Evaluation of Adult Fish Ladder Modifications to Improve Pacific Lamprey Passage at McNary and Ice Harbor Dams

Frank Loge[1], Donald Thompson[1], and Christopher Caudill[2]

[1]Department of Civil and Environmental Engineering
University of California, Davis
Davis, CA

[2]Department of Fish and Wildlife Sciences
University of Idaho
Moscow, ID

Study Overview

- Video monitoring of picketed leads at McNary and Ice Harbor dams (4th year)
  - Improve understanding of escapement

- Monitoring of Lamprey Prototype Entrance Structure (LPES)
  - Salmon/steelhead (optical video)
  - Lamprey (DIDSON, optical video)

Picketed Lead Monitoring Methods

McN S ladder: 4 cameras (94%)

McN N ladder: 2 cameras (80%)

IHR S ladder: 3 cameras + Count window (100%)

IHR N: 2 cameras + Count window (100%)

Picket video: 24/7 (June 13 - Oct 15)
Count window : 21:00- 05:00

- ~ 36,000 hours of video collected
  - Transmitted via satellite
  - Processed using CBVision

Lamprey escapement

Lamprey escapement: McNary OR shore

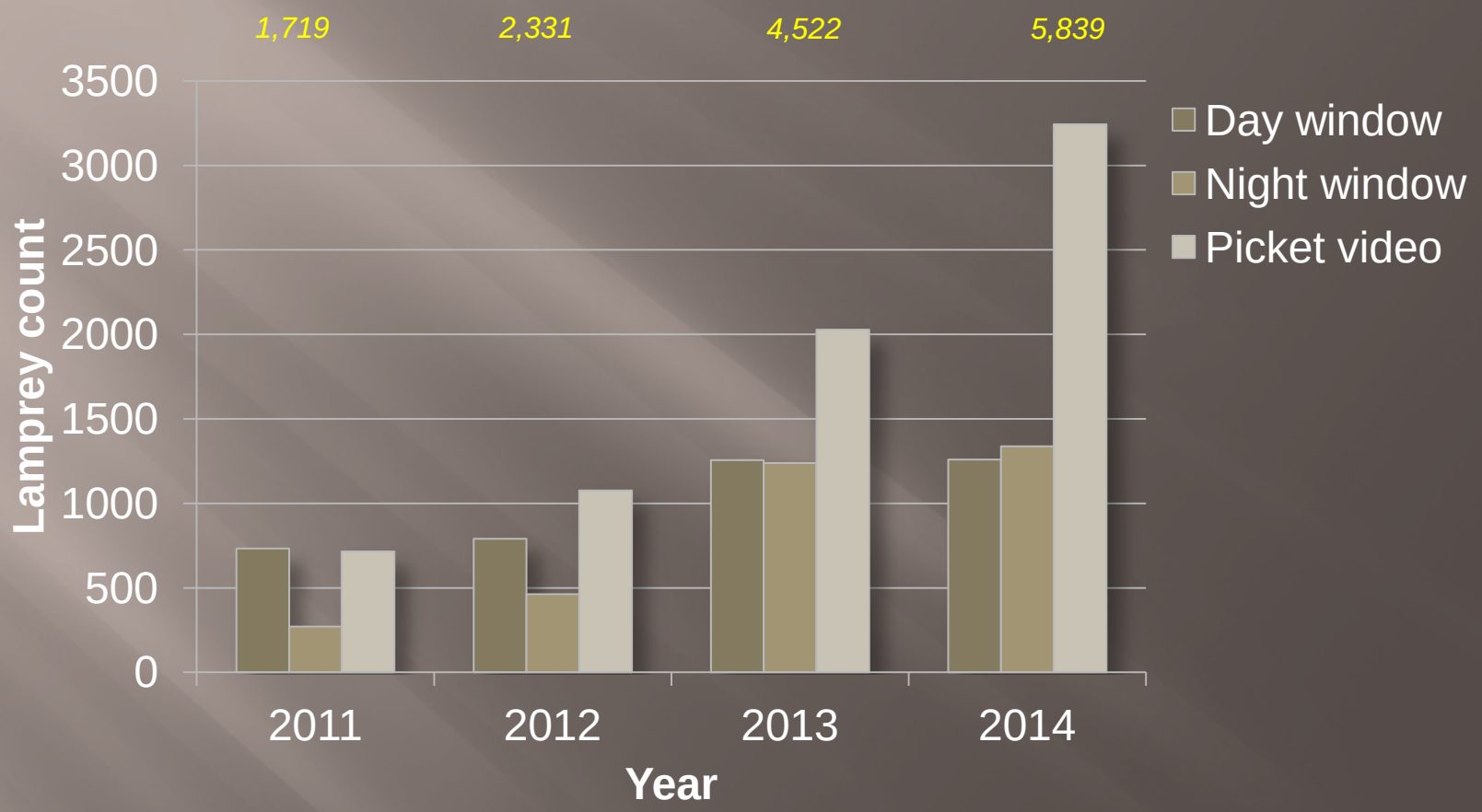
June 13 though Sept 15

Count window		Picket video	
Day	1,259	Day	2,545
Night	1,337	Night	698
=	2,596		3,243

