Pacific Northwest
NATIONAL LABORATORY
Proudly Operated by Battelle Since 1965

Behavior, Distribution, and Passage Metrics of Juvenile Chinook Salmon Above and Below Lookout Point Dam

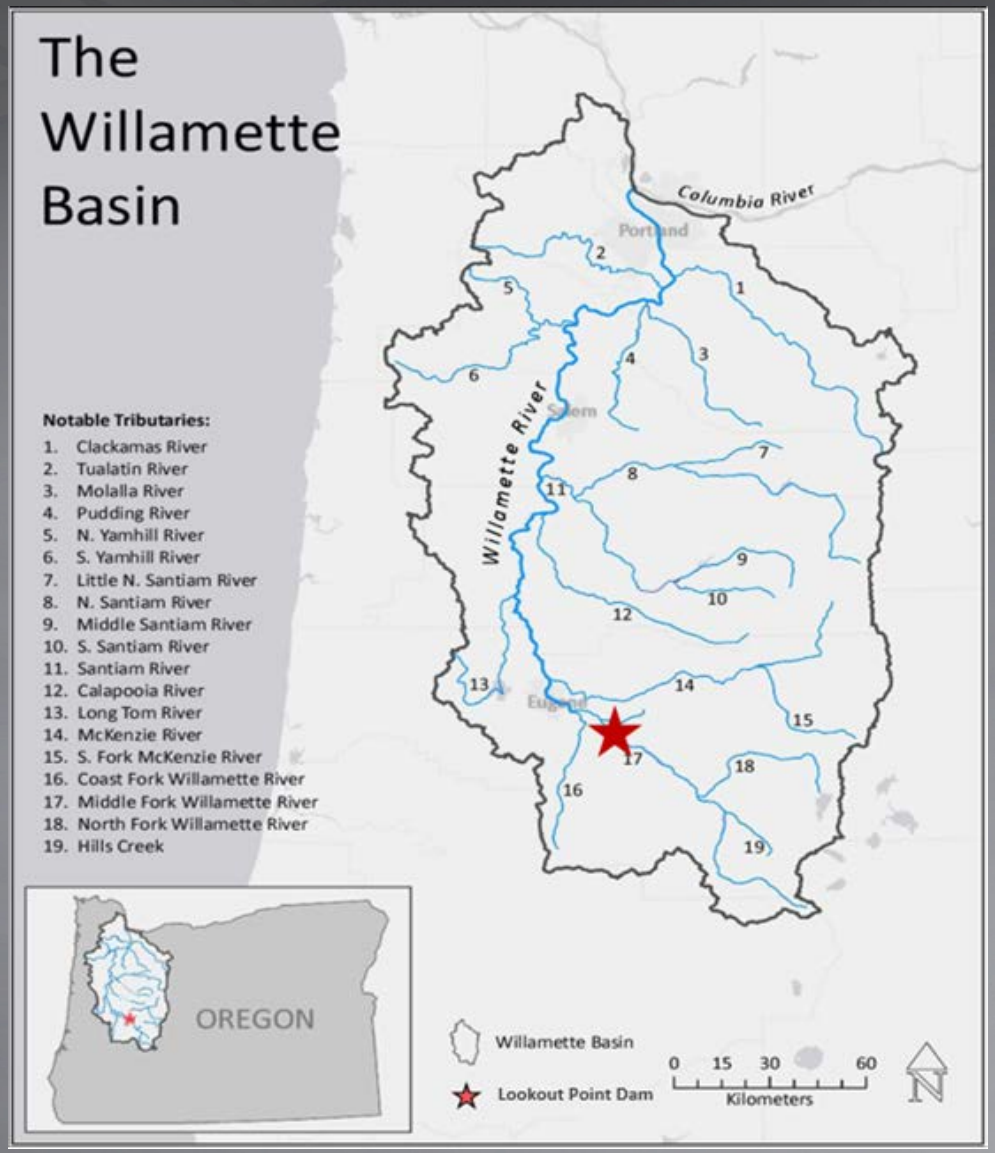
ES FISCHER, JS HUGHES, PS TITZLER, KD HAM AND GE JOHNSON

WILLAMETTE FISHERIES SCIENCE REVIEW
CORVALLIS, OREGON
FEBRUARY 2018

STUDY CODE: JPL-15-04-LOP

U.S. DEPARTMENT OF
ENERGY

Background


The Willamette Basin
Notable Tributaries:
1. Clackamas River
2. Tualatin River
3. Molalla River
4. Pudding River
5. N. Yamhill River
6. S. Yamhill River
7. Little N. Santiam River
8. N. Santiam River
9. Middle Santiam River
10. S. Santiam River
11. Santiam River
12. Calapooia River
13. Long Tom River
14. McKenzie River
15. S. Fork McKenzie River
16. Coast Fork Willamette River
17. Middle Fork Willamette River
18. North Fork Willamette River
19. Hills Creek
Columbia River
Portland
Salem
Eugene
Willamette River
OREGON
Willamette Basin
Lookout Point Dam
0 15 30 60
Kilometers
N

Background

Pacific Northwest
NATIONAL LABORATORY
Proudly Operated by Battelle Since 1965

- Lookout Point Dam
  - Storage Project
    - Flood Risk Reduction
    - Peak Power Generation
    - Navigation
    - Irrigation
  - 3 Turbine Units
  - 5 Spillbays
  - 4 Regulating Outlets

Background

Pacific Northwest
NATIONAL LABORATORY
Proudly Operated by Battelle Since 1965

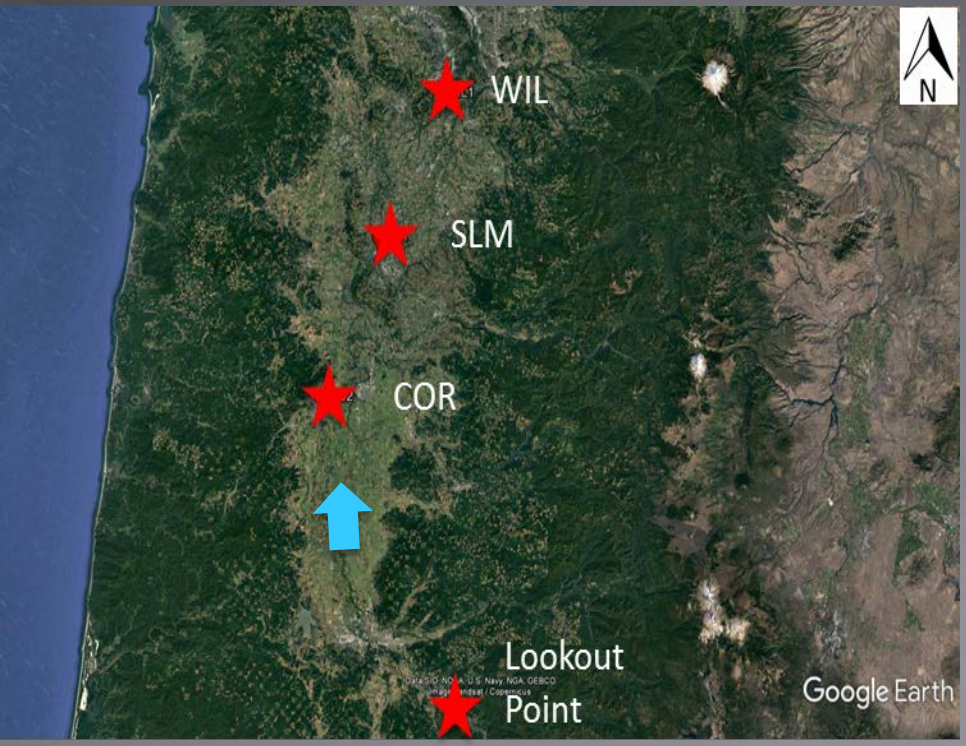
- Dexter Dam
  - Run-of-River
    - Flood Risk Reduction
    - Peak Power Generation
    - Navigation
    - Irrigation
  - 1 Turbine Unit
  - 7 Spillbays

