

# Comparing PIT interrogation methods for detecting juvenile salmonids in the Lower Columbia River Estuary

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# Objectives

## Pile dike PIT interrogation sites

- ▶ Site design
- ▶ Antenna design
- ▶ Site selection

## 2023 detection data

- ▶ Pile dike detections
- ▶ Comparison with trawl and flexible system
  - ▶ Origin basin
  - ▶ Species composition
  - ▶ Bonneville recovery rate

## Implications and future outlook



# Objectives

- ▶ Maximize detections of out-migrating juvenile salmonids using autonomous methods
- ▶ Determine if detections from pile dike sites can supplement or potentially replace trawl detections
- ▶ Operate the towed flexible array in tandem with pile dike sites to boost steelhead detections and counter species bias
- ▶ Identify areas for site expansion



Work smarter  
Not harder...

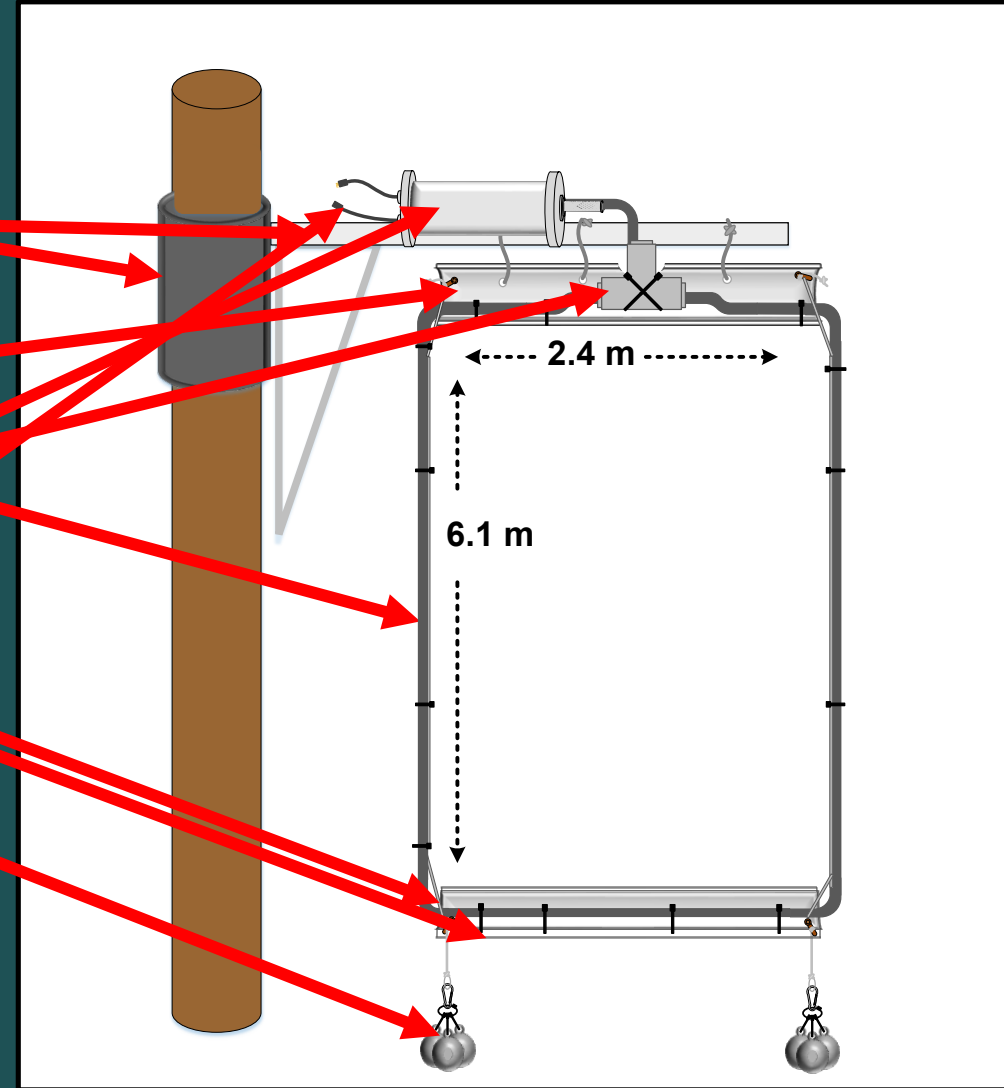
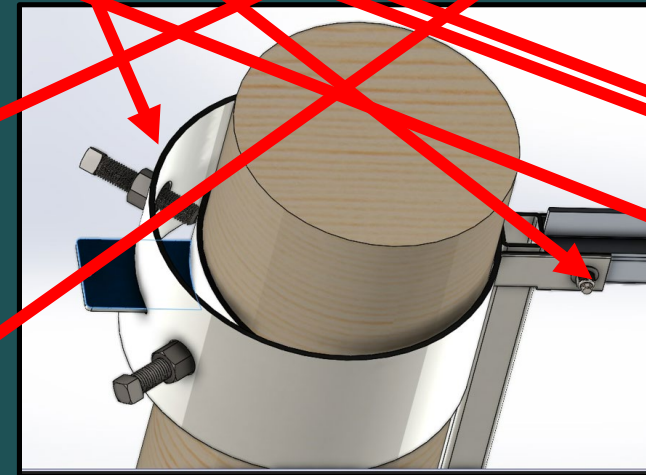
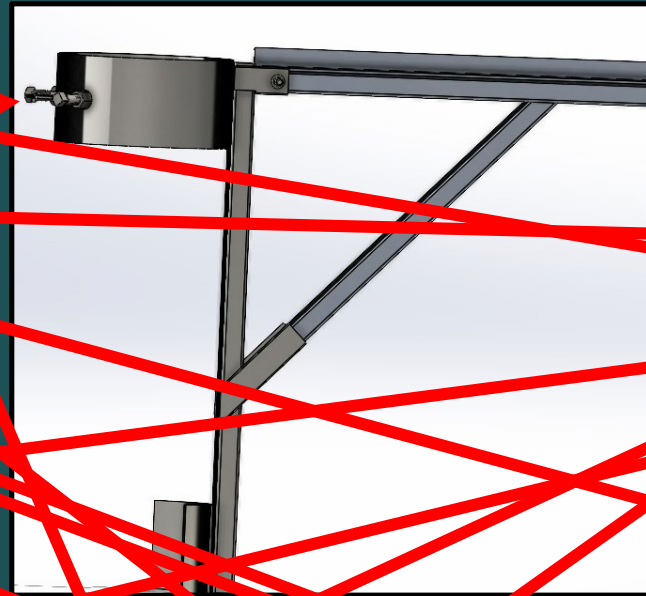
# Pile Dike Site Layout