Escapement 5,839 lampreys

55.5% picket use

Trends: McNary south



Picket use:	41.7%	46.2%	44.8%	55.5%

Lamprey counts: McNary WA shore

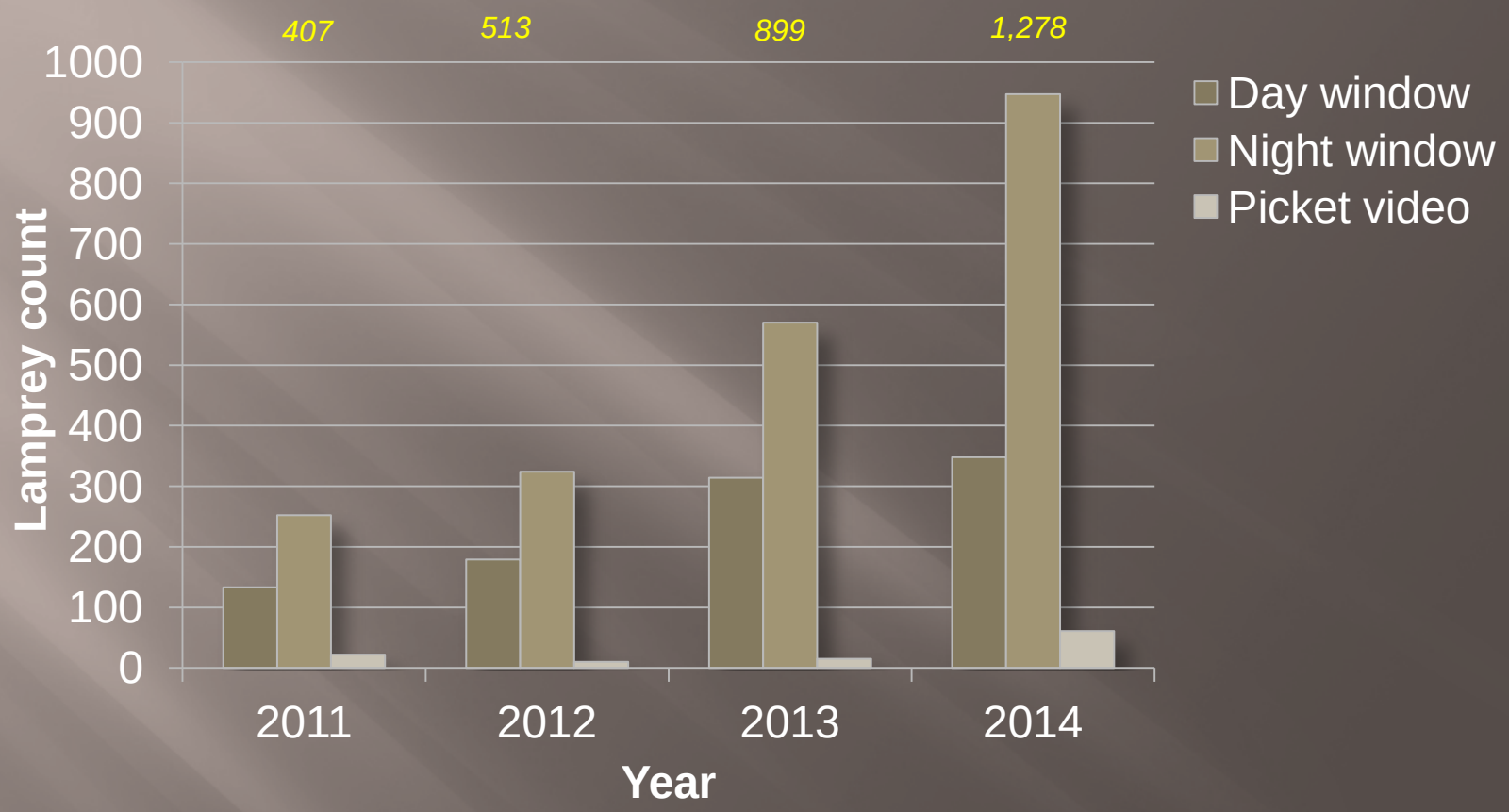
June 14 though Sept 15

Count window		Video at pickets	
Day	322	Day	44
Night	895	Night	17