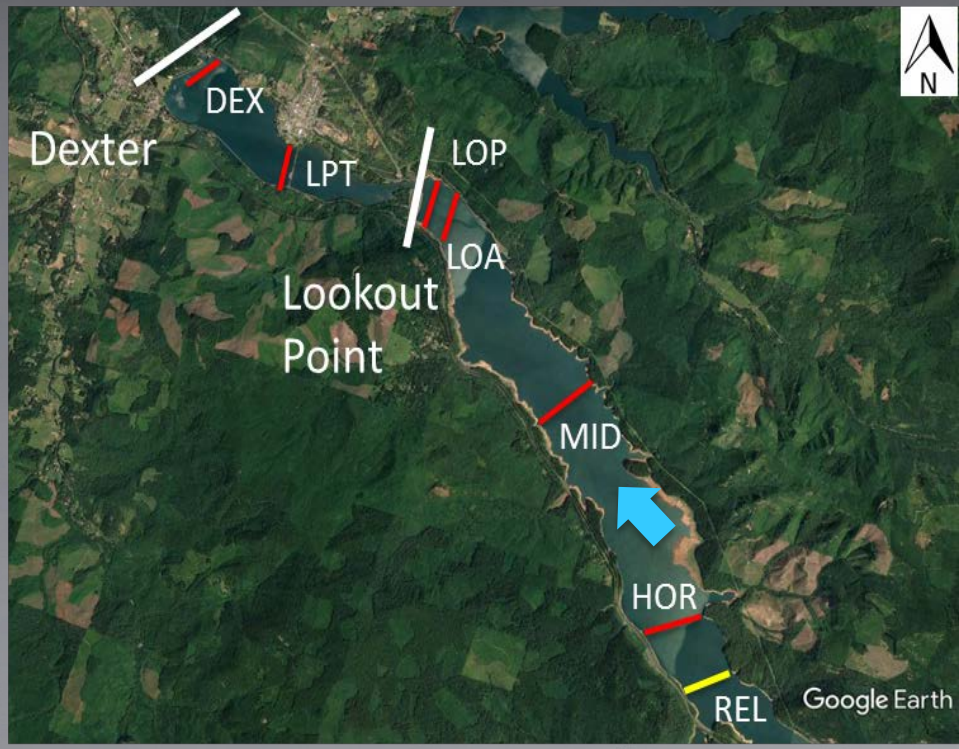
Objectives

- Reservoir Movement and Behavior
  - Daily Movement
  - Cross Reservoir Distribution by Array
  - Forebay Approach
- Travel Times
- Downstream Migration and Survival

Study Area

Pacific Northwest
NATIONAL LABORATORY
Proudly Operated by **Battelle** *Since 1965*





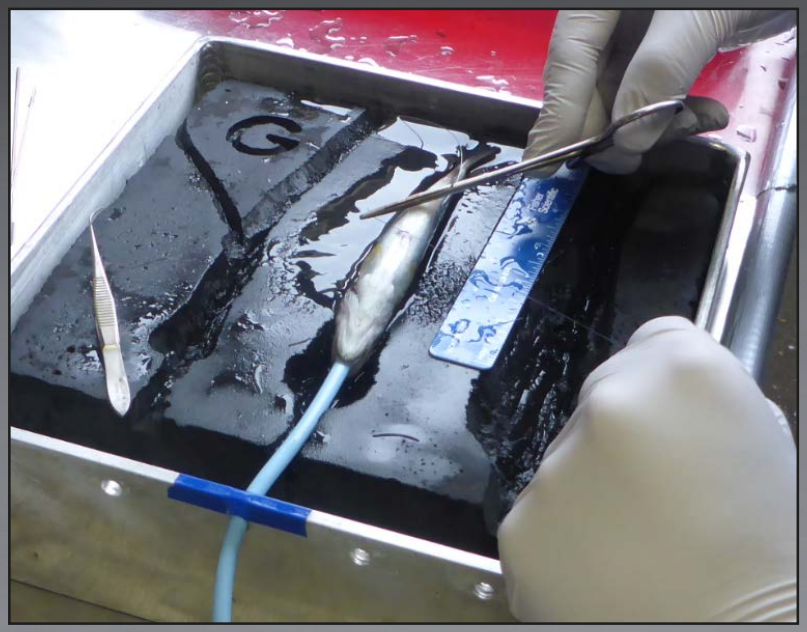
Tagging and Release

Pacific Northwest NATIONAL LABORATORY
Proudly Operated by Battelle Since 1965

- OSU Wild Fish Surrogate Program
- Fish Tagging

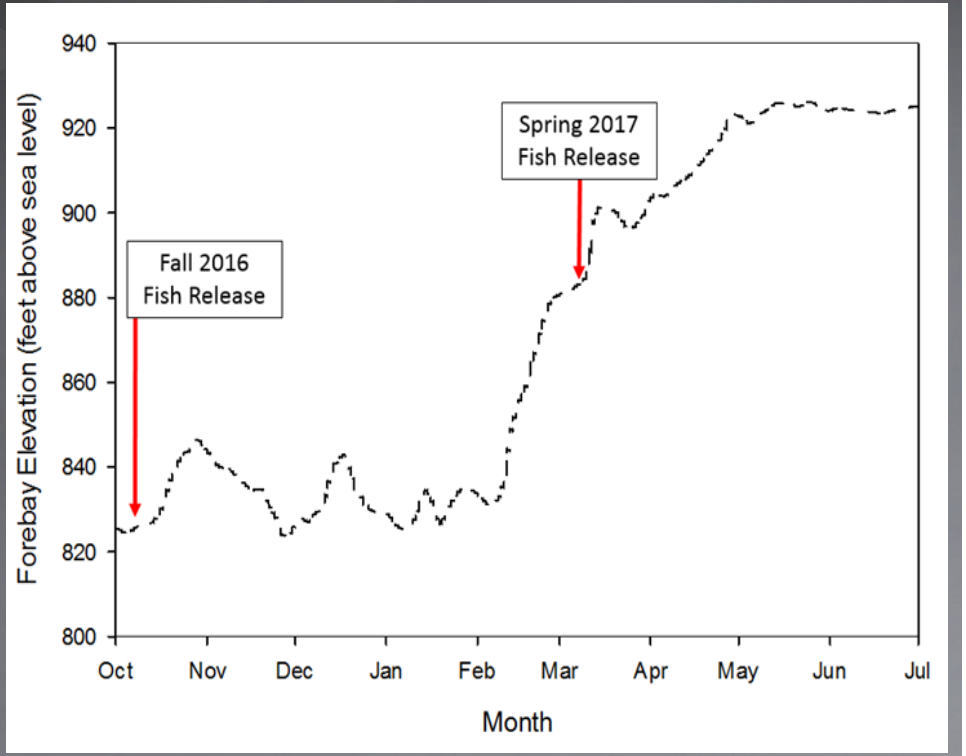
Season	n	Size (mm)	Weight (g)
Fall 2016	520	148	39
Spring 2017	549	199	82

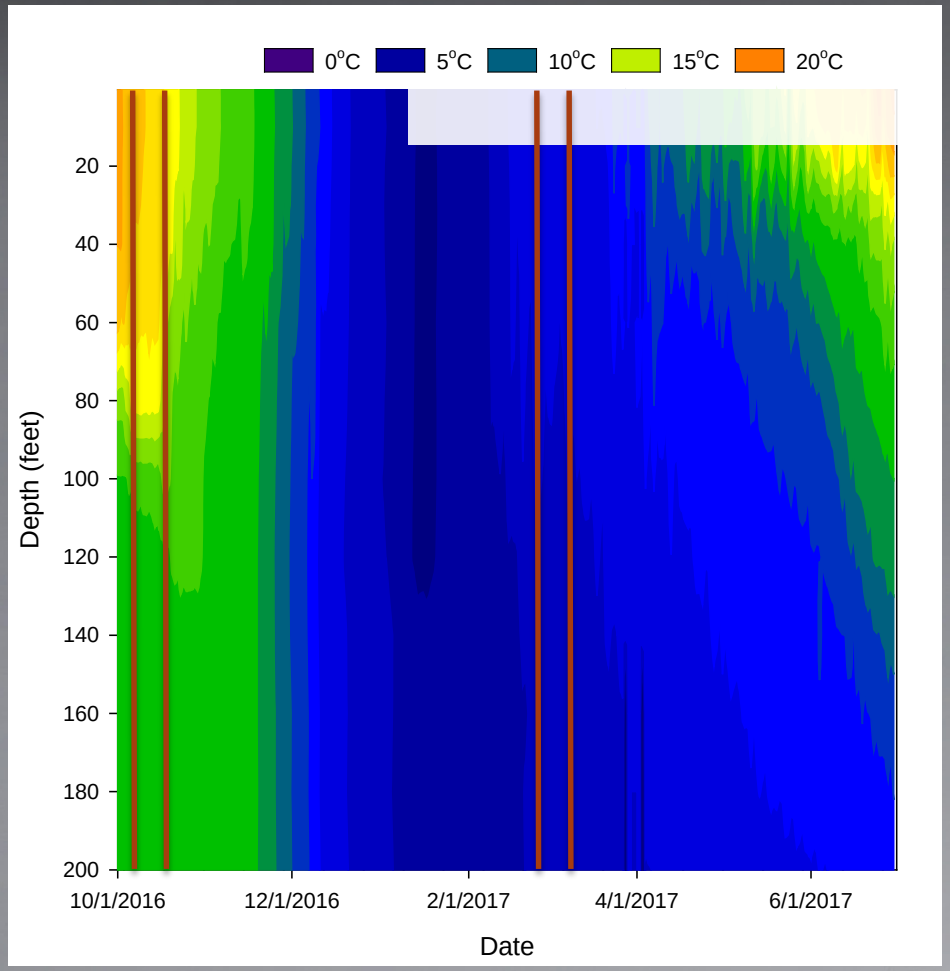
  - Dead Fish Release per season; n=60
  - 24-h Mortality = 0.28%
  - 20 Tag Life (~102 days)
- Fish Release
  - Fall: October 4-8, 2016
  - Spring: March 7-10, 2017



