NOAA – PIT Detection System Improvements from the Estuary to McNary

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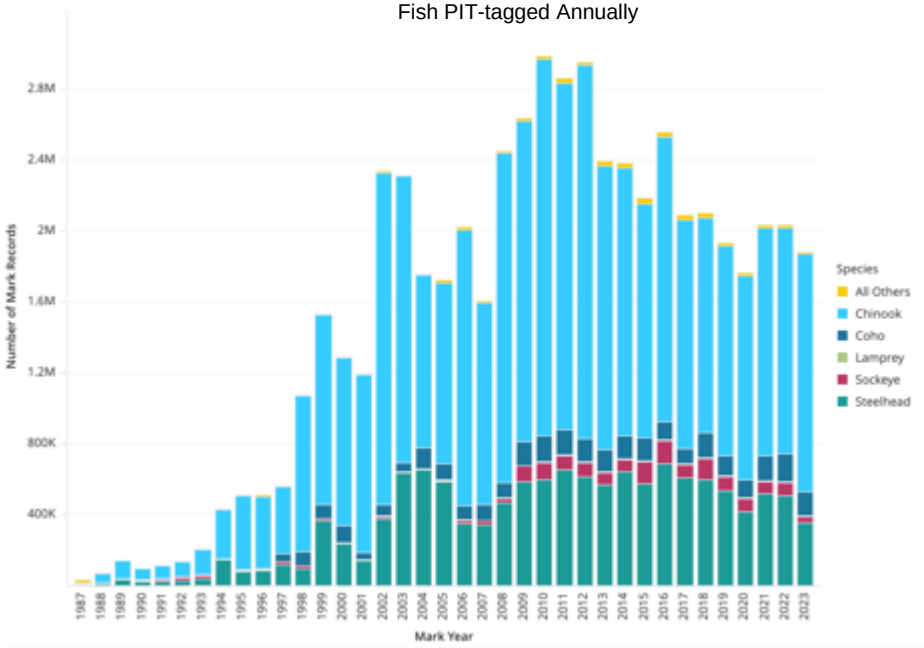
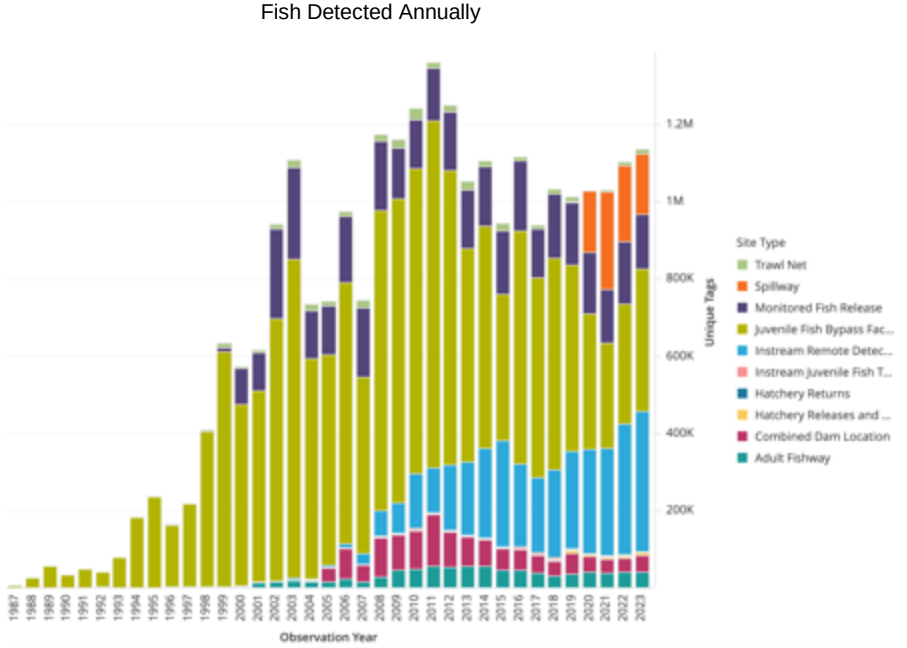
CRB PIT Overview