=	1,217		61

Escapement 1,278 lampreys

4.8% picket use

Trends: McNary north



Picket use:	5.4%	1.9%	1.7%	4.8%

Lamprey counts: Ice Harbor south shore

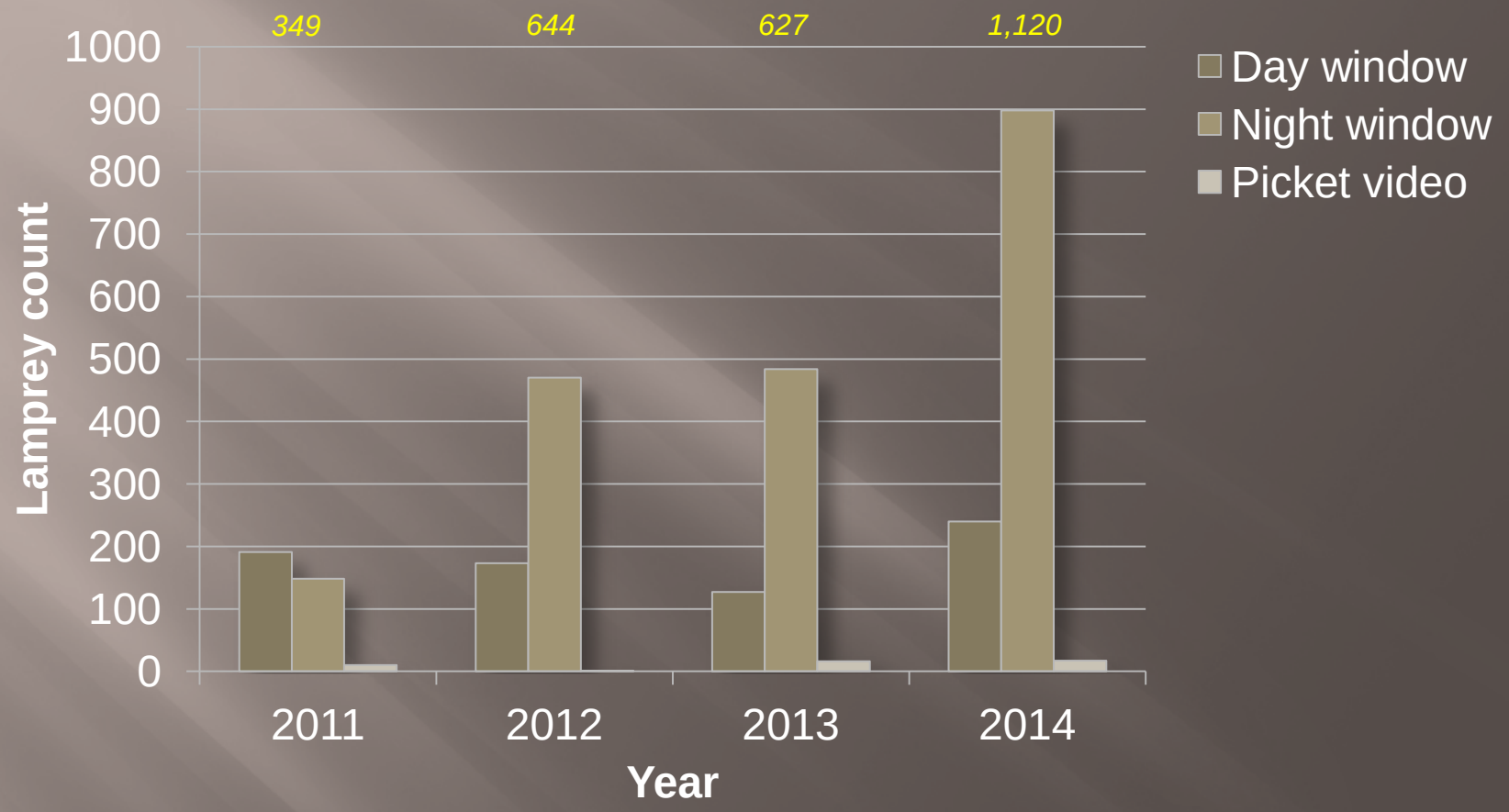
June 12 though Sept 15

Count window		Video at pickets	
Day	227	Day	5
Night	877	Night	11
