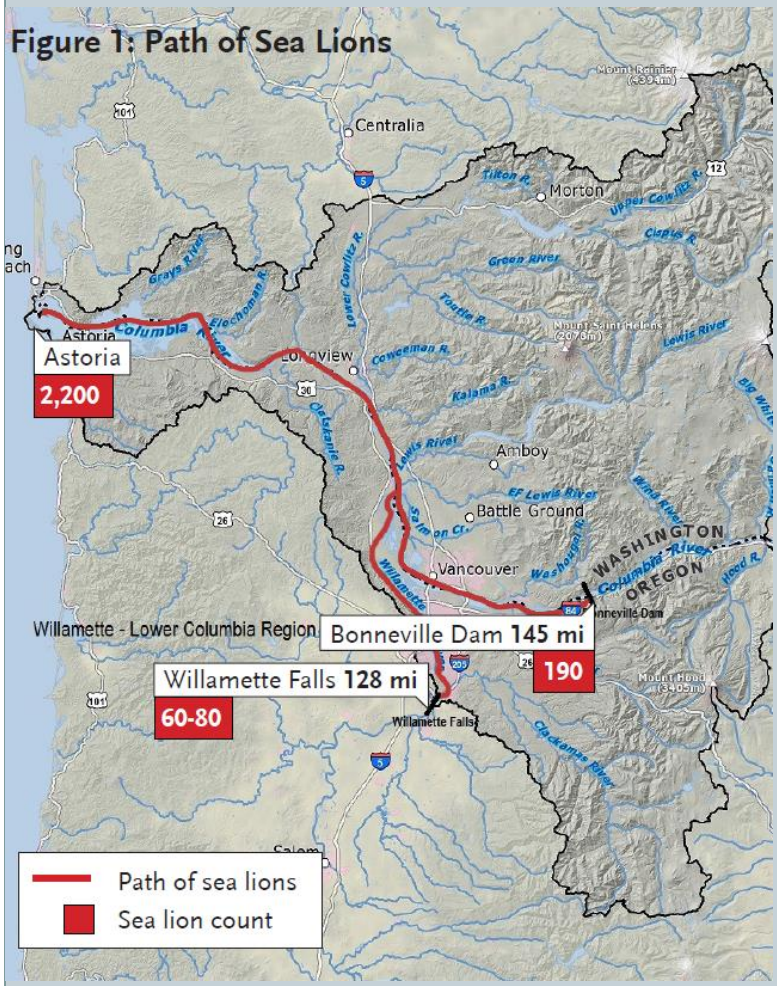
California Sea Lions

- Range SE AK to central Mexico
- Pop Size ~300K
- Live up to 17 yrs in wild
- Mature at 4-6, but defend 8-10 yrs
- Mainly breeds in Channel Islands

Steller Sea Lions

- Eastern stock range: CA to SE AK
- Pop Size ~71K
- Live up to 30 yrs in wild
- Defend territories until 9-13 yrs
- Rookeries in CA, OR, BC and SE AK

History of Sea Lions in Columbia River

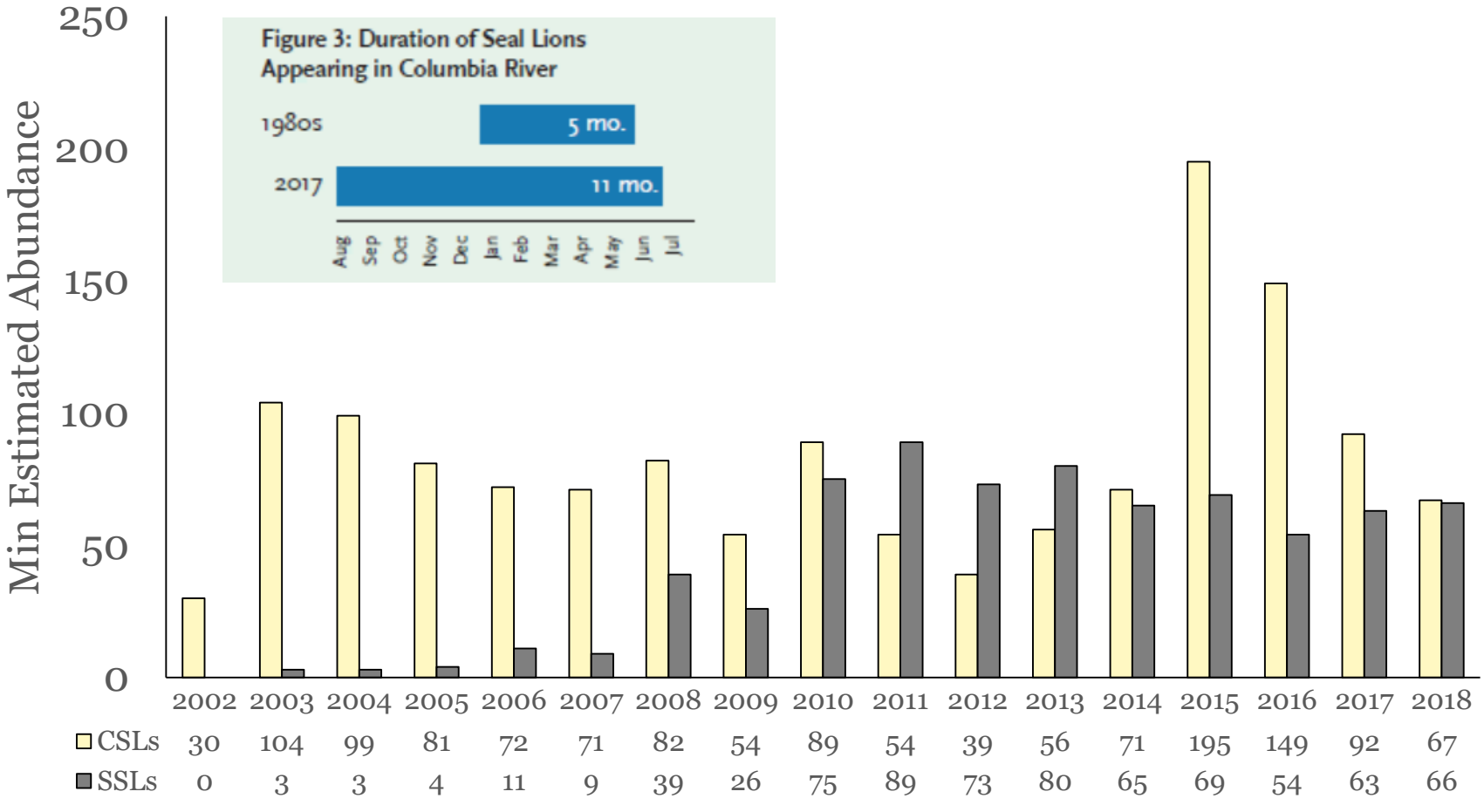


In the 1980's, CSLs started appearing in the Columbia R

Progressively been moving up the Columbia River to Bonneville Dam

Sea Lion in Fish Ladder at Bonneville

Sea Lions @ Bonneville Dam



Movement Patterns of CSLs

Wright et al. (2010):

- 14 “river-type” males in East Mooring Basin and South Jetty haul-outs
- Time between EMB and Bonneville

(131 miles, 1.9 days, 5 miles/hour)

- Leave for rookeries June

San Miguel & San Nicolas Islands (~970 miles)