Fish PIT-tagged Annually

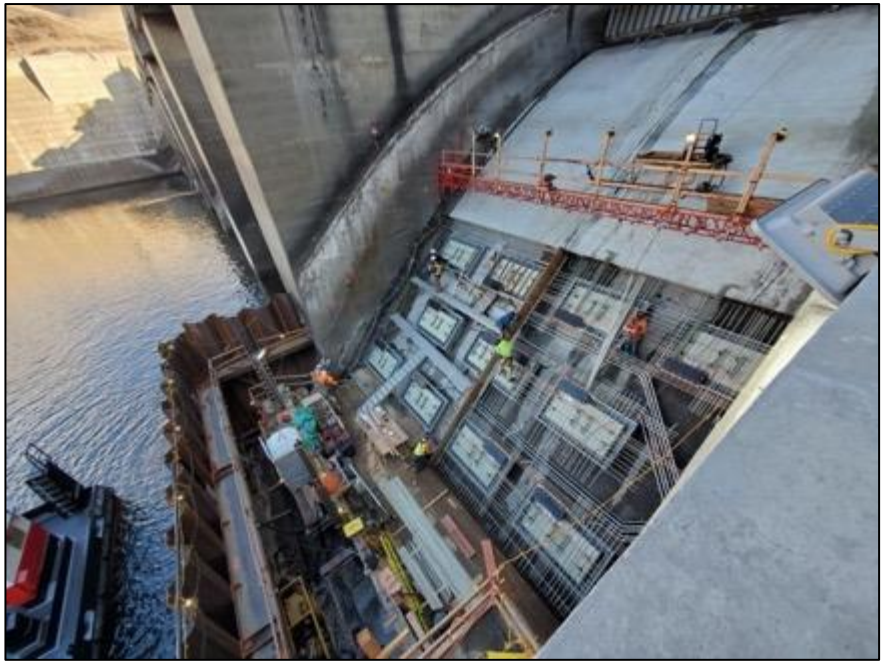


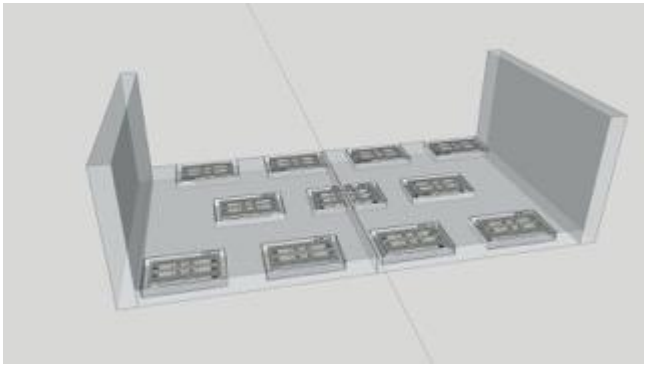
Fish Detected Annually



- Detections are increasing while tagged fish are decreasing
- GRS and Instream sites are providing significant data