This research was conducted in compliance with a protocol approved by PNNL's Institutional Animal Care and Use Committee

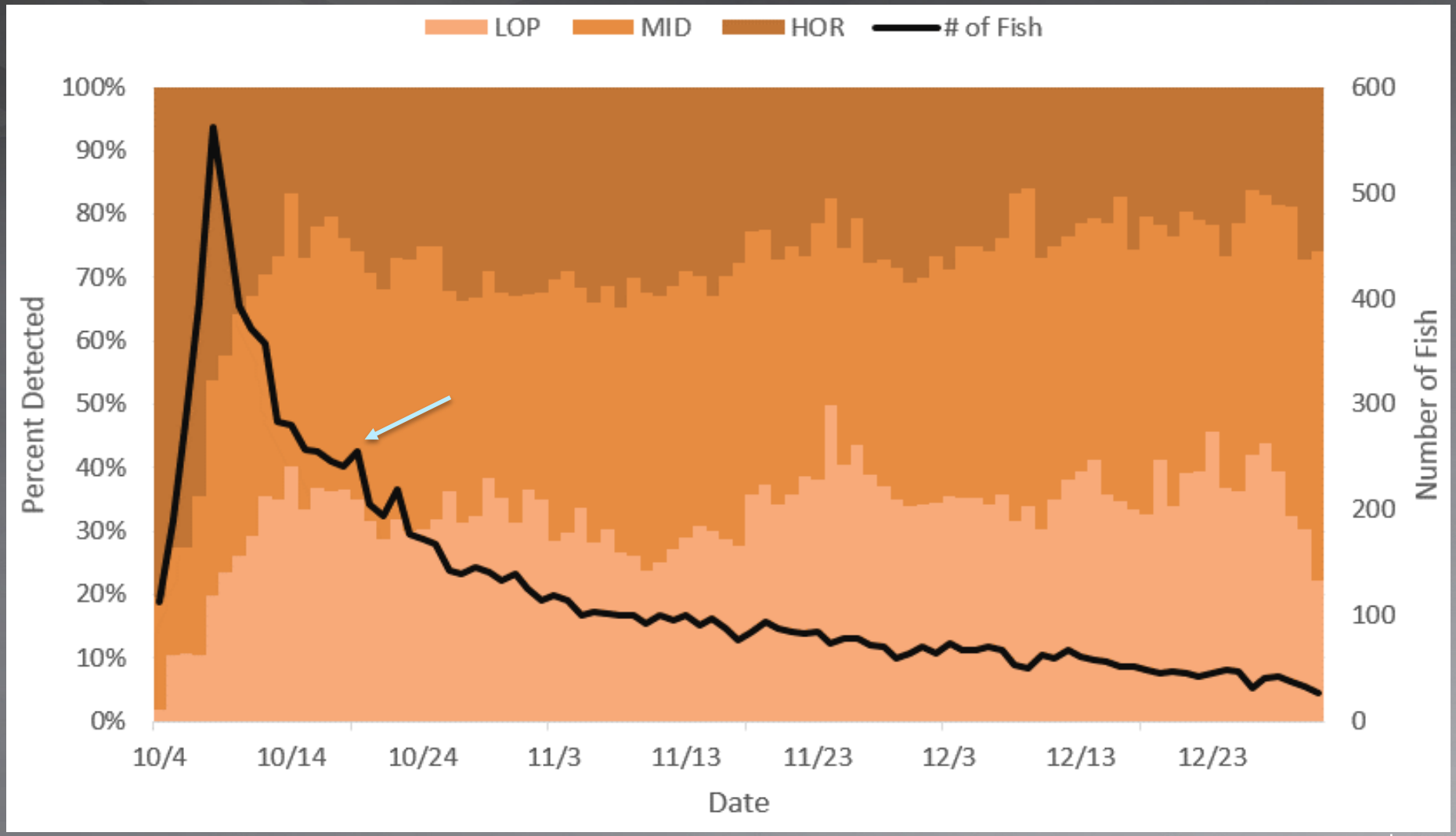
Environmental Conditions



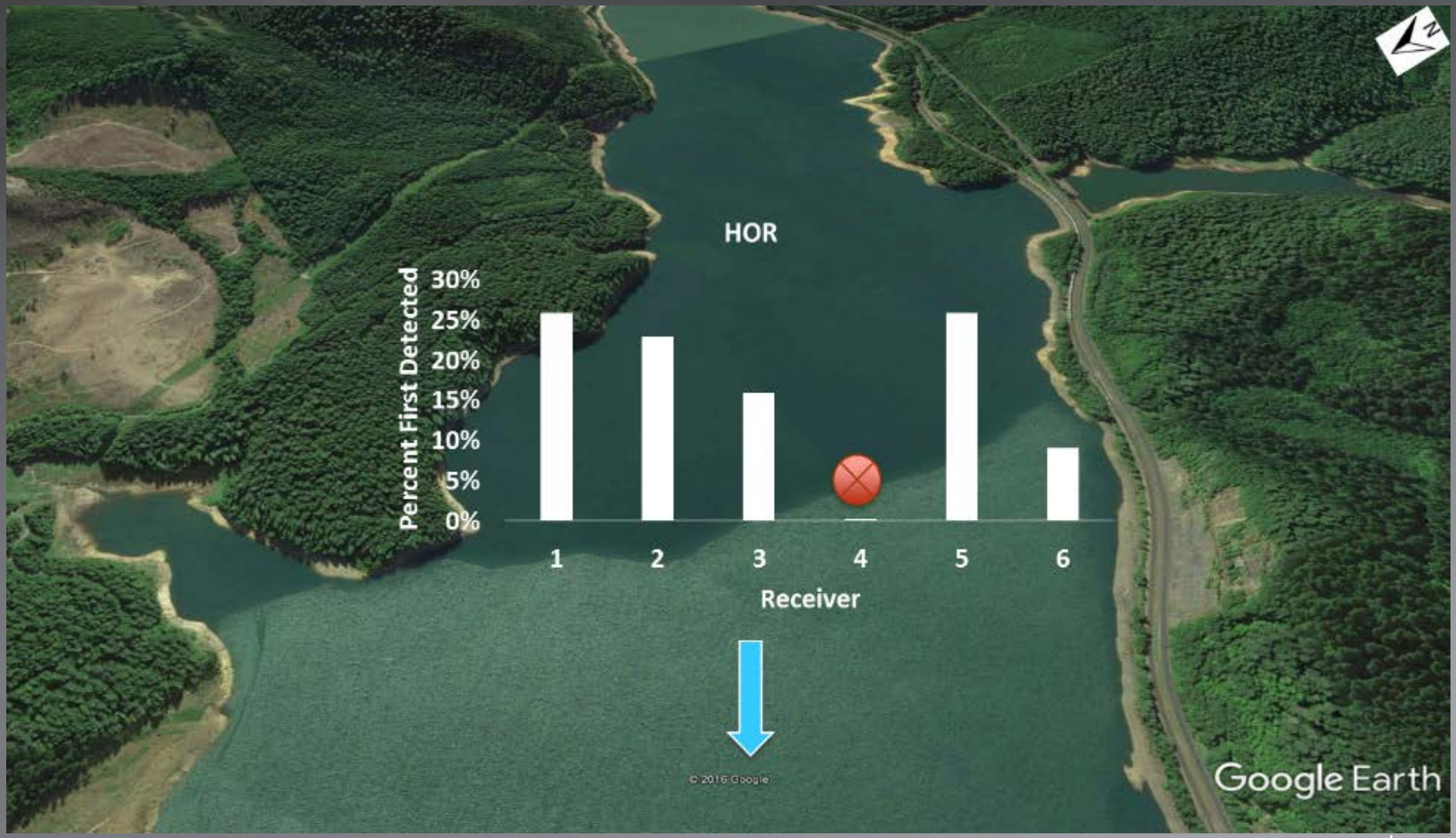


Fall 2016 Reservoir Movement

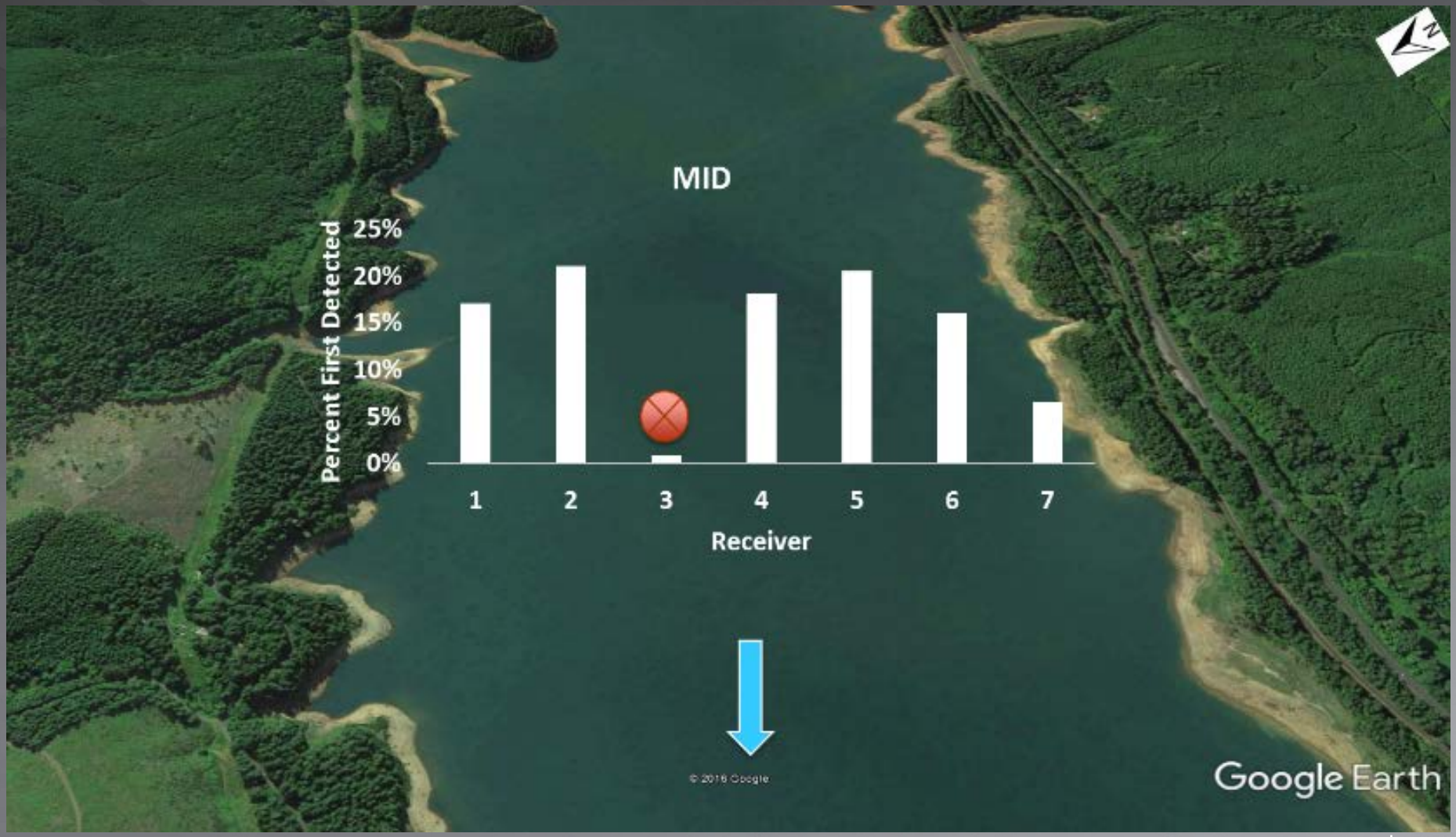
Pacific Northwest
NATIONAL LABORATORY
Proudly Operated by Battelle Since 1965