- Males fast while defending territories during breeding

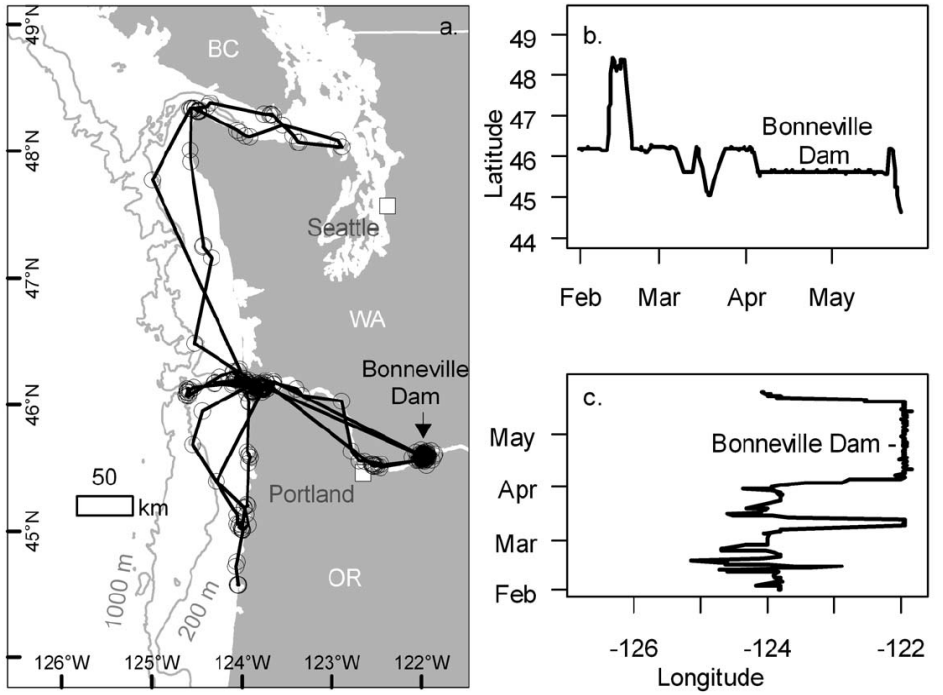


Figure 4. (a) Movement path, and (b) latitudinal and (c) longitudinal movement profiles for C265, a “river”-type California sea lion tracked from 1 February 2007 to 25 May 2007.

CSL stayed EMB but 4 trips Feb-May, Weight in Jan = 650 lbs, May 21, 1050 lbs

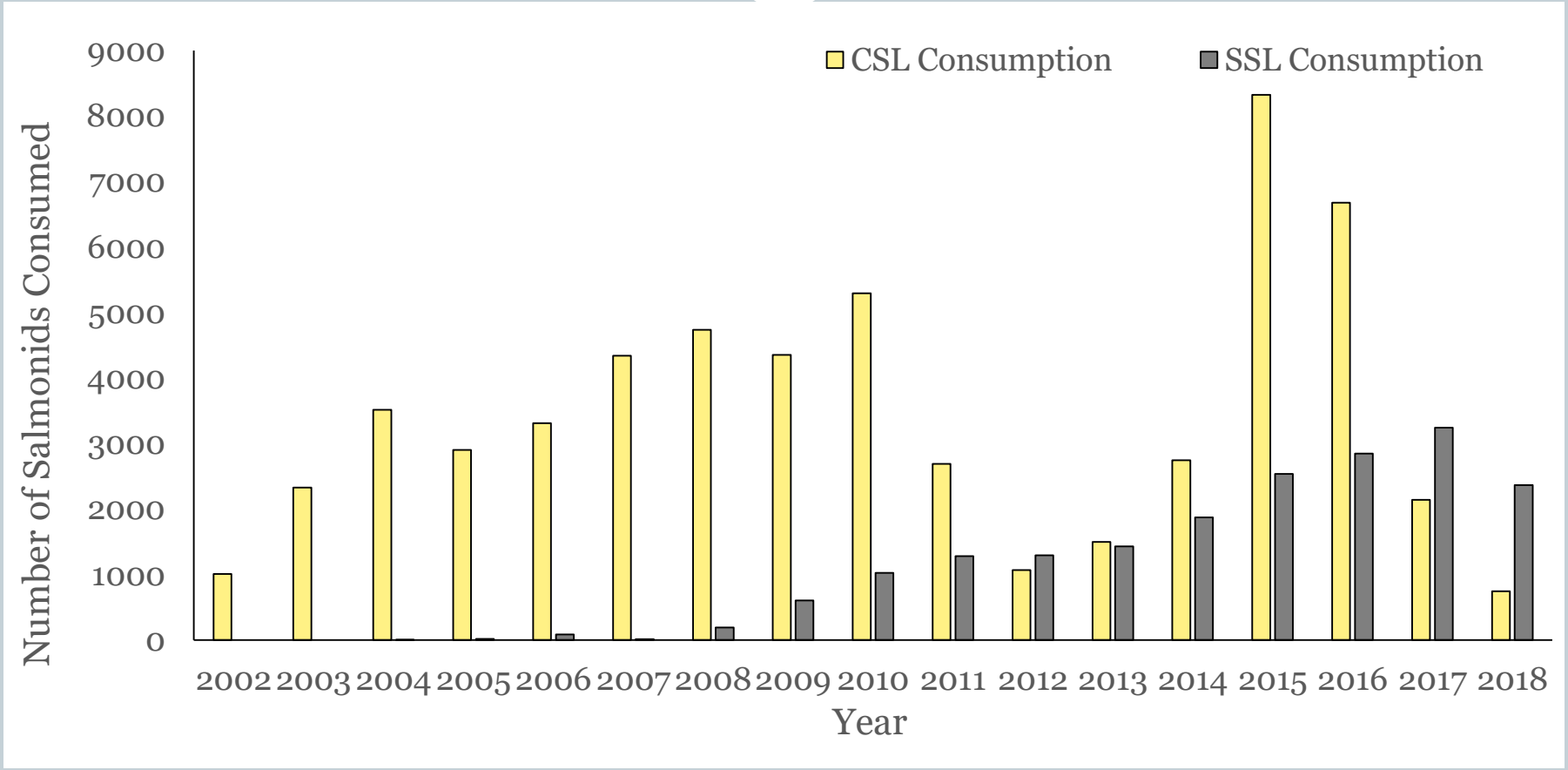
Measuring Predation Impacts

USACOE: Estimated predation in 1/4 mile reach below Bonneville Dam

Trained observers document surface predation events from Jan - June

Stratified random sampling design – estimate number of pinnipeds, fish consumed/wk

Measuring Predation Rates



~0.4% to 5.8% of Counts at Bonneville Dam; Majority Sp/Su Chinook winter steelhead consumed by SSLs and unknown smolts

Measuring Predation Impacts

Bioenergetic Studies

Chasco *et al.* (2017a)

- Not direct estimate but can inform level/scale of predation if assumptions are valid