=	1,104		16

Escapement 1,120 lampreys

1.4% picket use

Trends: Ice Harbor south



Picket use:	2.9%	0.2%	2.6%	1.4%

Lamprey counts: Ice Harbor north shore

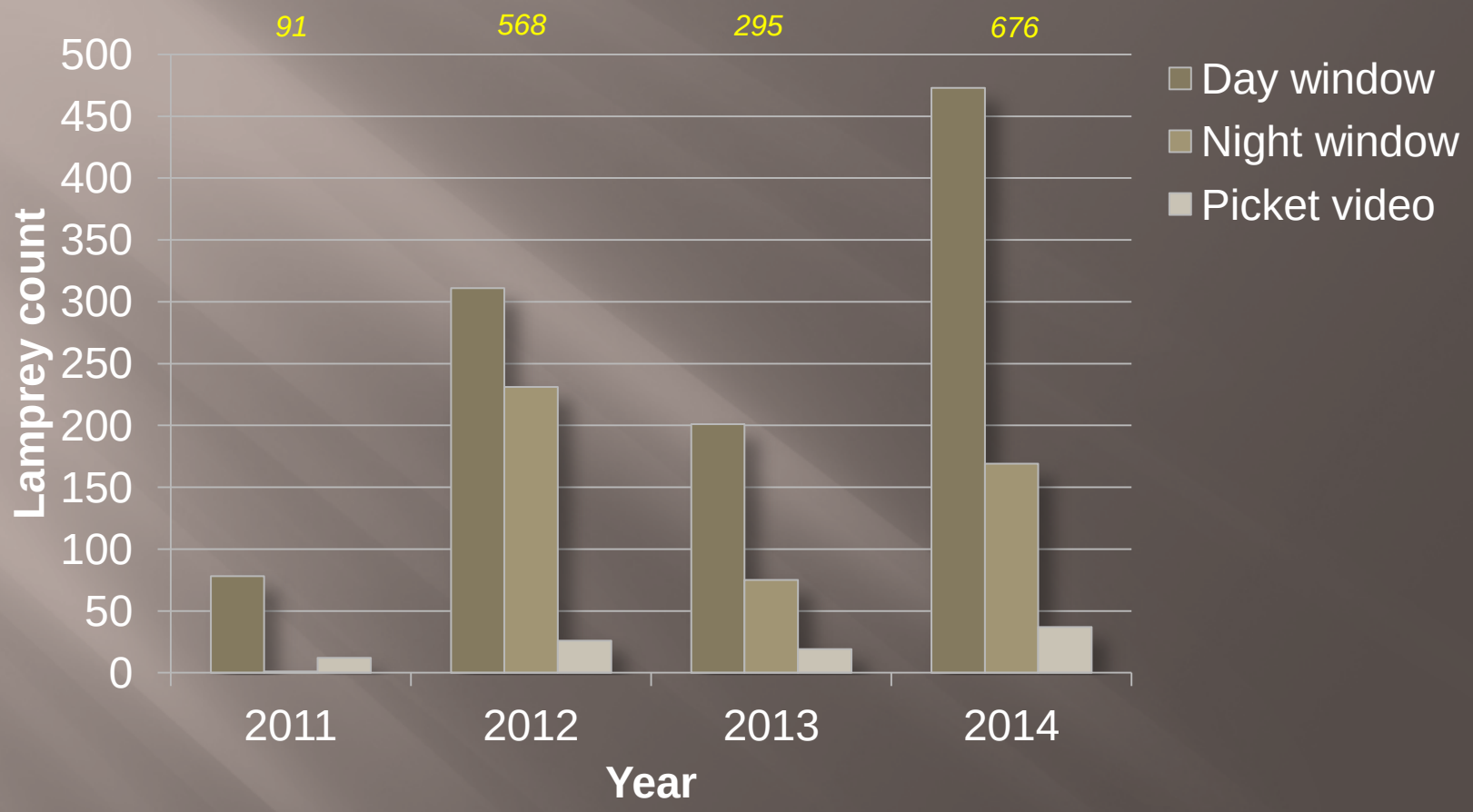
June 14 - Sept 15

Count window		Video at pickets	
Day	470	Day	29