Fall 2016 Horizontal Distribution



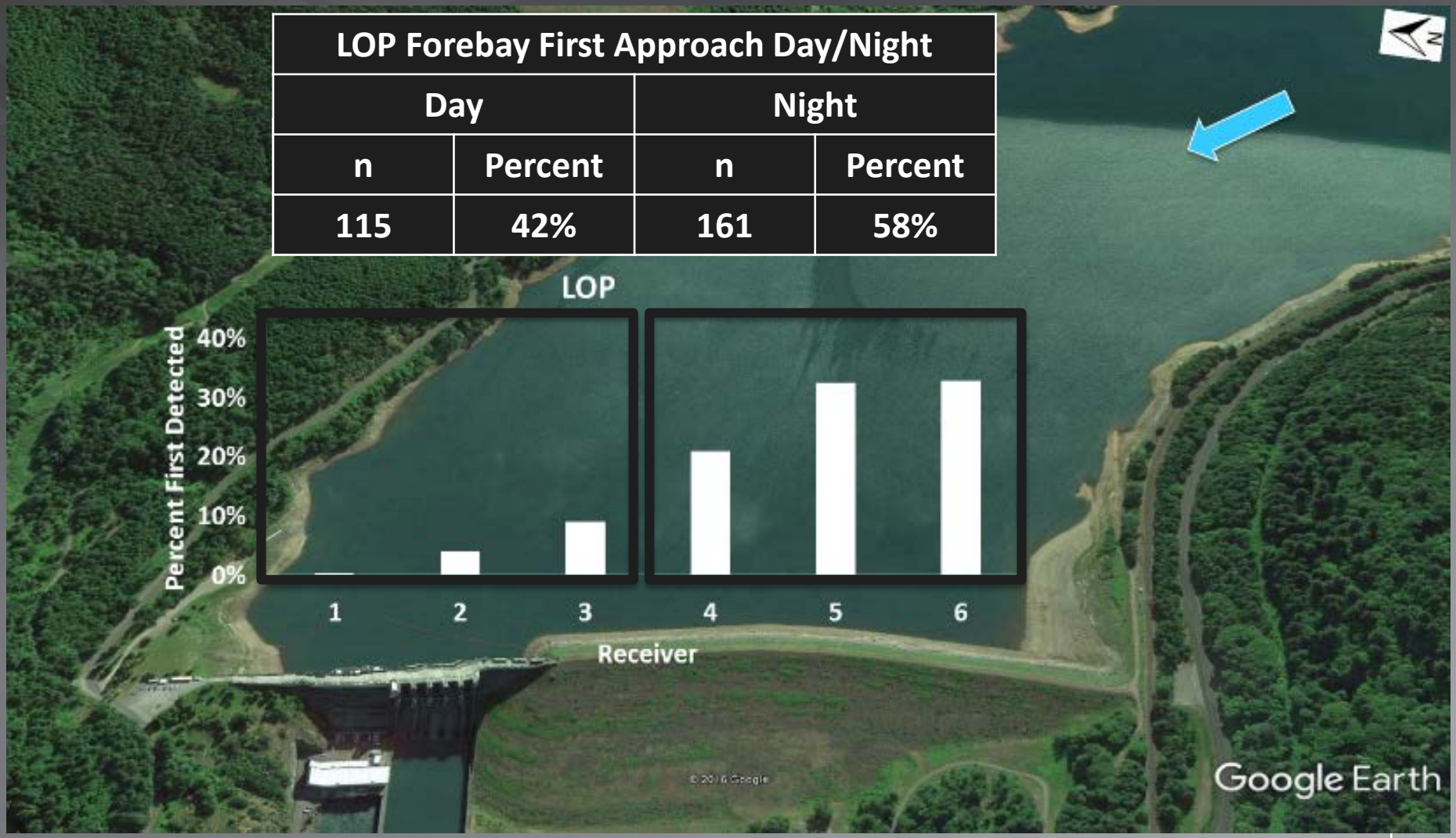
Fall 2016 Horizontal Distribution



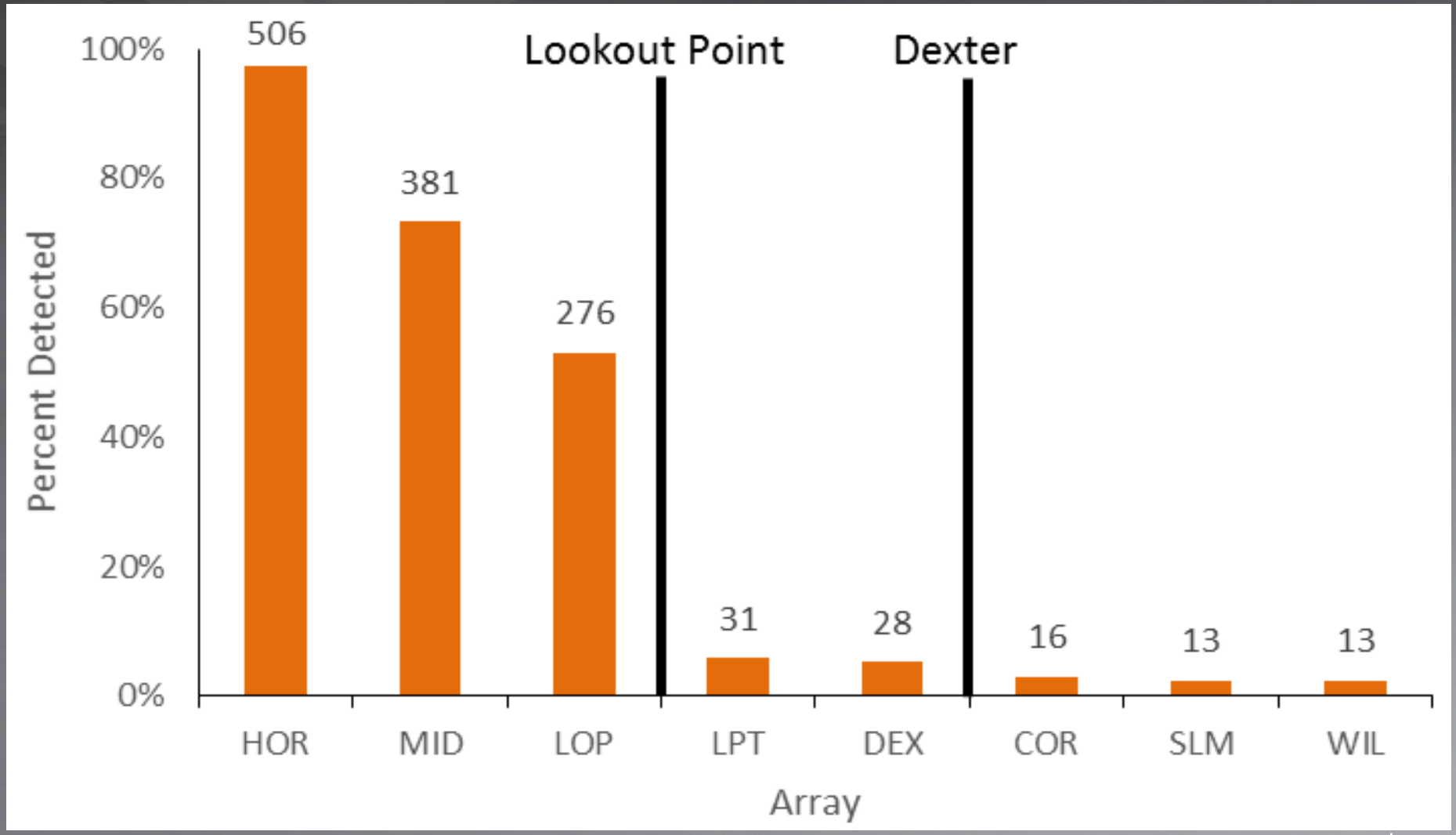
Fall 2016 Horizontal Distribution

Pacific Northwest