- ▶ Antennas
- ▶ Biomark IS1001 MTS transceiver and readers
- ▶ CANbus
- ▶ Electronics barge
- ▶ Power:
  - ▶ solar panel
  - ▶ charge controller
  - ▶ battery bank
- ▶ Cell modem

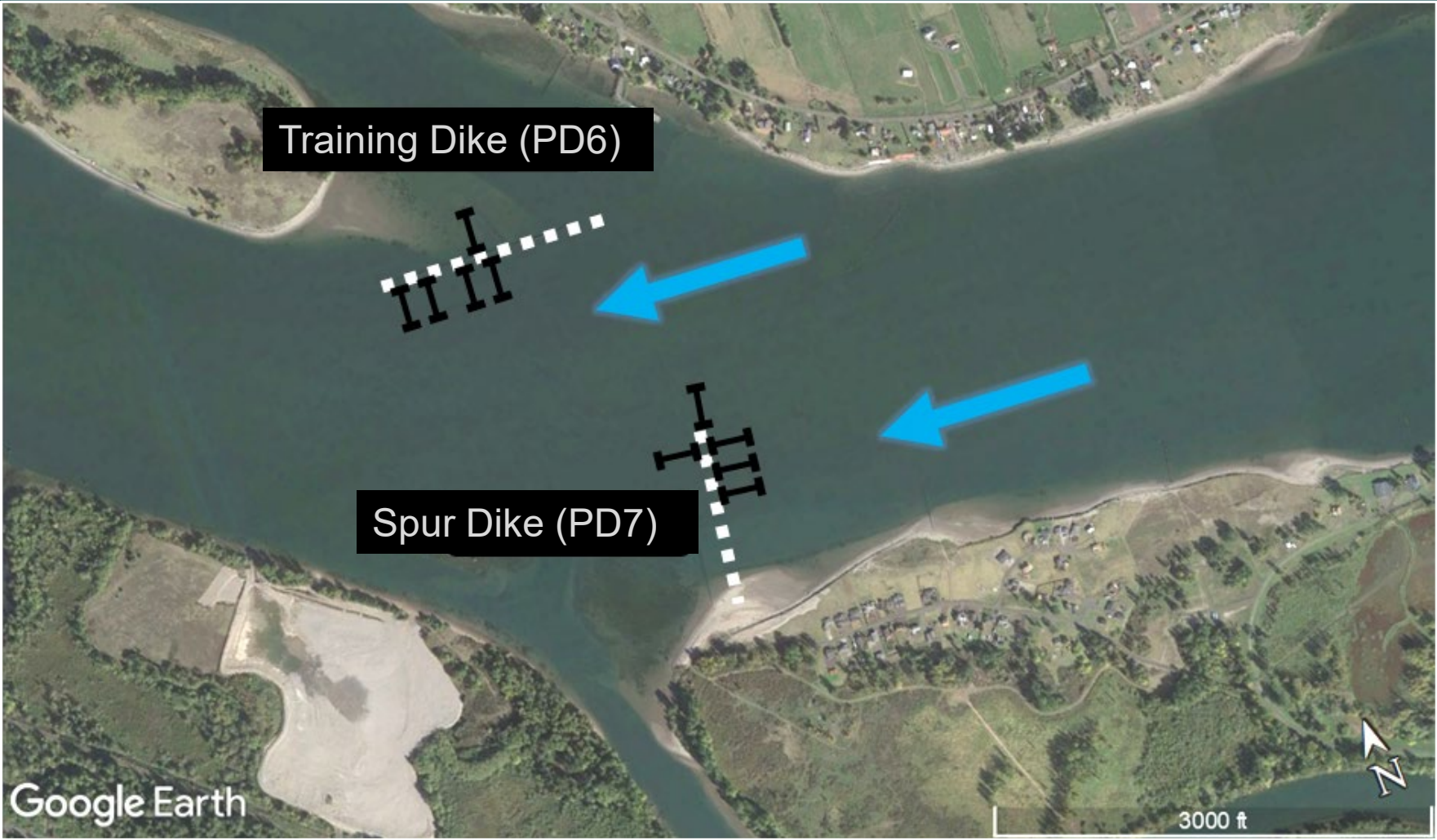


# Antenna and Bracket Design

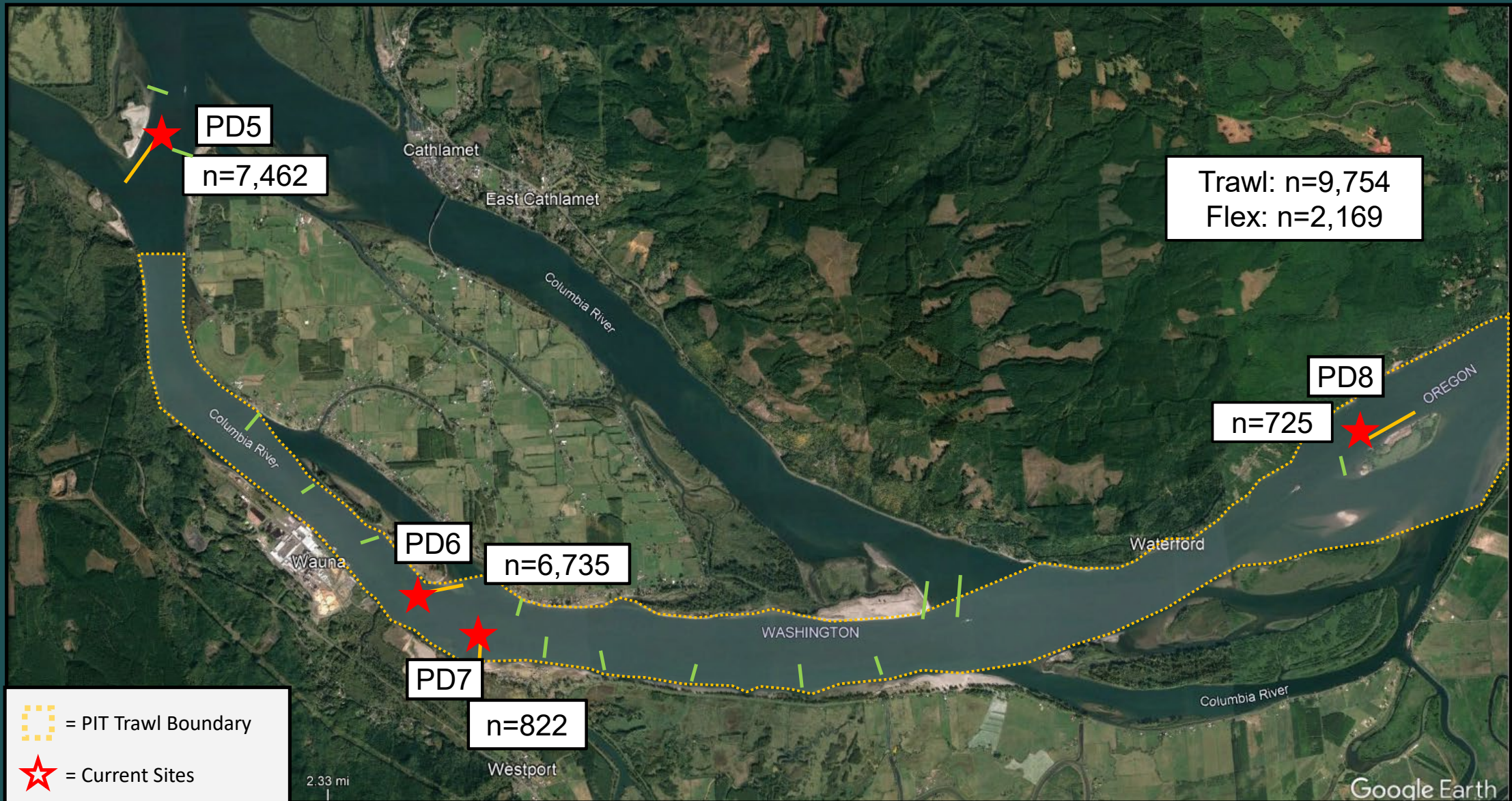
- ▶ Fabricated steel collar
- ▶ Aluminum spar
- ▶ Flexible antenna cable
- ▶ Static rope frame
- ▶ Halved PVC for structure
- ▶ 75# weights for each side
- ▶ PVC Tee with exciter to capsule
- ▶ Aluminum capsule for IS1001 reader
- ▶ Wet-mate pig tail connectors