Night	169	Night	8
=	639		37

Escapement 676 lampreys

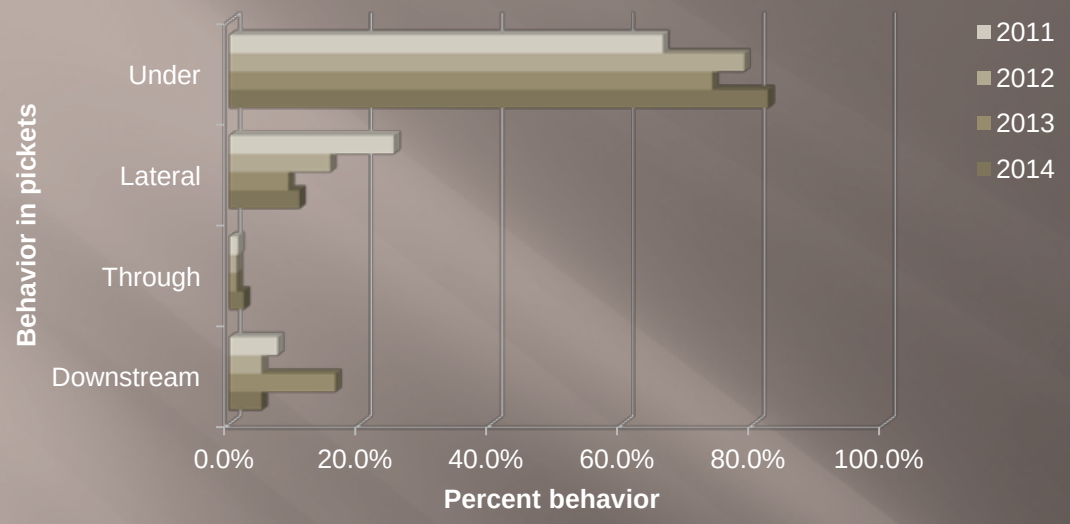
5.4% picket use

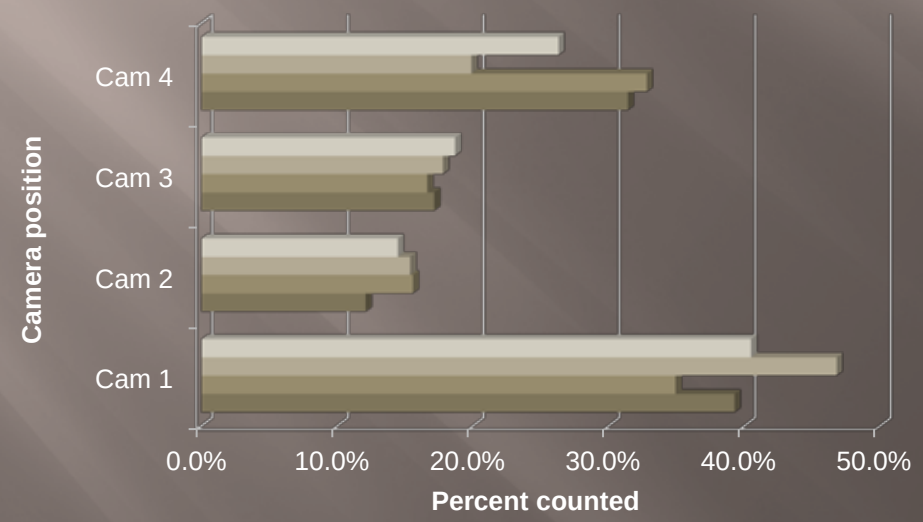
Ice Harbor north shore



Picket use:	13.2%	4.6%	6.4%	5.4%

Count index at McNary south

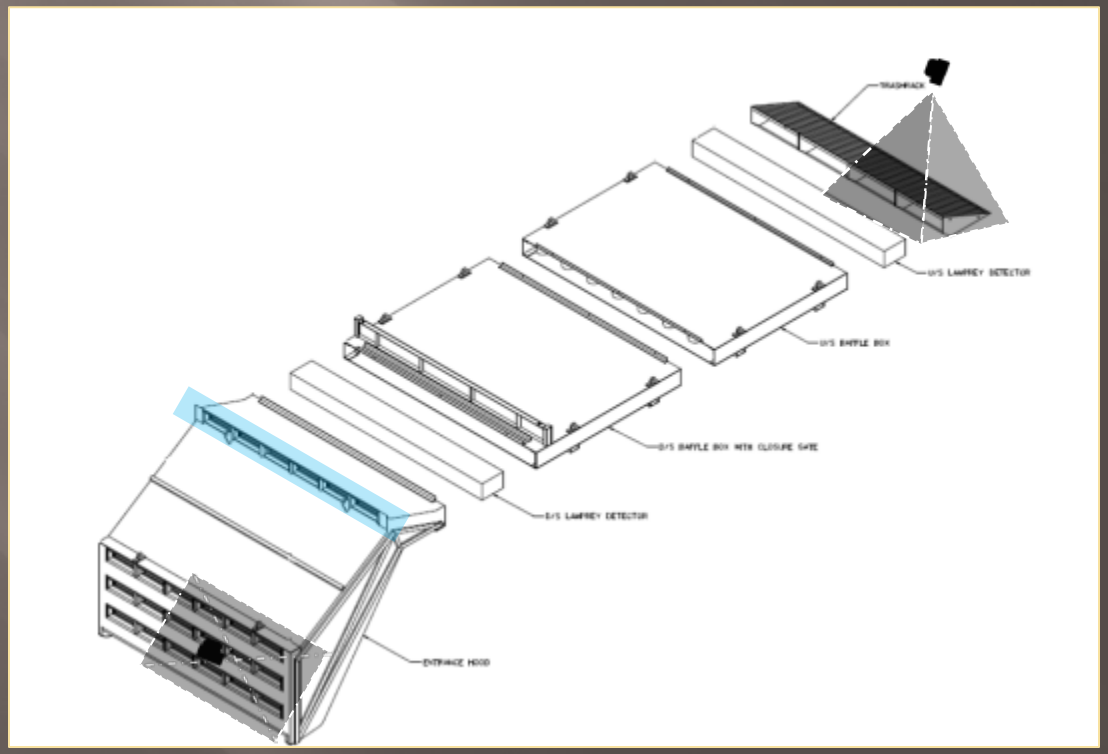