NATIONAL LABORATORY
Proudly Operated by Battelle *Since 1965*

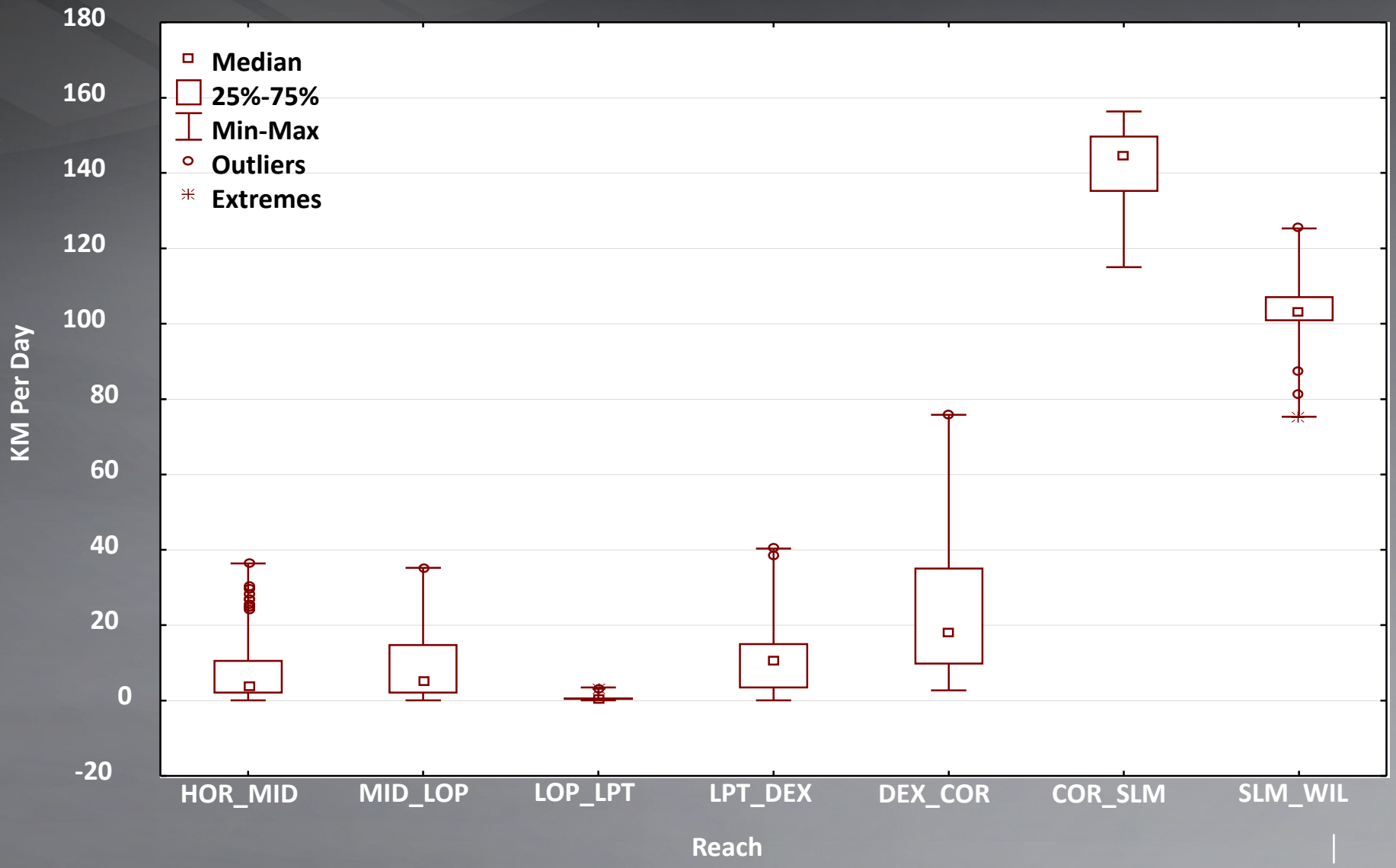
LOP Forebay First Approach Day/Night			
Day		Night	
n	Percent	n	Percent
115	42%	161	58%