# Orientation to flow



# Site Locations



# 2023 Pile Dike Detections: All Species

Species	Interrogation Site				Total
	PD5	PD6	PD7	PD8	
Chinook salmon	3,993	4,489	537	503	9,542
Coho salmon	762	294	70	43	1,169
Steelhead	2,358	1,688	96	127	4,269
Sockeye salmon	117	105	18	4	244
Sea-run Cutthroat	31	8	3	2	44
White Sturgeon	56	9	46	14	125
Green Sturgeon	0	1	0	0	1
Northern Pikeminnow	2	0	0	5	7
Unknown	143	141	32	27	343
Grand total	7,462	6,735	822	725	15,744



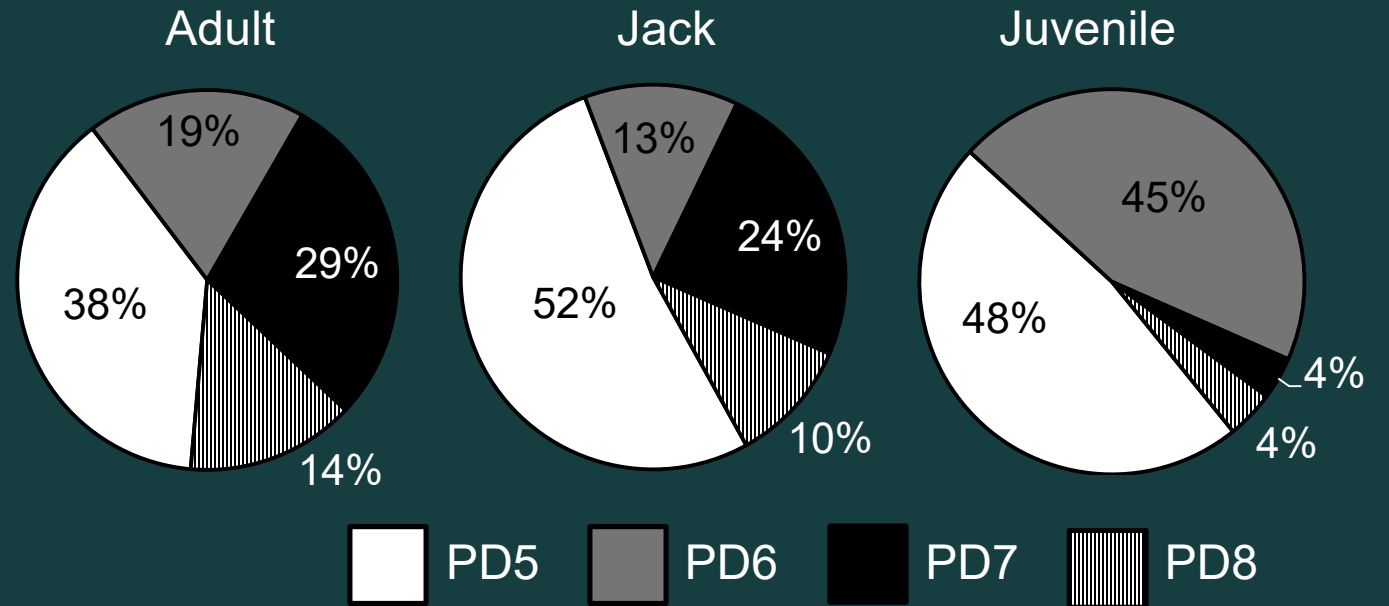
# 2023 Pile Dike Detections: Salmonid life histories

- ▶ Upstream antennas to target juvenile detections April through June
- ▶ Downstream antennas to target adults July-October