2011	41.7%
2012	46.4%
2013	44.4%
2014	55.4%

Index *48.8%* *+/- 7.0%*

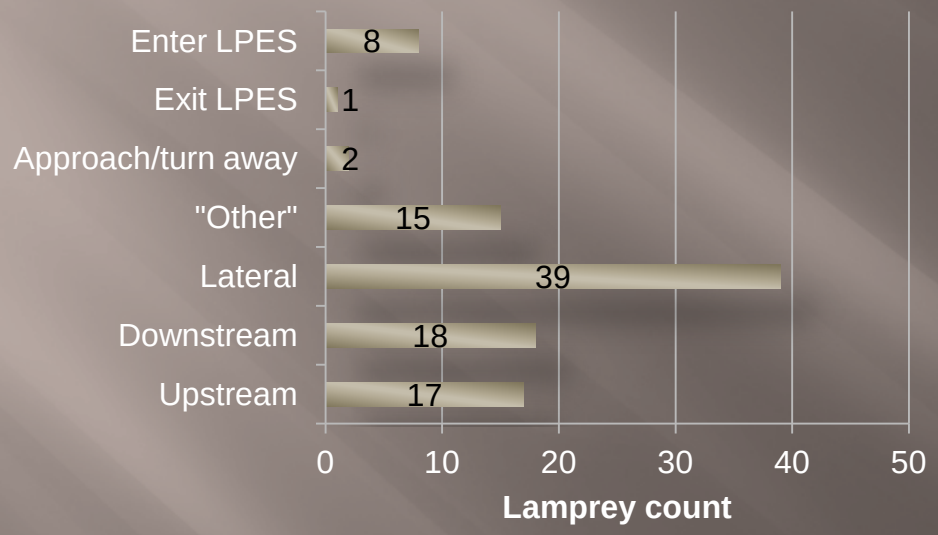
LPES Monitoring

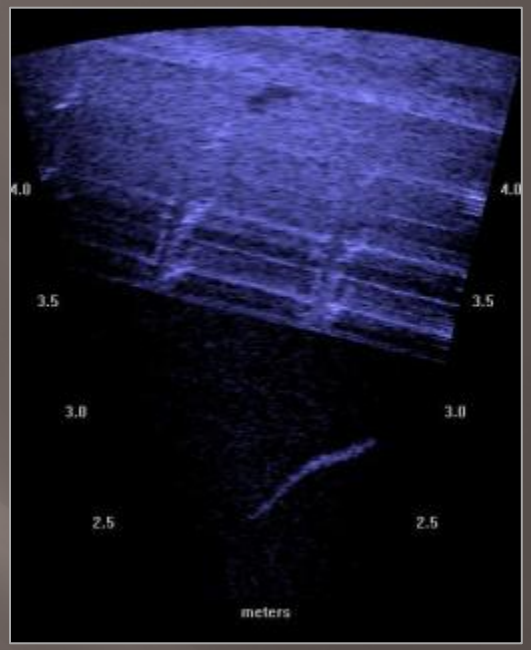


Lamprey behavior at LPES

LPES lower entrance ports

~ 430 hours analyzed (July 15 – Sept 11)