Fall 2016 Downstream Movement

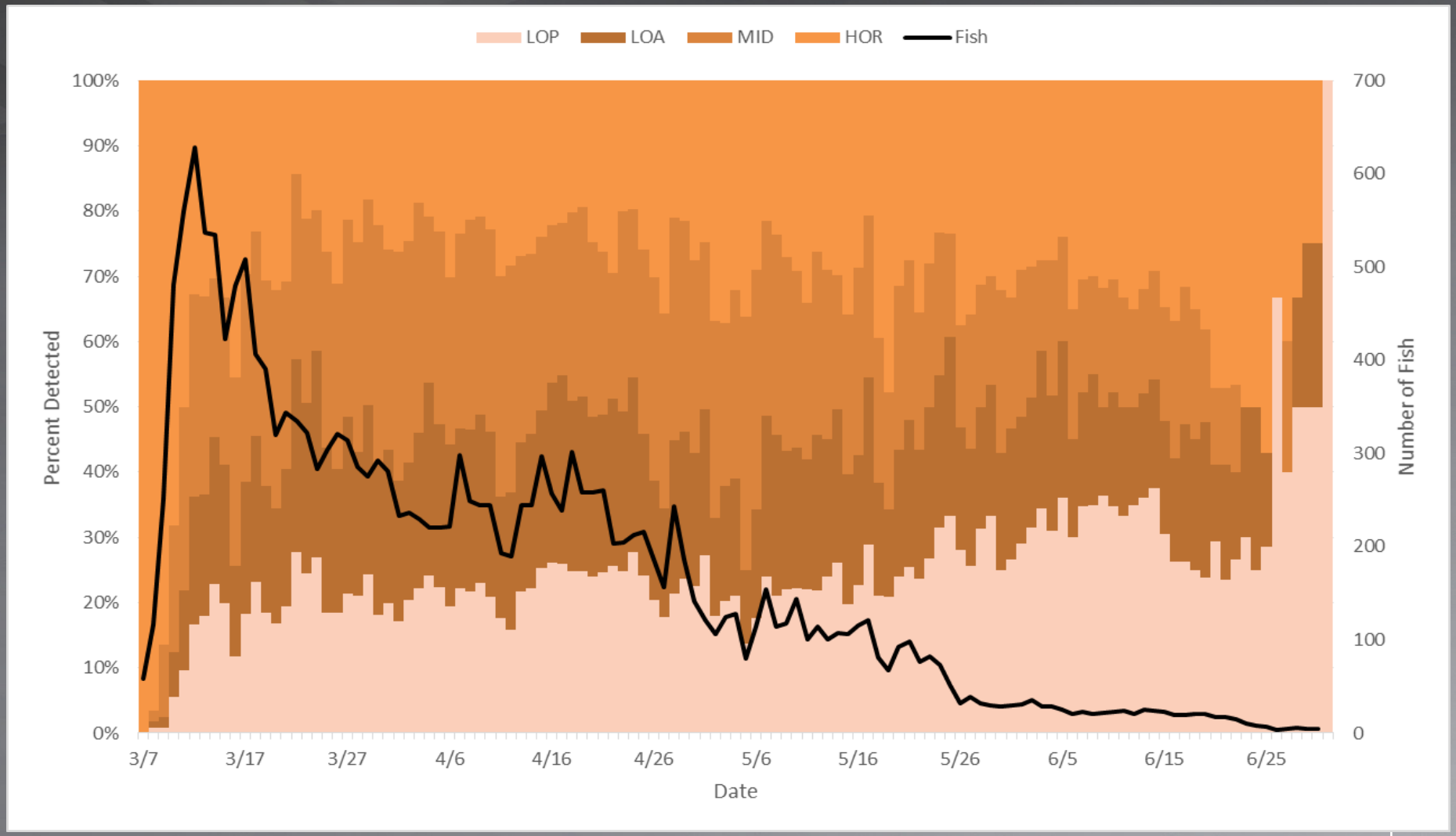


Fall 2016 Travel Time



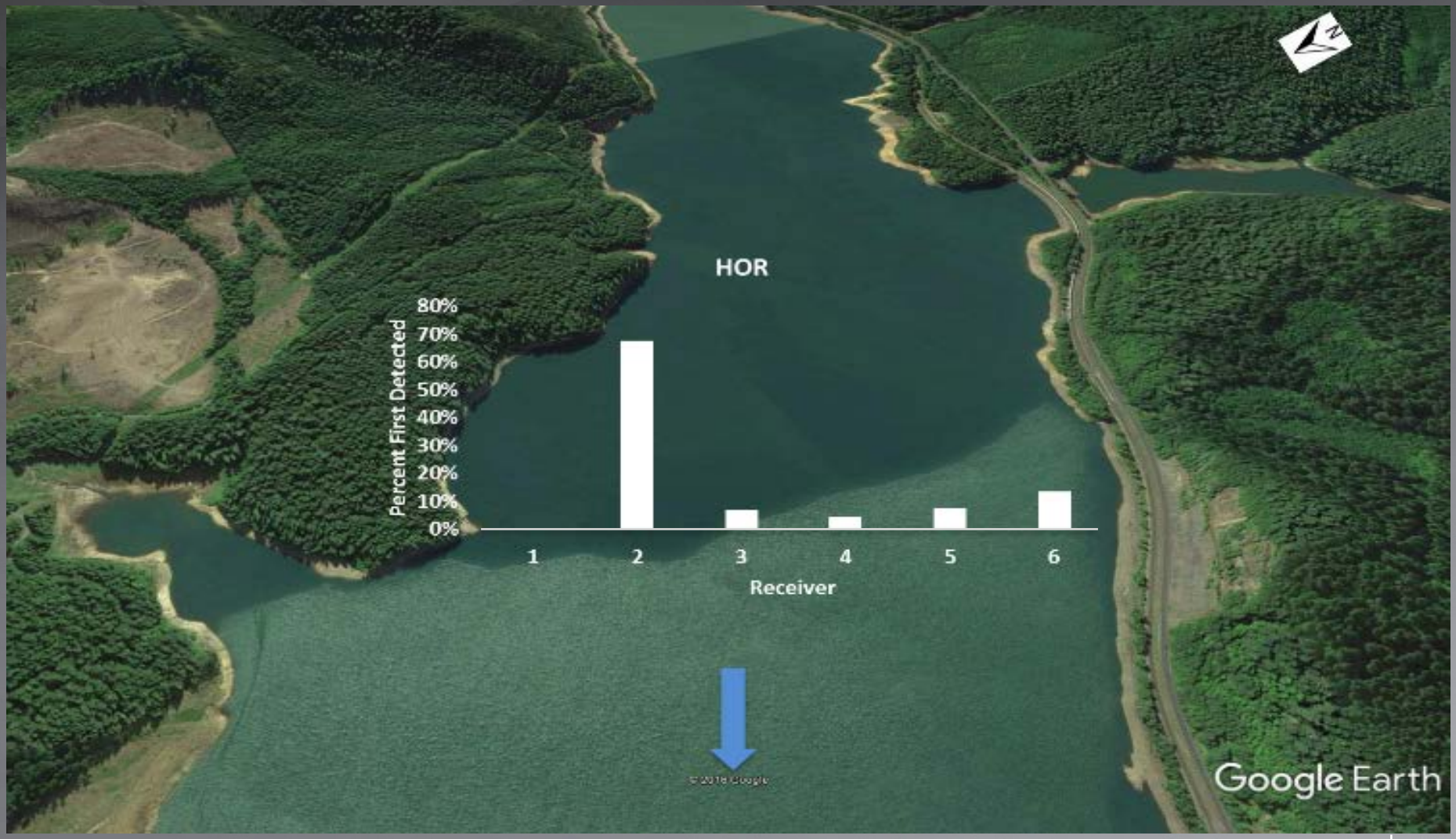
Spring 2017 Reservoir Movement

Pacific Northwest
NATIONAL LABORATORY
Proudly Operated by Battelle Since 1965



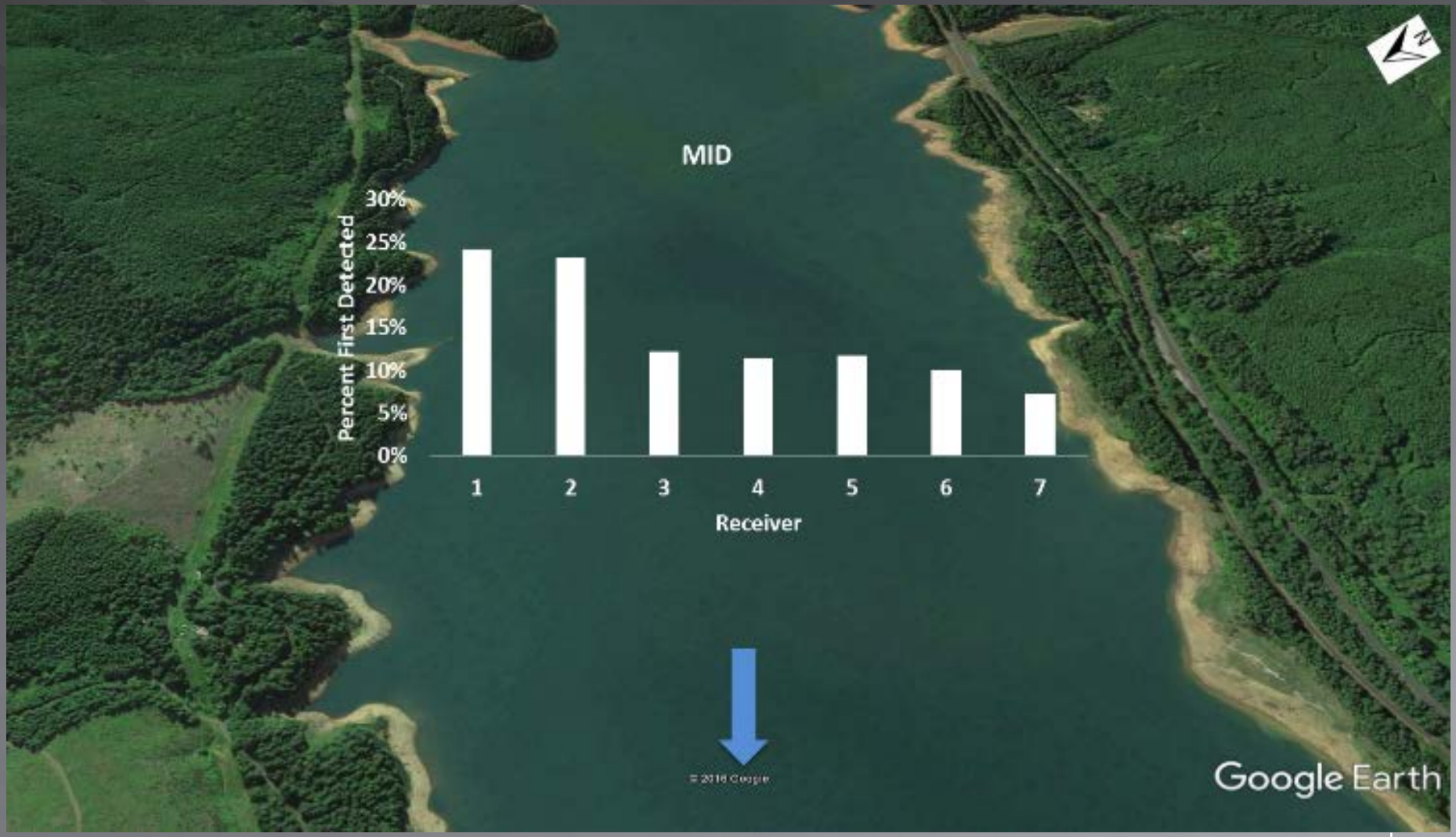
Spring 2017 Horizontal Distribution

Pacific Northwest
NATIONAL LABORATORY
Proudly Operated by Battelle *Since 1965*



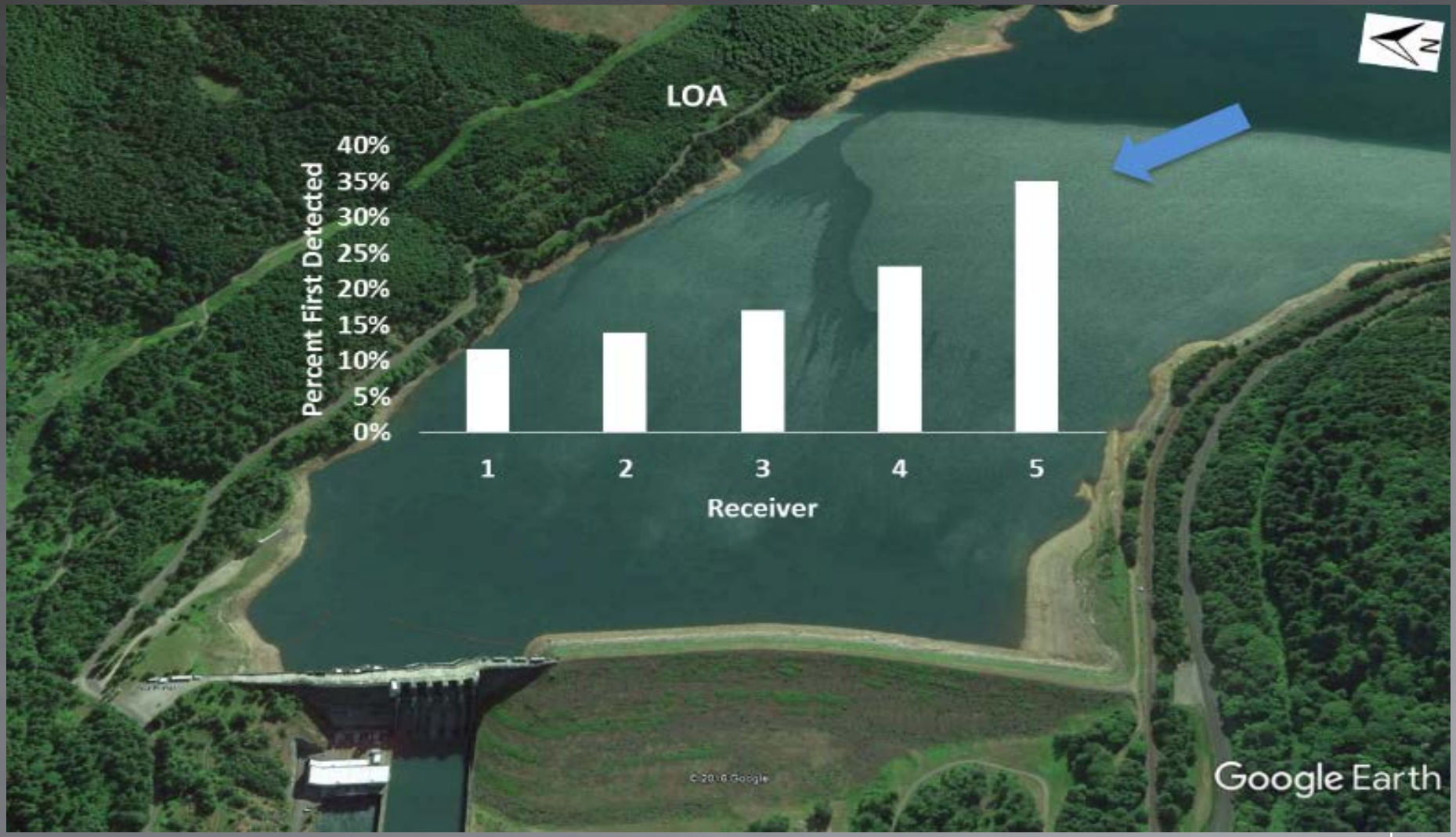