# 2023 Pile Dike Detections: Salmonid life histories

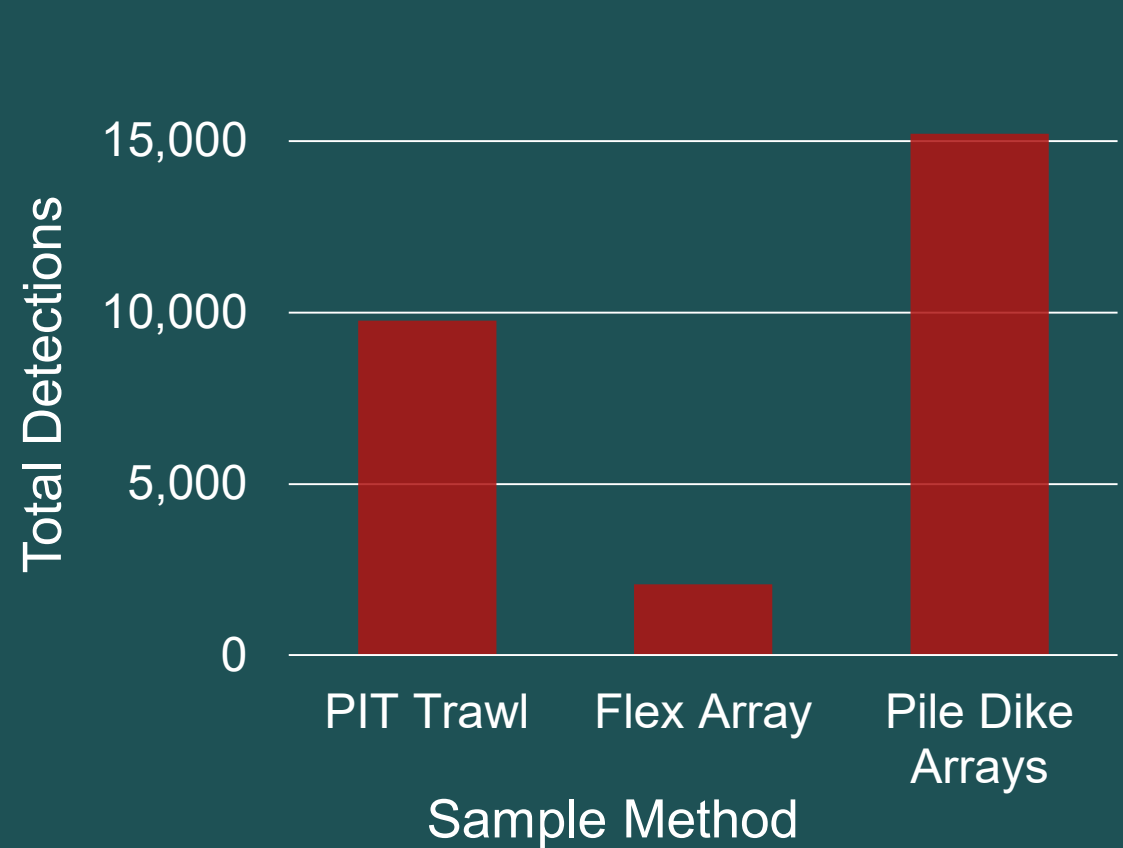
Age Class	Interrogation Site				Total
	PD5	PD6	PD7	PD8	
Adult	160	78	120	60	418
Jack	206	51	96	41	394
Juvenile	6,839	6,430	513	576	14,358
Grand total	7,205	6,559	729	677	15,170



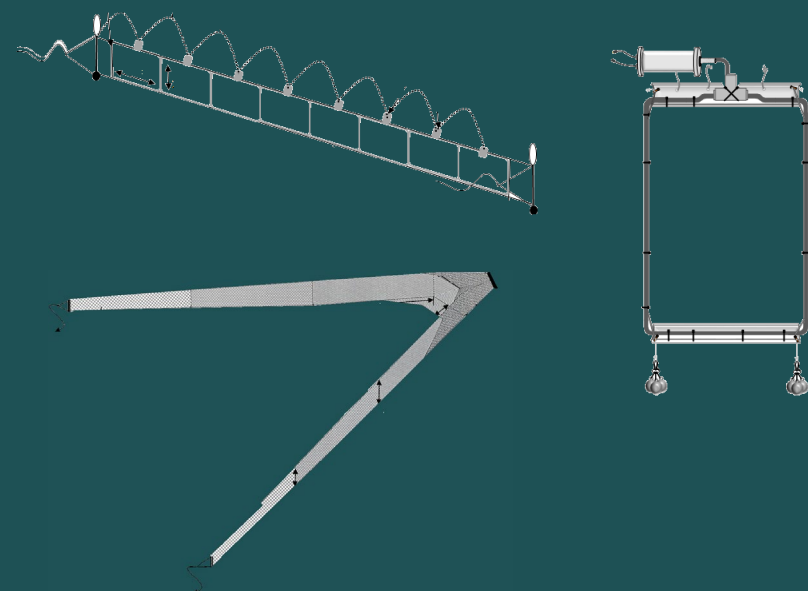
# How do pile dike data compare with the flex array and PIT Trawl?

- ▶ Total detections
- ▶ Species composition
- ▶ Basin of origin
- ▶ Recovery from Bonneville