100 lamprey observed

8 lamprey enter LPES → 8% LPES entry rate

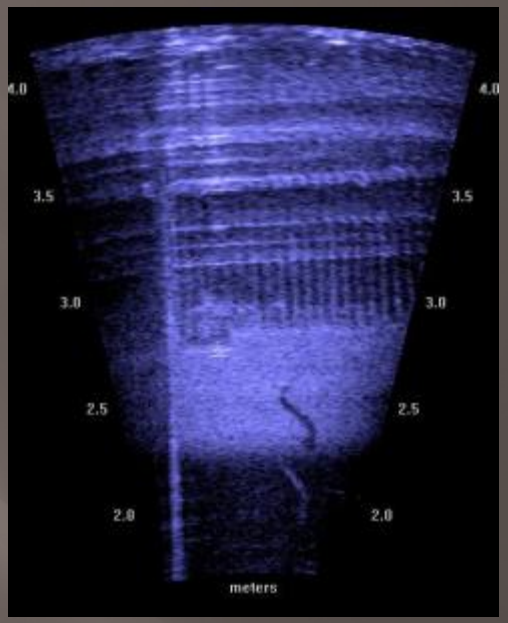
No salmon interactions

LPES trash rack

~ 400 hours analyzed

Lamprey observed = 85
Lamprey exiting = 62

LPES exit rate → 72.9%



No salmon interactions

LPES upper ports

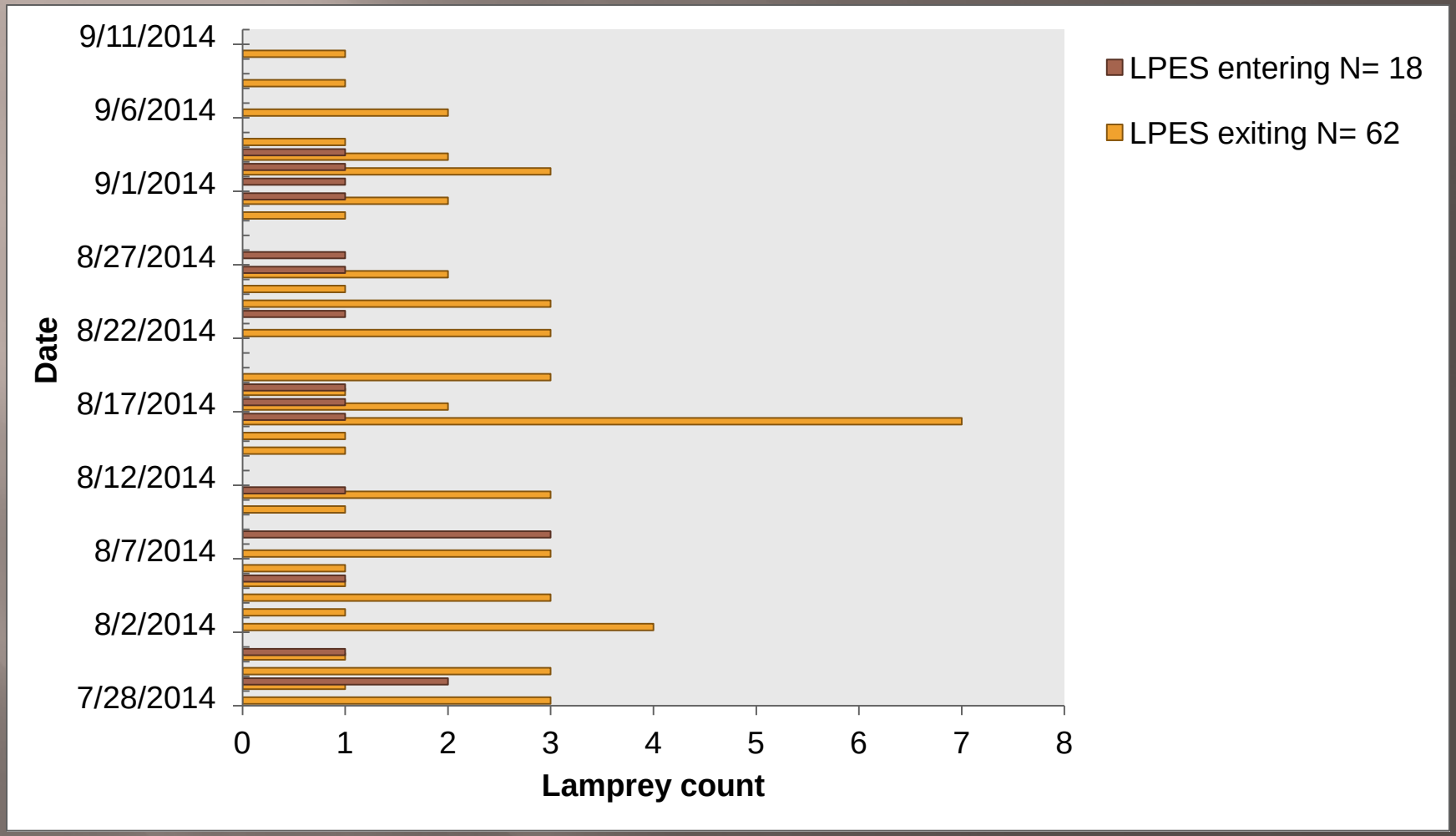
No interactions observed

- Chinook
- Steelhead
- Sockeye

Lamprey observed = 75
Lamprey entering = 13

LPES entry rate → 17.3%

LPES Passage



Conclusions

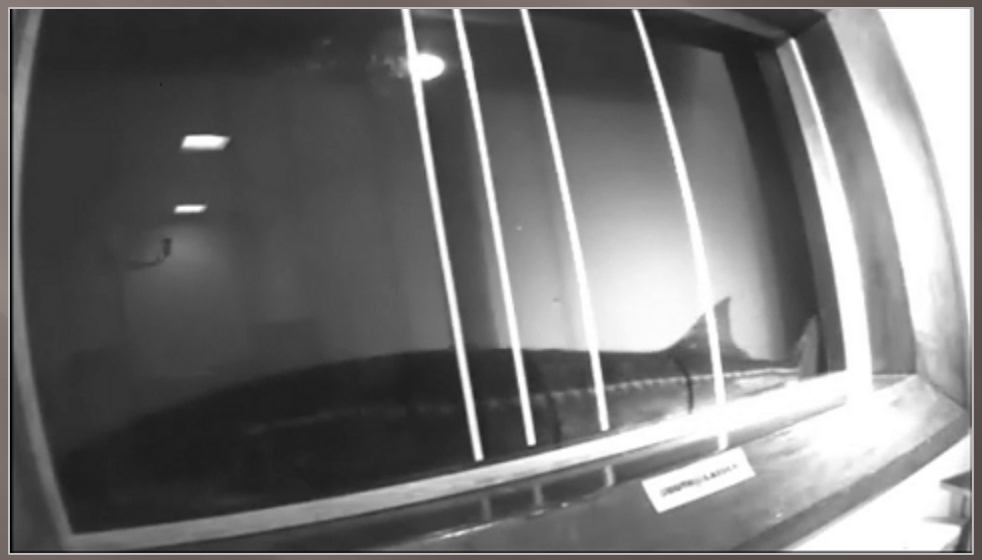
- PICKETED LEAD MONITORING
  - As in 2011-13, variable picket passage across sites
    - Count slot entrance differences
  - Picket use consistent across years
  - Window counts and picket video used to estimate escapement
    - Index for McNary south
- LAMPREY PROTOTYPE ENTRANCE STRUCTURE
  - No evidence of salmon interactions
  - LPES used by lamprey to enter SFE2
    - Low “fall out” rate
  - Increased coverage of LPES ports needed
    - High exit rate = more enter in unmonitored area

Acknowledgments

We wish to thank the following people for their help and assistance:

U of Idaho: Charles Boggs and Travis Dick; USACE: John Dalen (fish counts), Derek Fryer and Steve Juhnke. McNary crane operators and riggers.

UCD: Stephanie Klein, Evelien De Greef, Duyen Ho, Ryan Nguyen, and Lindsey Freeman for video analysis.



Count slot entrance

McNary south shore

Ice Harbor north shore