Spring 2017 Horizontal Distribution

Pacific Northwest
NATIONAL LABORATORY
Proudly Operated by Battelle *Since 1965*



Spring 2017 Horizontal Distribution

Pacific Northwest
NATIONAL LABORATORY
Proudly Operated by Battelle *Since 1965*



Spring 2017 Horizontal Distribution

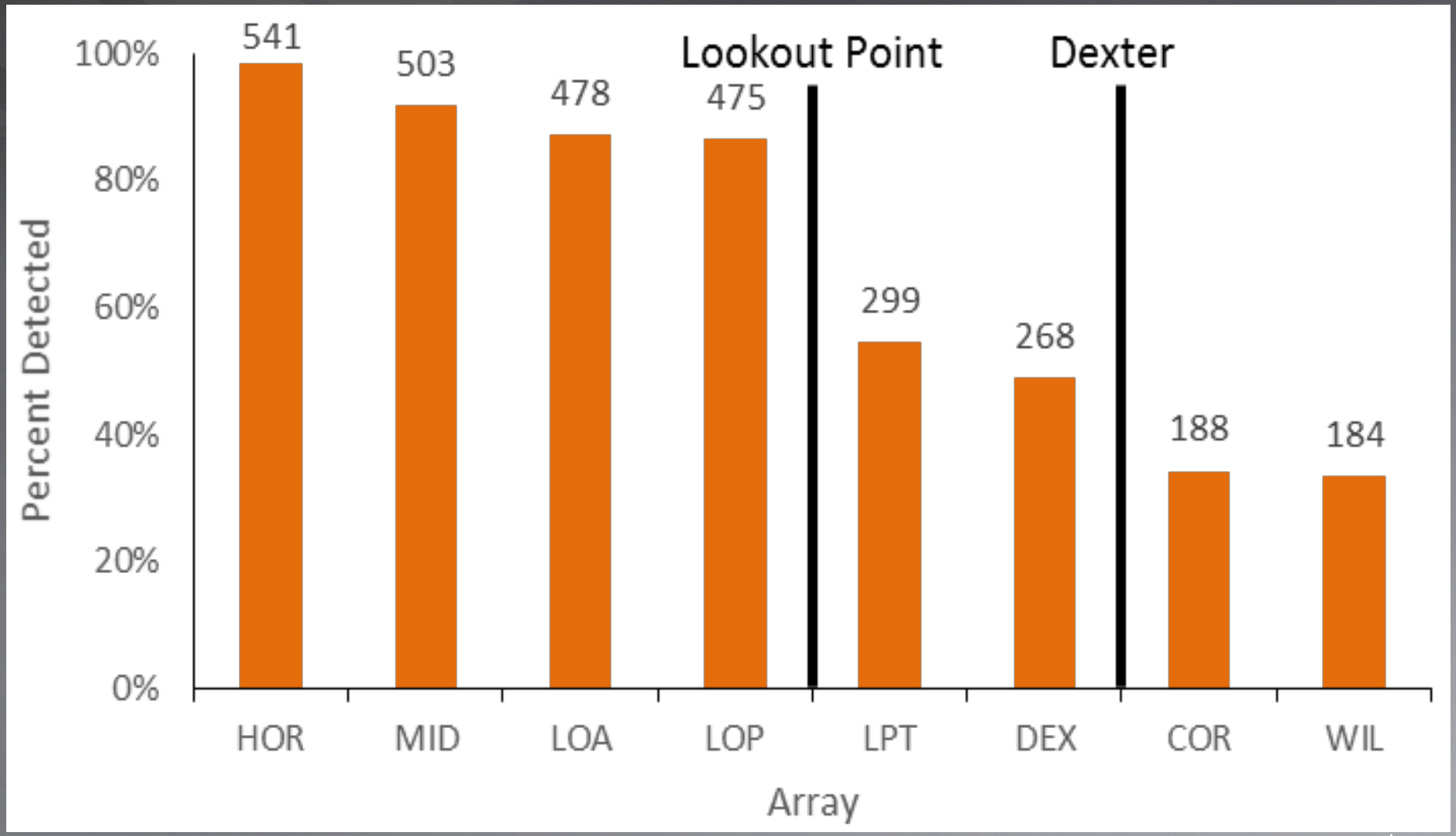
Pacific Northwest
NATIONAL LABORATORY
Proudly Operated by Battelle *Since 1965*

LOP Forebay First Approach Day/Night			
Day		Night	
n	Percent	n	Percent
259	55%	214	45%