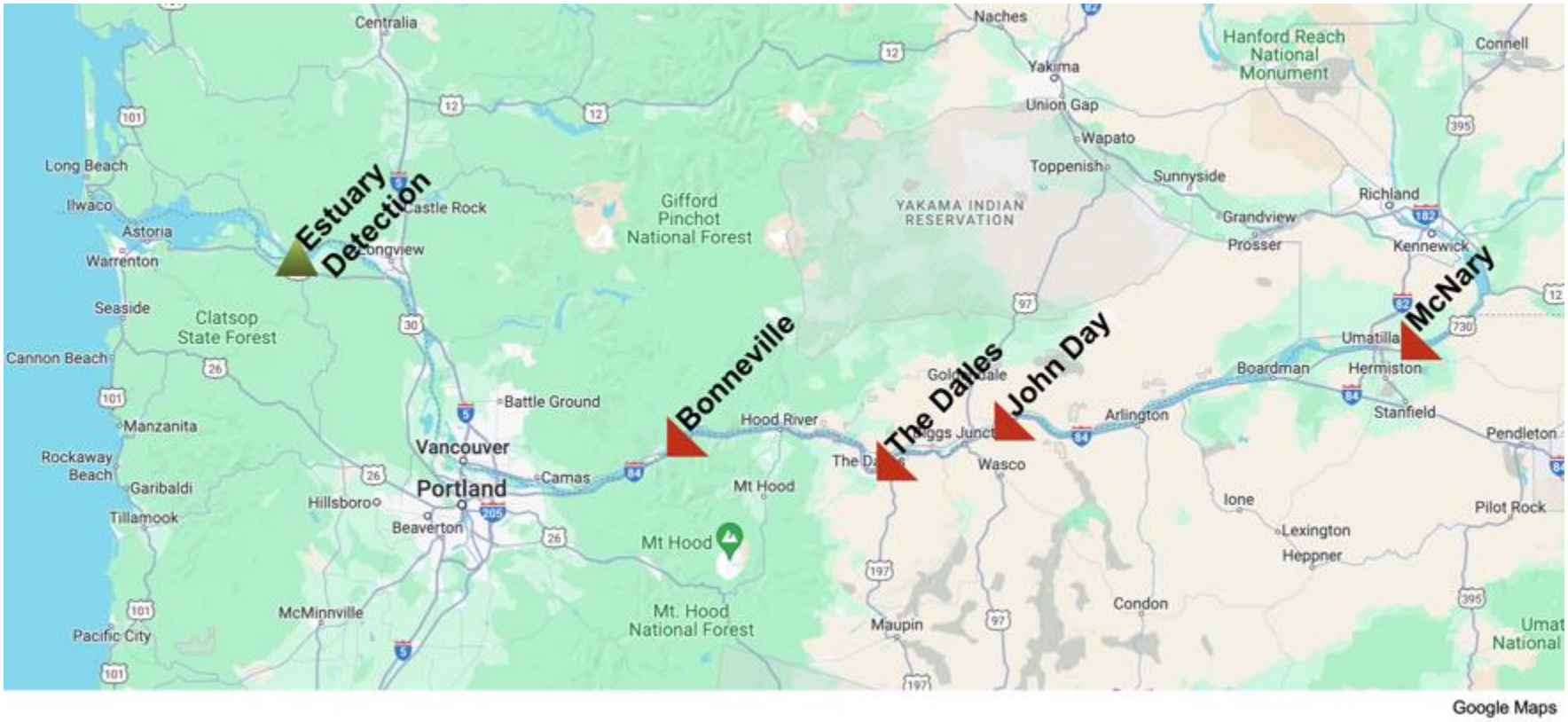
GRS Detector





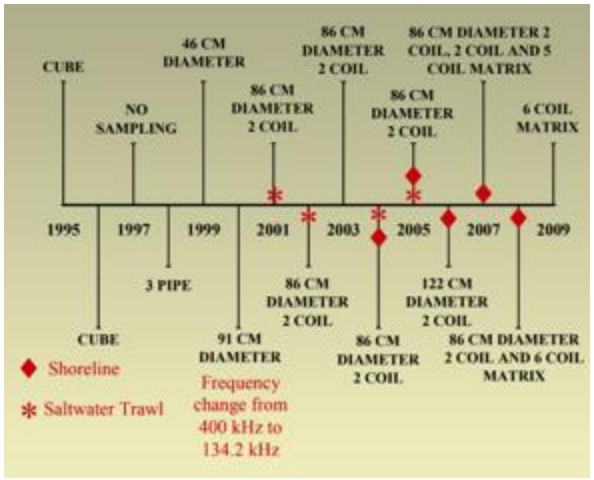
- Fully operations in 2020
  - 2020 – 160,039
  - 2021 – 251,484
  - 2022 – 195,721
  - 2023 – 156,172

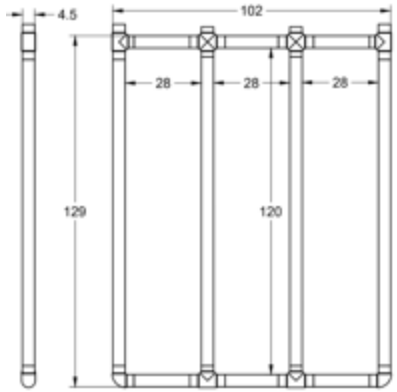
PIT Detection Overview



- McNary – MCJ
- John Day – JDJ
- The Dalles - None
- Bonneville – BCC, B2J, soon ITS
- Estuary – TWX, FLX, and Pile Dikes