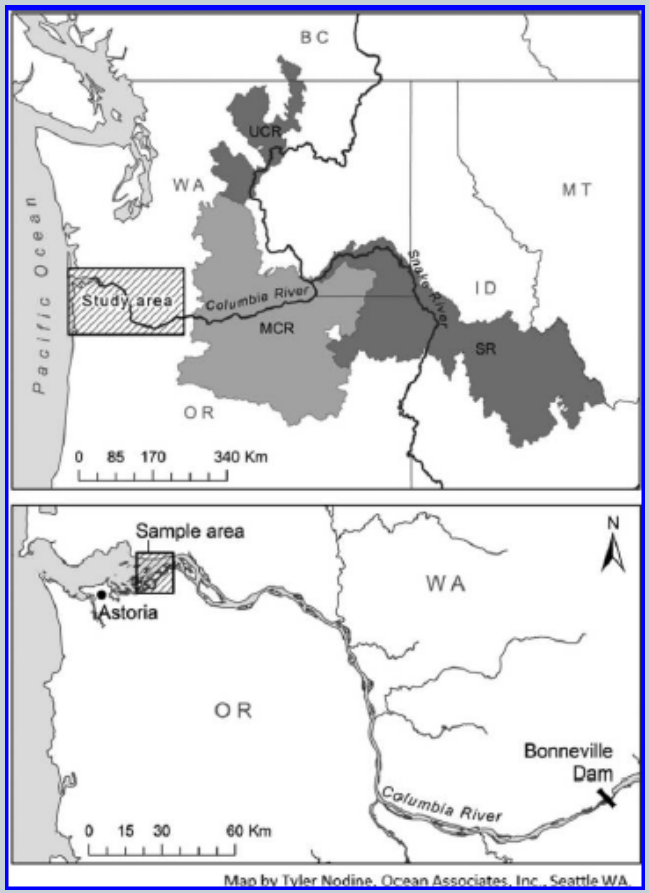
$$\mathbf{ED}_{p,h,j,y,t,i,a,s} = \mathbf{\Phi}_{p,h,j,t,s} \times \mathbf{SEL}_{p,j,t,a} \times \mathbf{FEC}_{p,j,t} \times \mathbf{N}_{p,h,y} \times \mathbf{PA}_{p,h,y,i} \times \mathbf{PF}_{p,h,y,i} \times \frac{\boldsymbol{\alpha}_{p,i,s}\mathbf{M}_{p,h,i,s}^{0.75}}{\mathbf{Ef}_{p}}$$

- Model - abundance of sea lions, sex, age-structure, weight-at age for sea lion, energy and size class of Chinook, spatial and temporal overlap

- In 2015, 65K Chinook adults and 70K jacks eaten by sea lions in Columbia R.

Measuring Predation Impacts

Rub *et al.* 2019:



- PIT-tagged Spring Chinook Salmon in estuary in April
  (N = 1,424; 2010 – 2015)
- Estimate survival to Bonneville Dam
- Release week, length, adipose-fin, shad abundance, sea lion abundance, eulachon abundance
- Accounted for sport/commercial harvest

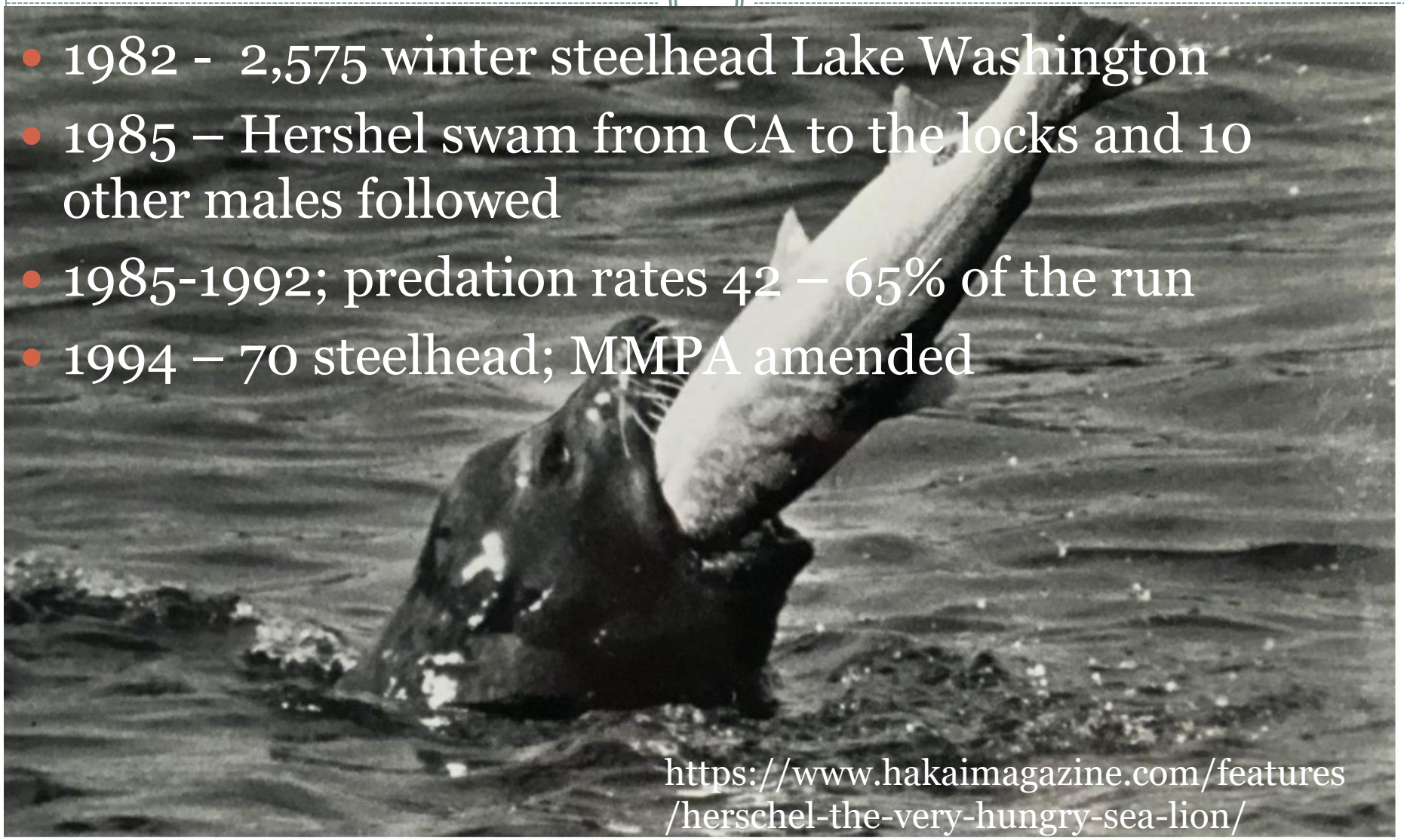
Measuring Predation Impacts

- All factors important to overall mortality
- Highest ranked - Sea lion abundance, shad abundance and adipose fin
- Fish tagged earlier – lower survival (e.g Rapid River)
- Non-harvest mortality ranged from 20% to 44%
  (50K to 224K adults)

"Given that average returns of wild spawners was 4450 for UCR and 33,133 for the SR from 2010 to 2015, our observed high end (natural) mortality does not appear to be sustainable in the future"

Lessons Learned – Ballard Locks

- 1982 - 2,575 winter steelhead Lake Washington
- 1985 – Hershel swam from CA to the locks and 10 other males followed
- 1985-1992; predation rates 42 – 65% of the run
- 1994 – 70 steelhead; MMPA amended