Google Earth

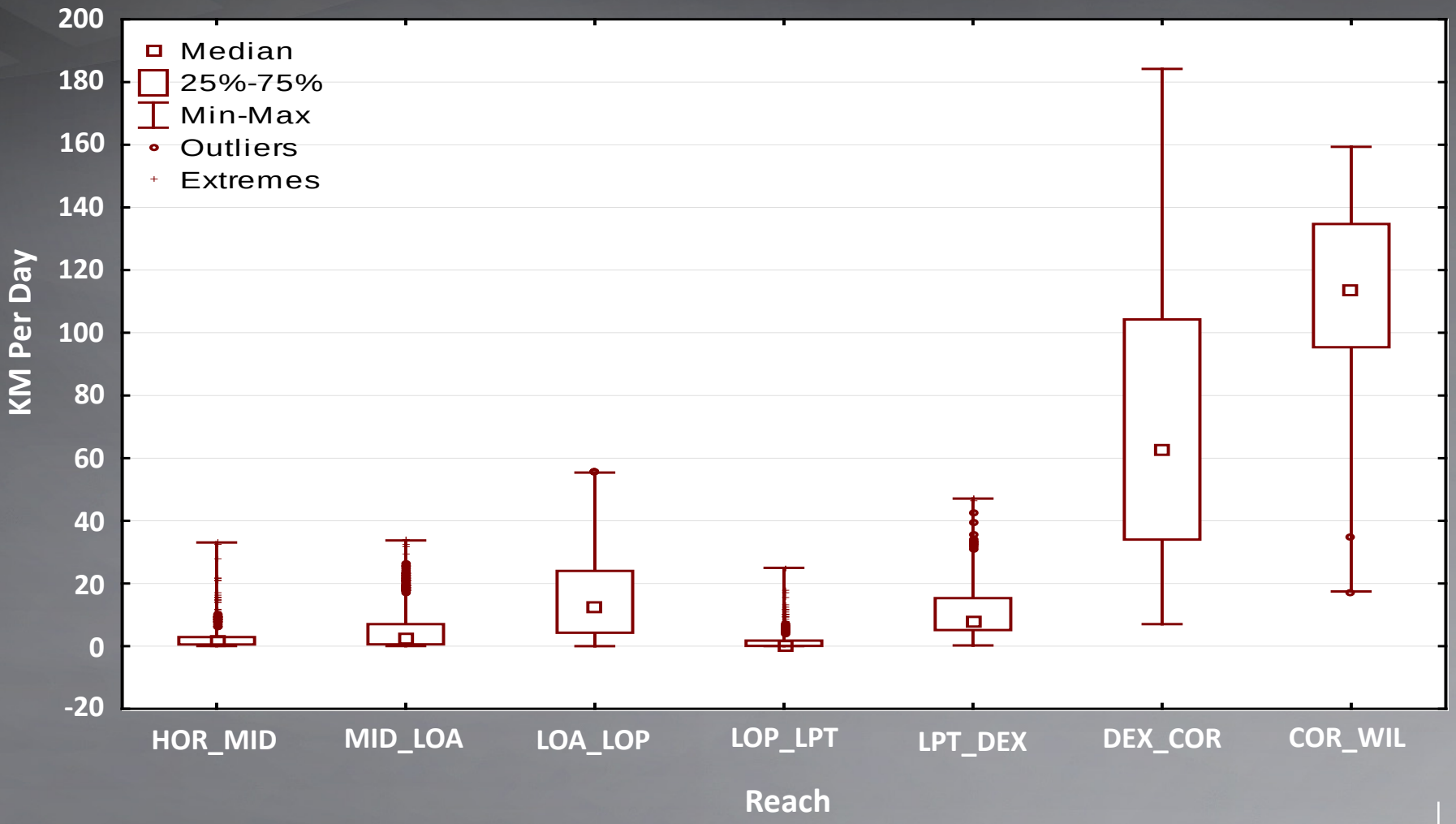
Spring 2017 Downstream Movement

Pacific Northwest
NATIONAL LABORATORY
Proudly Operated by Battelle Since 1965



Spring 2017 Travel Time

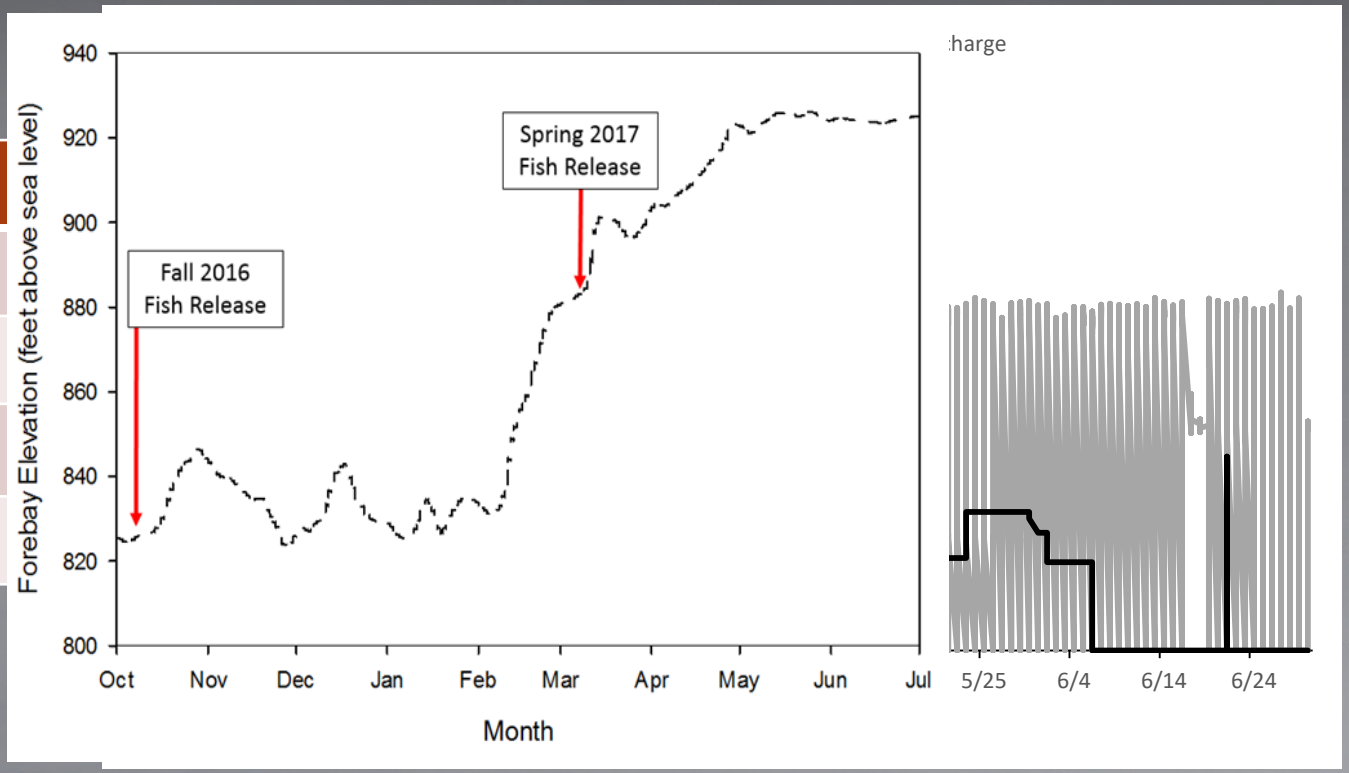
Pacific Northwest
NATIONAL LABORATORY
Proudly Operated by Battelle Since 1965



Spring 2017 Passage by Operation

Pacific Northwest
NATIONAL LABORATORY
Proudly Operated by **Battelle** *Since 1965*

Route	n
Spill	37
Turbine	9
Spill + Turbine	145
Unassigned	108



Summary

- 520 subyearling and 549 yearling Chinook Salmon were tagged and released in the fall and spring
- Fish detections in the reservoir peaked within days of being released but diminished as the study period progressed
- Reservoir horizontal distribution differed between fall and spring
- Majority of fish first approached LOP from the earthen side in both fall and spring
- Low numbers of fish passed Lookout Point and Dexter during fall (31 and 16, respectively), whereas spring study fish passed in relatively high numbers (299 and 188, respectively).
- Travel times were similar between fall and spring
- Increased flows and the use of the spillway from March 14 to June 5, may have contributed to the increased passage of fish in spring compared to fall.

Fall 2017 and Spring 2018 Study

Pacific Northwest
NATIONAL LABORATORY
Proudly Operated by Battelle Since 1965

- Current full scale telemetry study being conducted at LOP and DEX
- 1507 subyearling Chinook salmon were released in October and November
- Fish are being tracked throughout the 2 reservoirs with detailed 3D tracking at Lookout Point Dam and route of passage at Dexter Dam.
- Tags are currently active and will be through mid February.
- Spring tagging will commence in late February
  - Two tagging sessions
    - One planned during spring refill
    - One planned with a spill treatment test (assuming adequate water availability)

Acknowledgements

- U.S. Army Corps of Engineers
  - Fenton Khan
  - Greg Taylor
  - Chad Helms
  - Doug Garletts
  - Lookout Point control room operators, Engineering and structural staff
- Advanced Telemetry Systems
  - Peter Kuechle
  - Sheldon Struthers
  - Tom Kase
- OSU
  - Karen Cogliati
  - Rob Chitwood
  - Staff of the fish surrogate program
- PNNL
  - Alex Crump
  - Kate Deters
  - Ryan Flaherty
  - Kate Hall
  - Samuel Harding
  - Stephanie Liss
  - Amy Goldman
  - Kristin Engbrecht
- ODFW
  - Fred Monzyk
  - Brett Boyd
  - Cameron Sharpe
  - Jeremy Romer

Questions