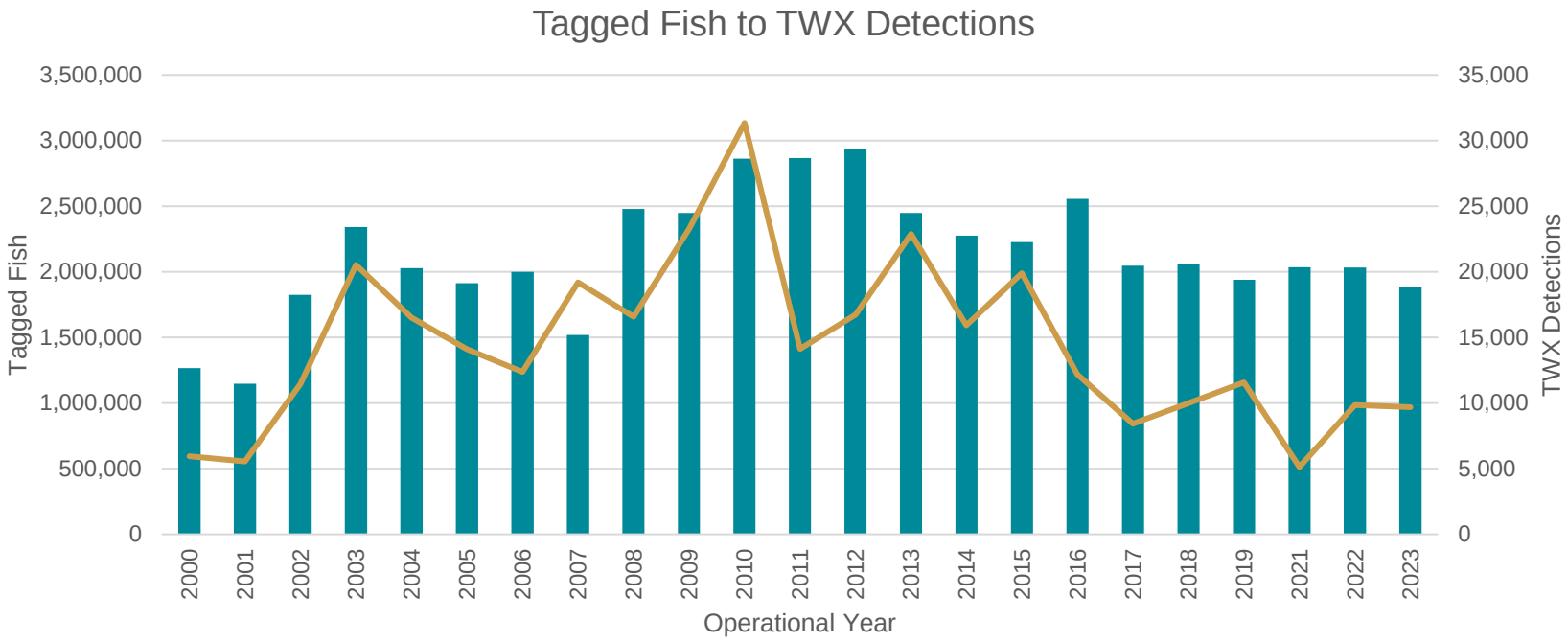
Pair Trawl - TWX





Historic method of estuary PIT detection

Pair Trawl - TWX



Pile Dikes

"… approximately 233 CENWP pile dikes located between the mouth of the Columbia River and Bonneville Dam. These pile dikes were constructed between 1885 and 1969, typically in a coordinated program of pile dike construction coupled with channel dredging. Although the specific functions of the individual pile dikes vary the original purpose of the pile dikes, in general, was to support the establishment of a stable navigation channel and/or to minimize the maintenance dredging requirements."

-*Structural and Hydraulic Analysis of Columbia River Pile Dikes Final Report*

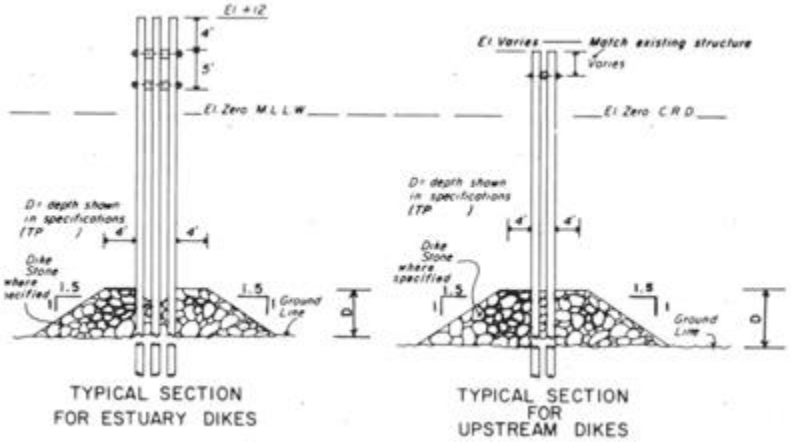


Figure 2-4 Typical Pile Dike Cross-Sections (USACE, 1988)