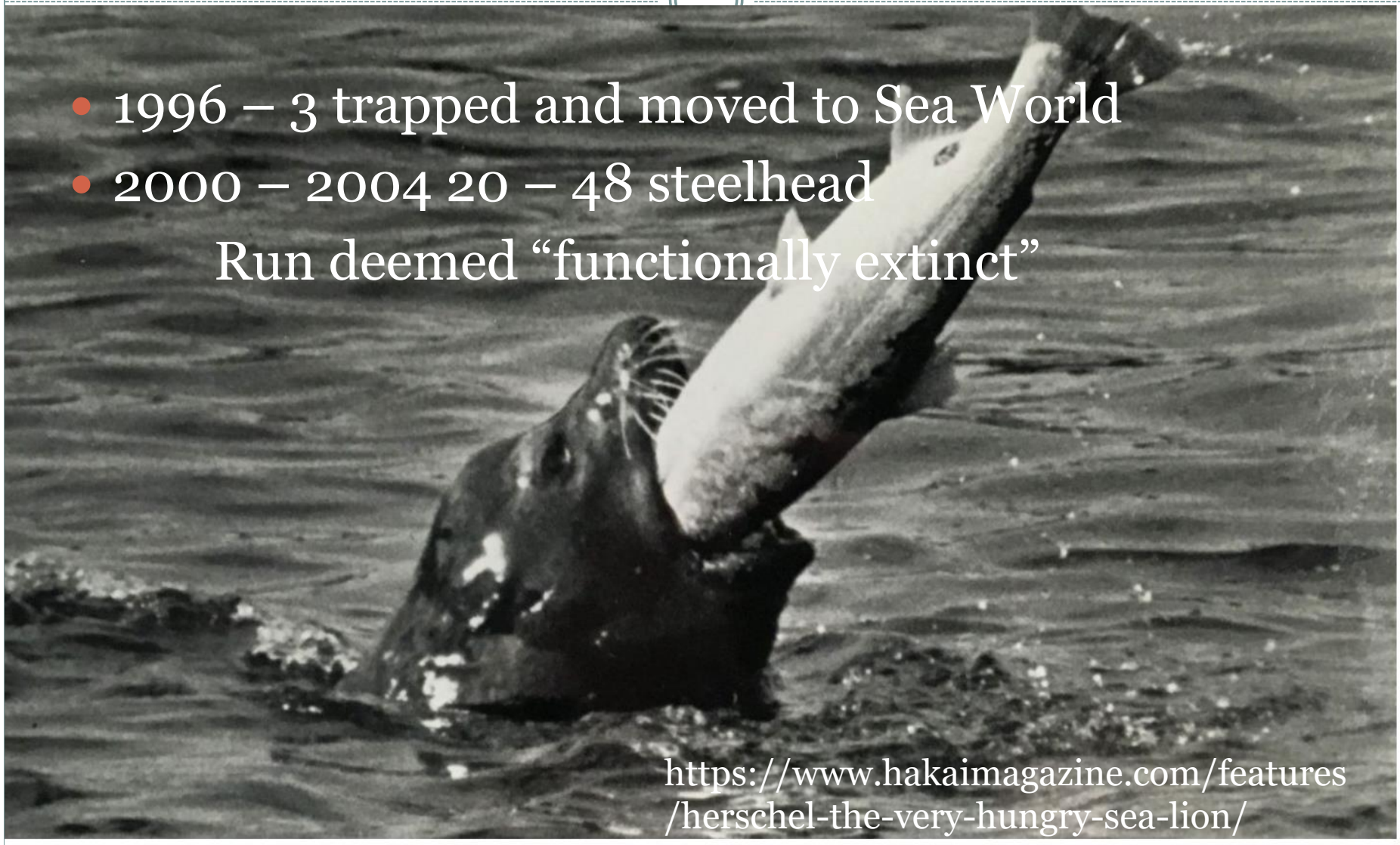
https://www.hakaimagazine.com/features/herschel-the-very-hungry-sea-lion/

Section §120 - Marine Mammal Protection Act

"States may apply to (NMFS to) lethally take individually identifiable pinnipeds that are having a significant negative impact on the decline or recovery of a salmonid stock that is being considered for or is listed as threatened or endangered under the ESA"

Aka "Ballard Locks amendment"

Lessons Learned – Ballard Locks



- 1996 – 3 trapped and moved to Sea World
- 2000 – 2004 20 – 48 steelhead

  Run deemed “functionally extinct”

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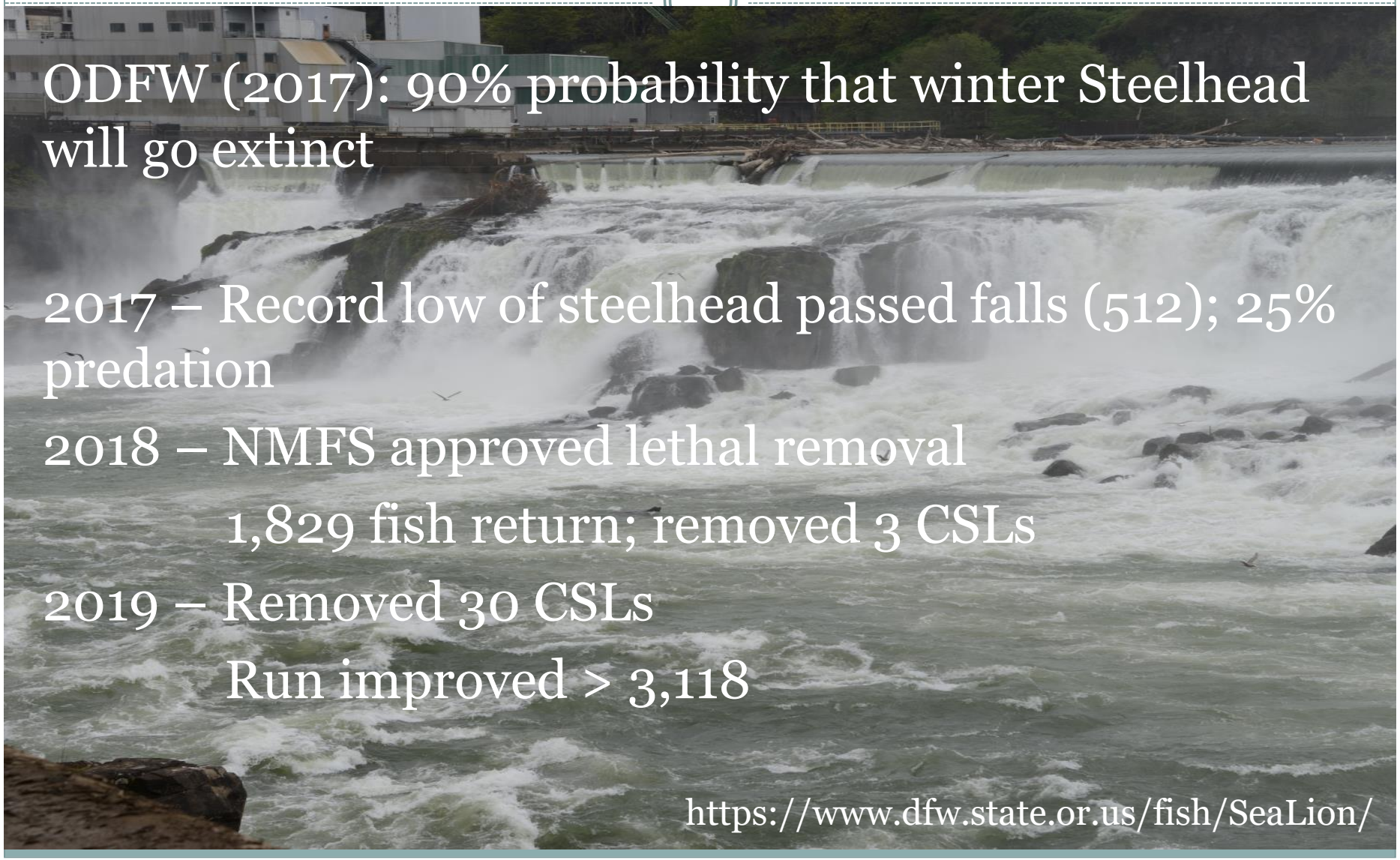
Lessons Learned – Willamette Falls