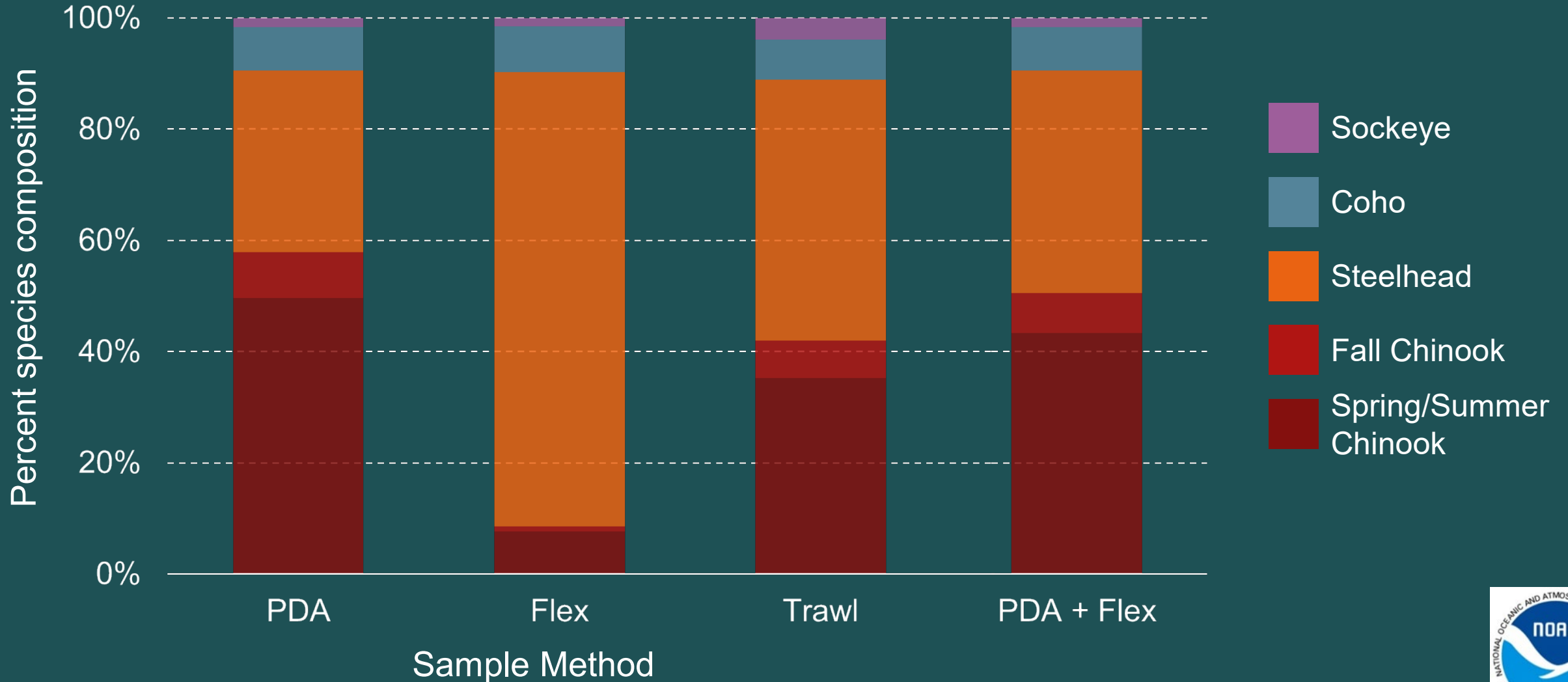
# 2023 Total unique detections (all methods)



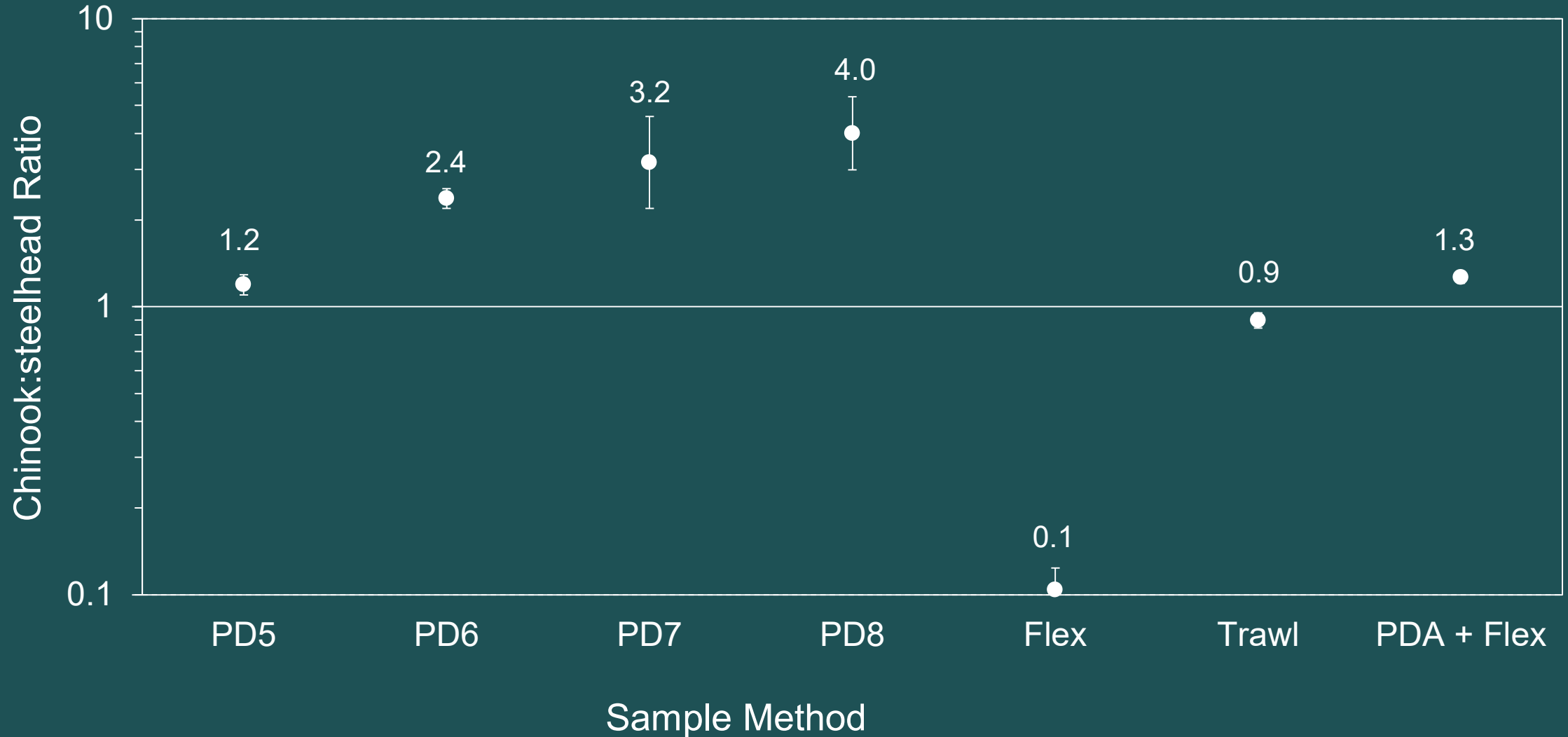
Sample Method	n
PIT Trawl	9,754
Flex Array	2,073
Pile Dike Arrays	15,217
Total	27,044