ODFW (2017): 90% probability that winter Steelhead will go extinct

2017 – Record low of steelhead passed falls (512); 25% predation

2018 – NMFS approved lethal removal

1,829 fish return; removed 3 CSLs

2019 – Removed 30 CSLs

Run improved > 3,118

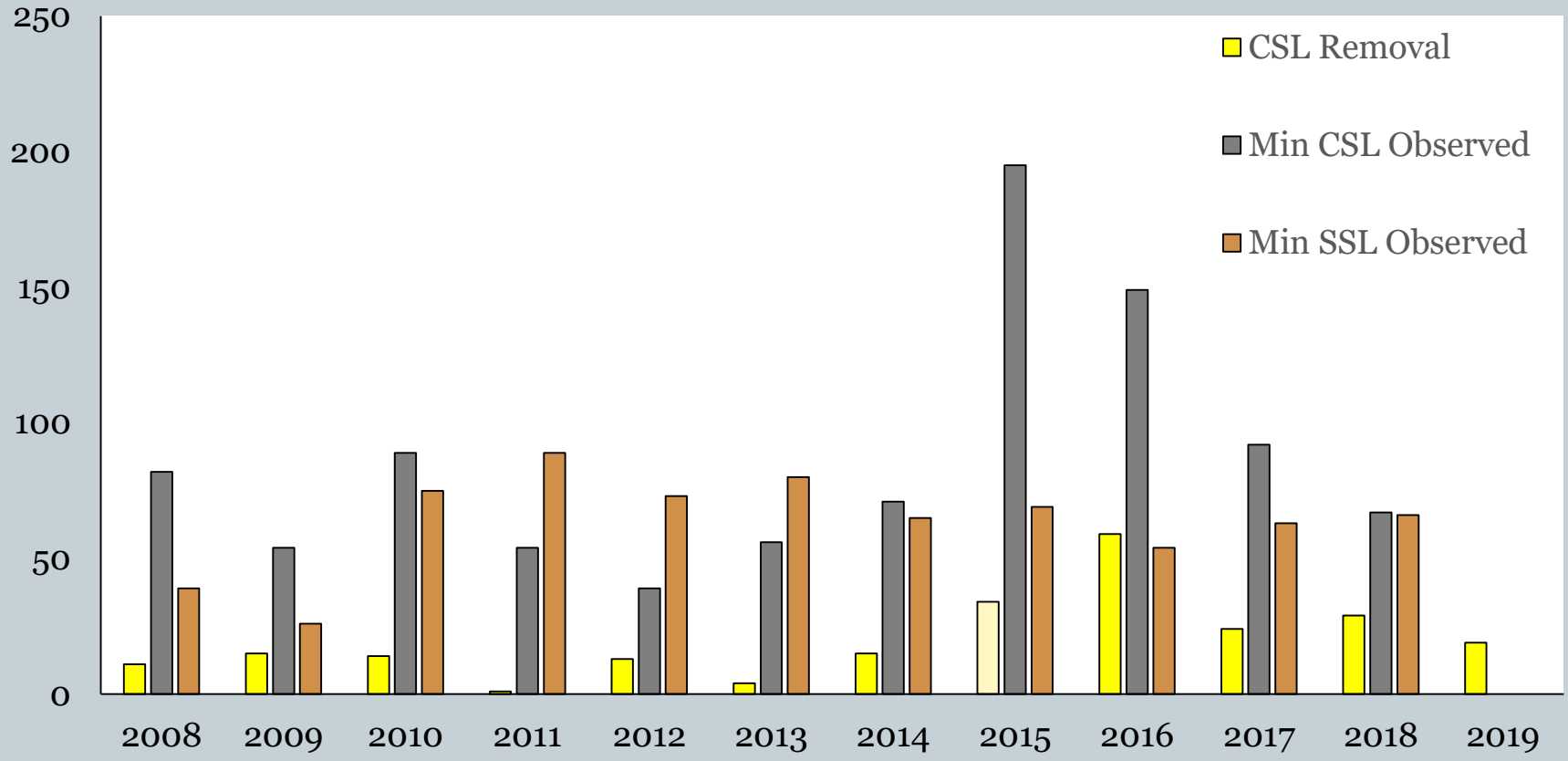
https://www.dfw.state.or.us/fish/SeaLion/

Section §120 - Marine Mammal Protection Act

2008 - NMFS authorized removal of CSLs under specific conditions:

- Up to 92 CSLs a year
- Individually identifiable (trapped, marked, released)
- Observed at Bonneville Dam for 5 days
- Observed eating a salmon
- Subject to non-lethal hazing first

Sea Lion Removals at Bonneville Dam



Tidwell et al. 2019,
Steingass et al. 2019

Recent Revisions to the MMPA

"Endangered Salmon and Fisheries Predation Prevention Act"

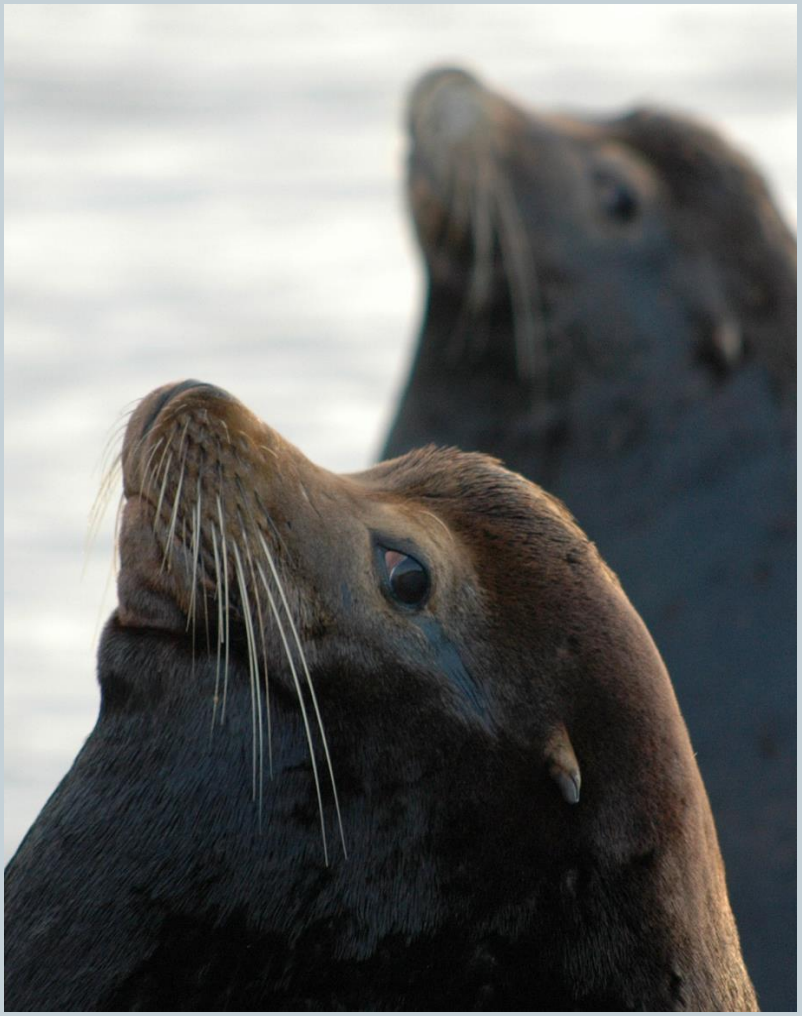
SB 3119

HR 2083

Passed & signed December 2018

Modifies Section §120:

- Tribal co-management
- Improve efficiency
- Removal not contingent on hazing or observational criteria



NMFS Permit Application

- Law allows NMFS to issue permit
- Submitted permit application - June 2019
- Finished Public Comment Period – Oct 30, 2019 (22k comments)
- New LOA in 2020

Criteria for Removals

	Section §120 (Current Permit)	Section §120 (New Permit)
Geographic range	Observed eating salmon at Bonn Dam, vicinity below Dam or above Dam	Mainstem of CR above RKM 112 and any trib of CR below Bonn
Duration	Jan 1 – May 31 Been observed for 5 (3) days	N/A
Hazing	Subject to non-lethal deterrence first	N/A
Annual Removal Cap	92 CSLs , 0 SSLs	~920 CSLs, 249 SSLs 144-286 CSLs, 105-130 SSLs

Sea Lion Removals

Bonneville Removals 2019

CSL's 7-8' length up to 1,000 lbs.

SSL's 9-12' length up to 2,500 lbs.

The “Project”

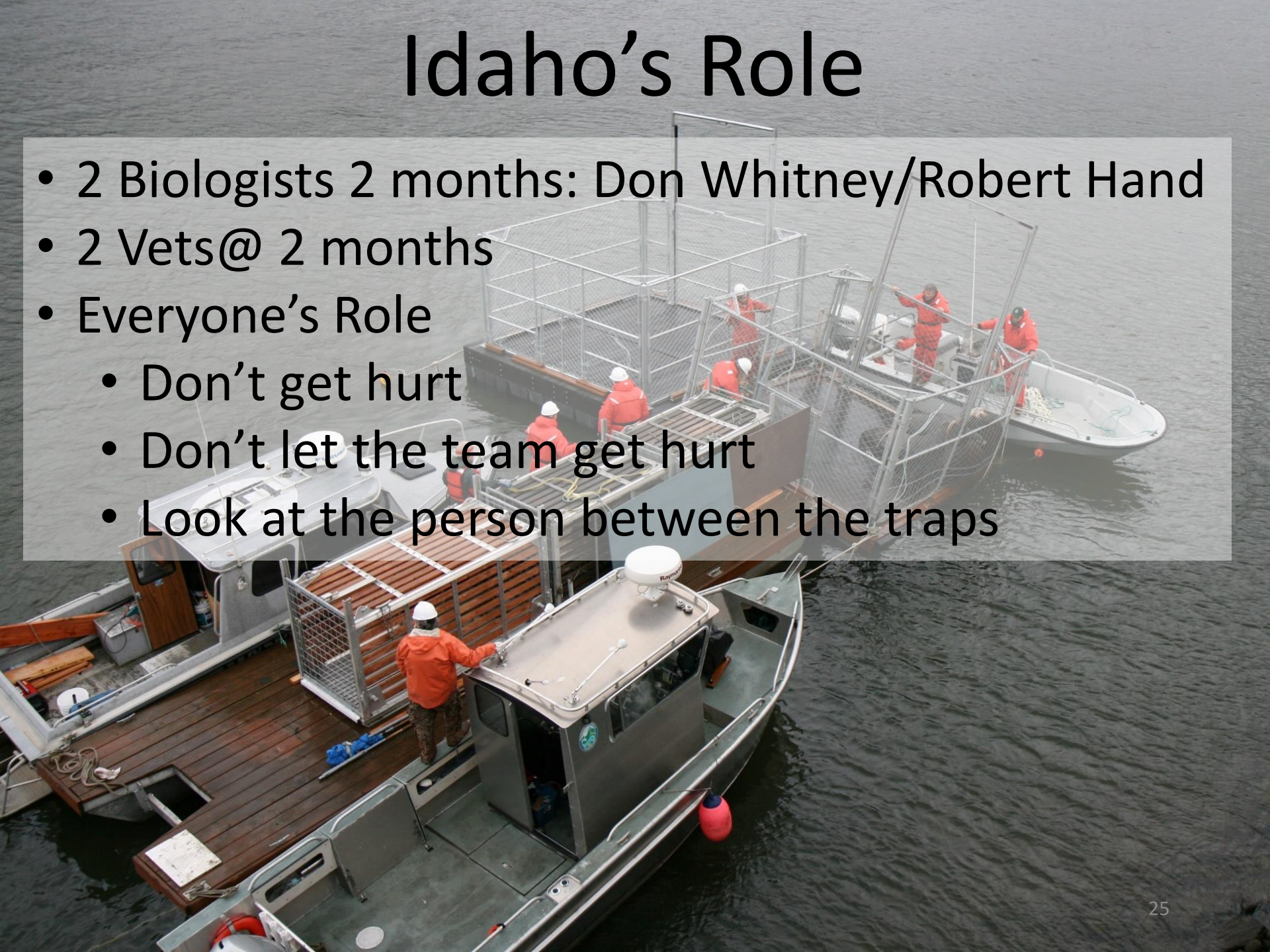
The Haul Outs w/o Traps

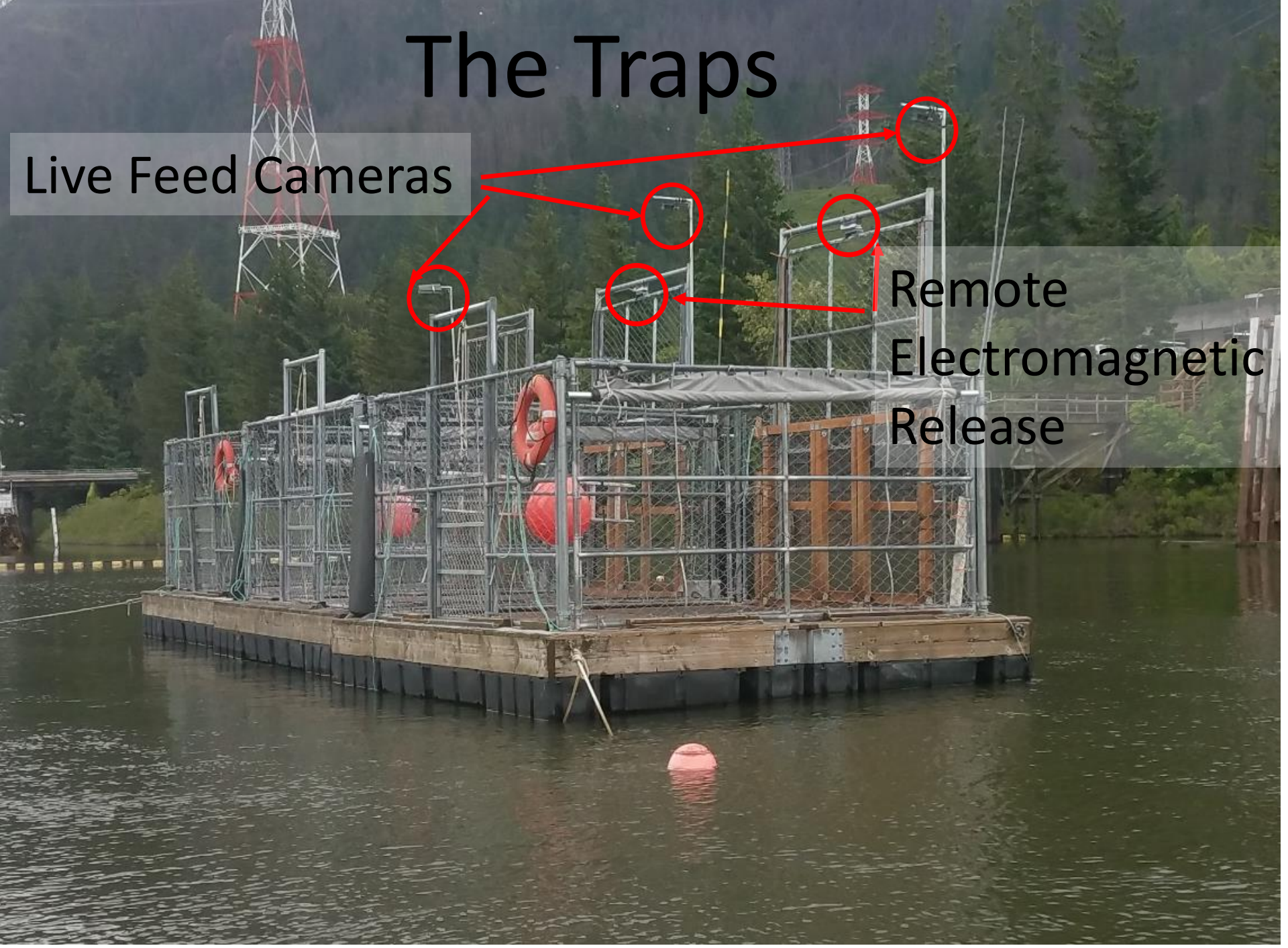
The Haul Out Traps

The Locks

Idaho's Role

- 2 Biologists 2 months: Don Whitney/Robert Hand
- 2 Vets@ 2 months
- Everyone's Role
  - Don't get hurt
  - Don't let the team get hurt
  - Look at the person between the traps




The Traps
Live Feed Cameras
Remote Electromagnetic Release

Leave Camp 3am

Viewing traps live

Play Willamette trap video

CALIFORNIA SEA LION TRAPPING

Willamette River, 2018

Daylight view from remote trigger

Who is in there?

Confirming Take, Brand and/or Release

CSL Vertical

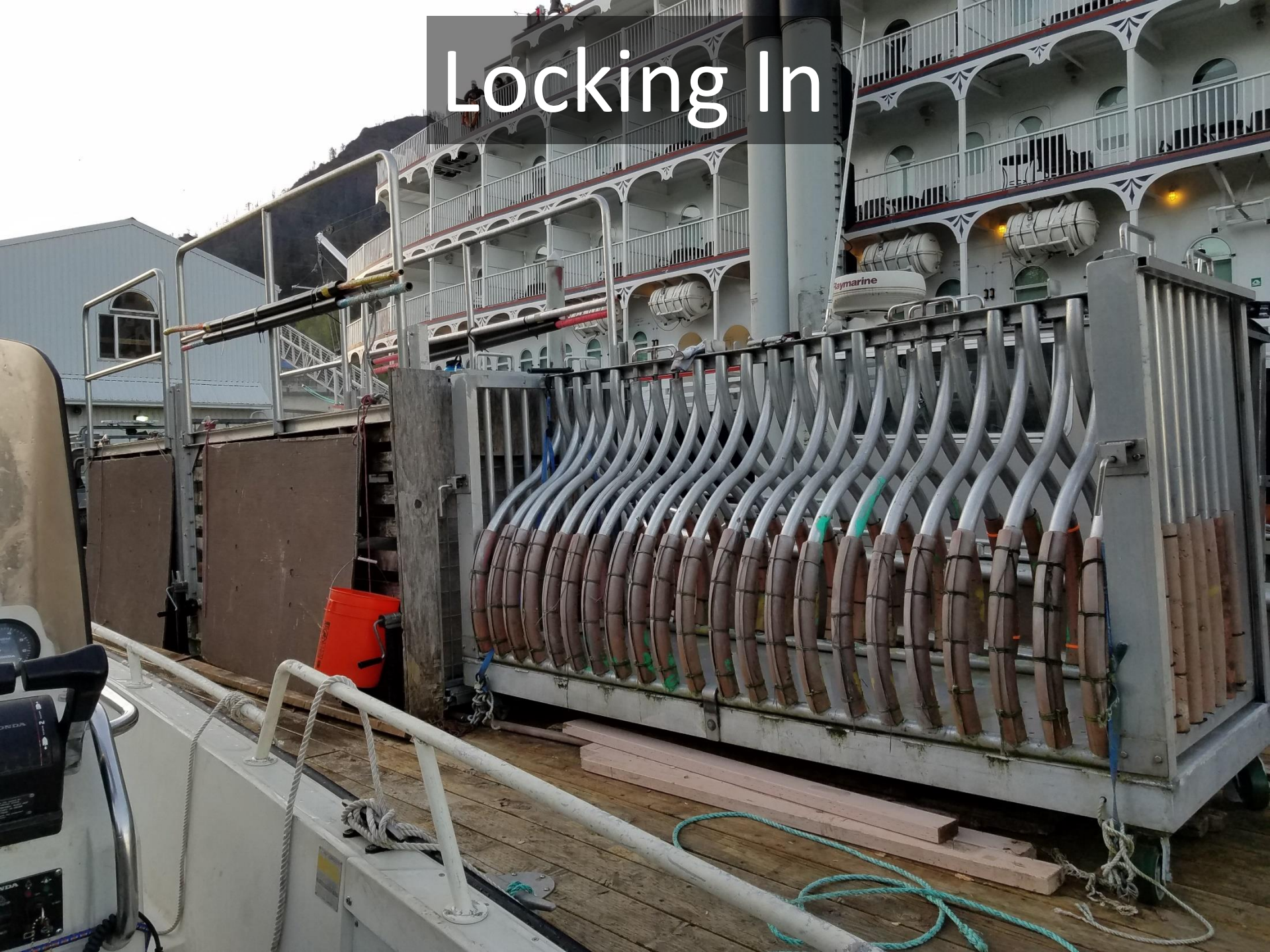
CLS Climbing the Trap

Transferring Animals

Branding CSL's

Bonneville Locks

Locking In

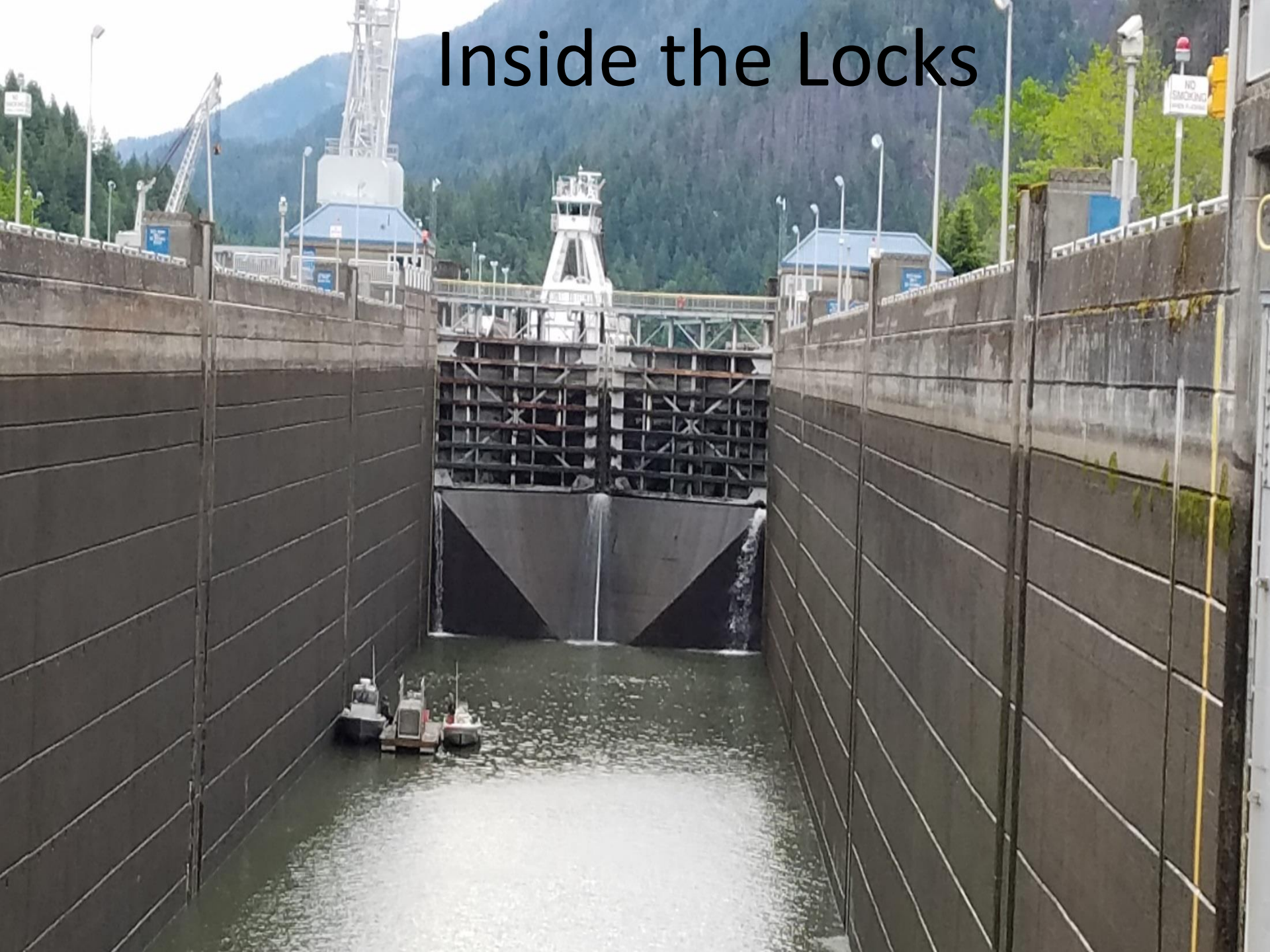


Locking with Tourists


NO
SMOKING
WHEN FLASHING
AMERICAN SONG

Move to 33 seconds

Inside the Locks



Barge to Truck Transfer

Processing: CSL Euthanasia/ SSL Branding

- CSL processing (@ 2 hours/animal depending)
  - Diet Analysis
    - Stomach (scan for PIT tags)
    - Large Intestine
    - Fat Content
  - Viral: Herpes etc.
  - Blood, muscle for contaminates (Mercury, PCB's)
  - Aging structures
  - Meeting rendering facility requirements

Steller Getting Ready for a Temporary Nap

After Capture/Processing

- Clean-Up
- Trap Repairs
- Electronics
- Test Electronics
- Reset Drop Gates
- Boat Maintenance
- Planning Next Capture

Project Needs (for Bonneville)

- @ 8 capable crew members
  - Able to pass security
  - Physical and know anatomy
  - Electronics
  - Construction
  - Understanding this work is necessary!
- 2 boats
- Multiple traps

Why so few removed in 2019?

- Really poor springer returns (Payoff is #1)
- Cold water