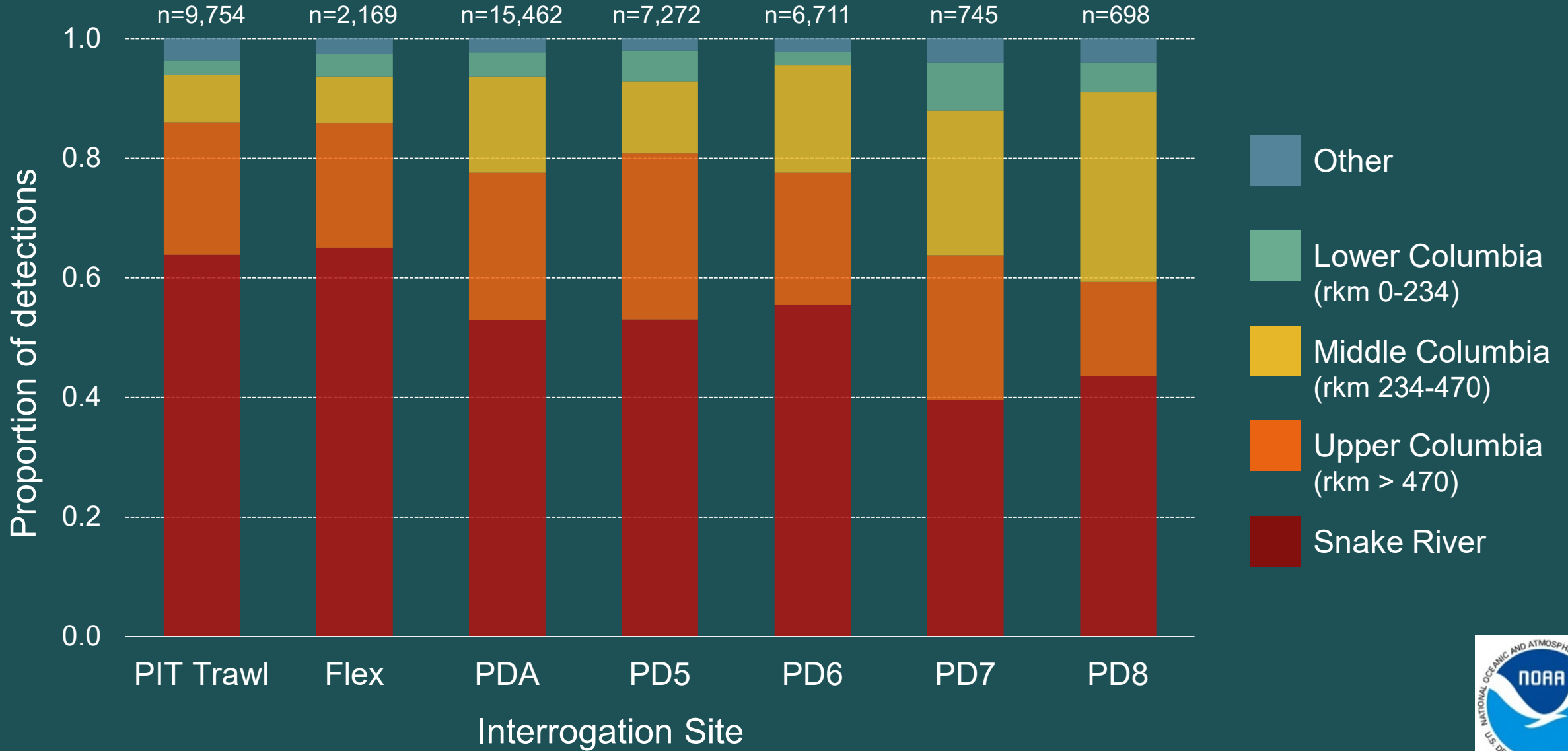
# Species Composition



# Chinook:steelhead Ratio



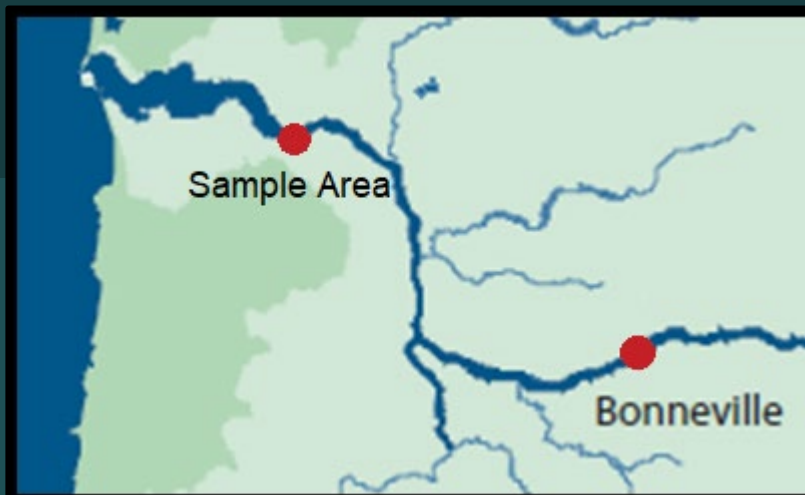
# Basin of Origin



# Recovery from Bonneville

	Barged fish originating upstream from McNary Dam			In-river fish detected at Bonneville Dam*		
	Released	Trawl	Flex + PDA	Released	Trawl	Flex + PDA
Chinook salmon	41,200	0.84%	<b>1.91%</b>	30,586	1.38%	<b>1.94%</b>
Steelhead	44,519	<b>2.12%</b>	1.84%	22,287	1.85%	<b>1.95%</b>

\* In-river fish included only those released at or upstream from McNary Dam. No fish were transported from McNary Dam in 2023.





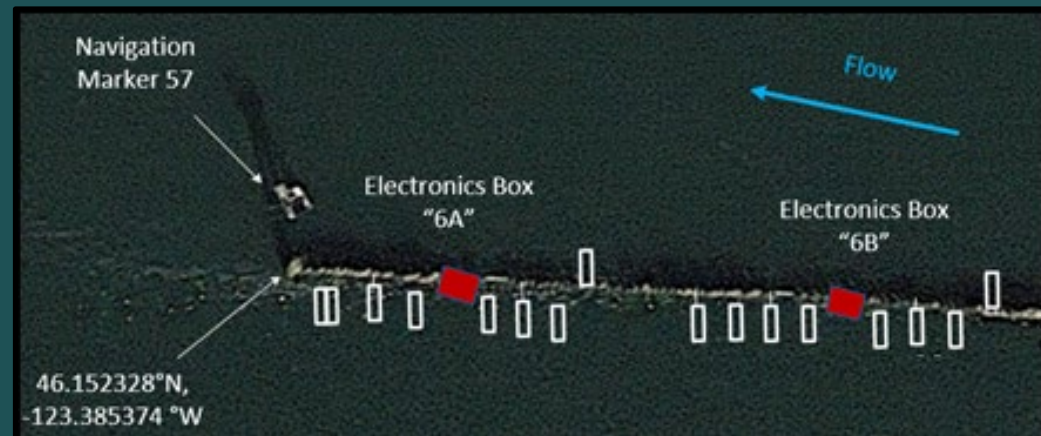
# Insights and future plans

## 2023 Conclusions

- ▶ Alternative methods seem promising: combination of flex & pile dikes appeared to calibrate detection ratios to match trawl
- ▶ Concurrent sampling in varied water years
- ▶ Increasing antennas at PD5 and PD6 should be additive

## 2024 Improvements and expansion

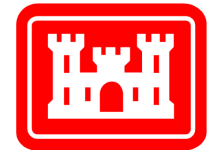
- ▶ Upgrade PD5 and PD6 to 16 antennas
- ▶ Test mobile electronics barge to explore new sites
- ▶ Mechanical antenna retrieval methods
- ▶ Piling-mounted solar and electronics



# Thank you!

Current and Past contributors: Ben Sandford, Sam Rambo, Ron Marr, Jesse Lamb, Matt Nesbit, Brian Fite, Chris Jacobsen, Darrion Klauser, Day'e Hix, Charlie Neace, Greg Caisse, Dick Ledgerwood, Bob Magie, Bill Newcomb, Jake Biron, Erika Holcombe, Alex Borsky, Sean Sullivan, Mary Powers

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