- But, …… the upshot is that we removed 19/22 = 86% of the CSLs available for removal. Of the three that eluded removal, 1-97 was never trapped (trap shy?), 2-64 eventually got on the list but migrated before he could be recaptured, and 2-65 did not make the list before he migrated!

Expanding Operations (my thoughts)

- Hazing and relocating does not work
- $ (Traps, etc.)
- Other alternatives to trapping for CSL's and now more importantly SSL's for euthanasia!
- Removals alter learning behavioor

Personnel and Equipment

- Current efforts @Bonneville Dam

  (under existing permit)

  - 6-8 weeks in Spring
  - Need 1 licensed veterinarian & ~9 staff
  - Food and lodging
  - Supplies and equipment
    - Drugs - $150/animal Rendering - $135/animal

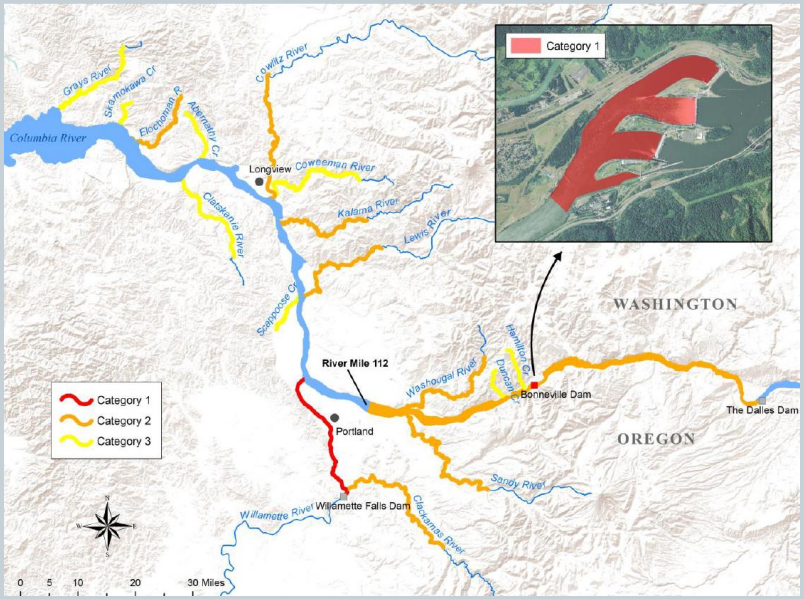
  Budget - mainly personnel costs - independent of sea lions removed

Current Budget

- $300K NMFS
- ODFW provides funding
- IDFG provided $25K, 2 veterinarians and 2 staff
  (2 - 4 wks each)
- CRITFC $250K – hazing funds from BPA

Personnel and Costs

- Future efforts
  - Trapping up to 10 months
    - Spring Trapping, Fall Trapping, Tributaries
    - Include SSLs – equipment needs
  - Personnel and Costs TBD



QUESTIONS