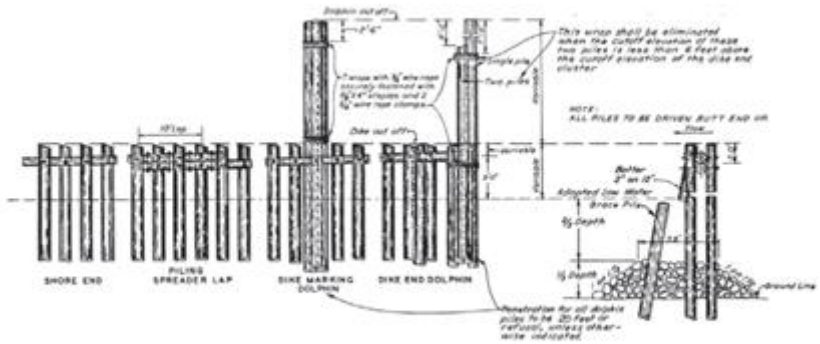
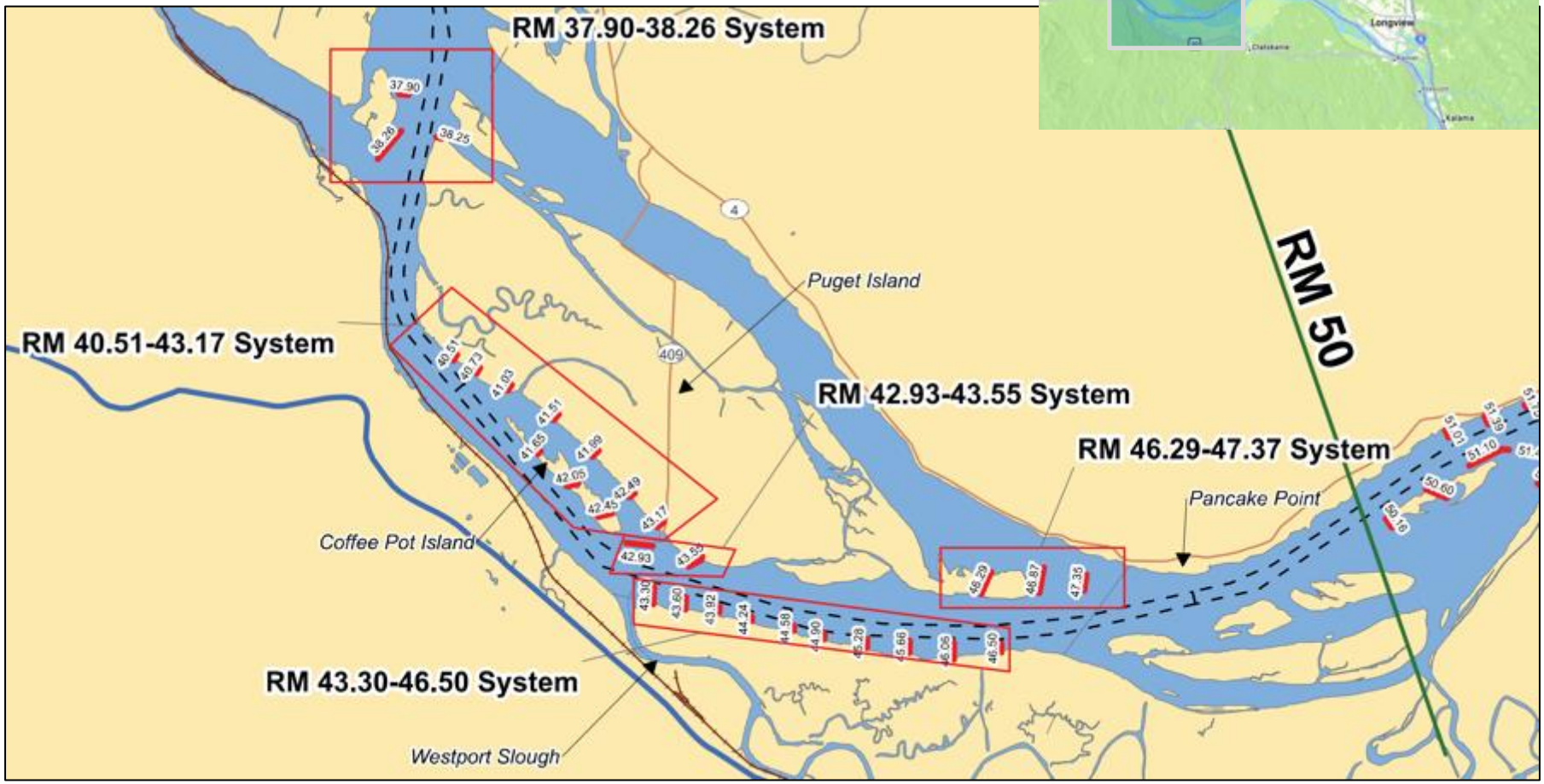
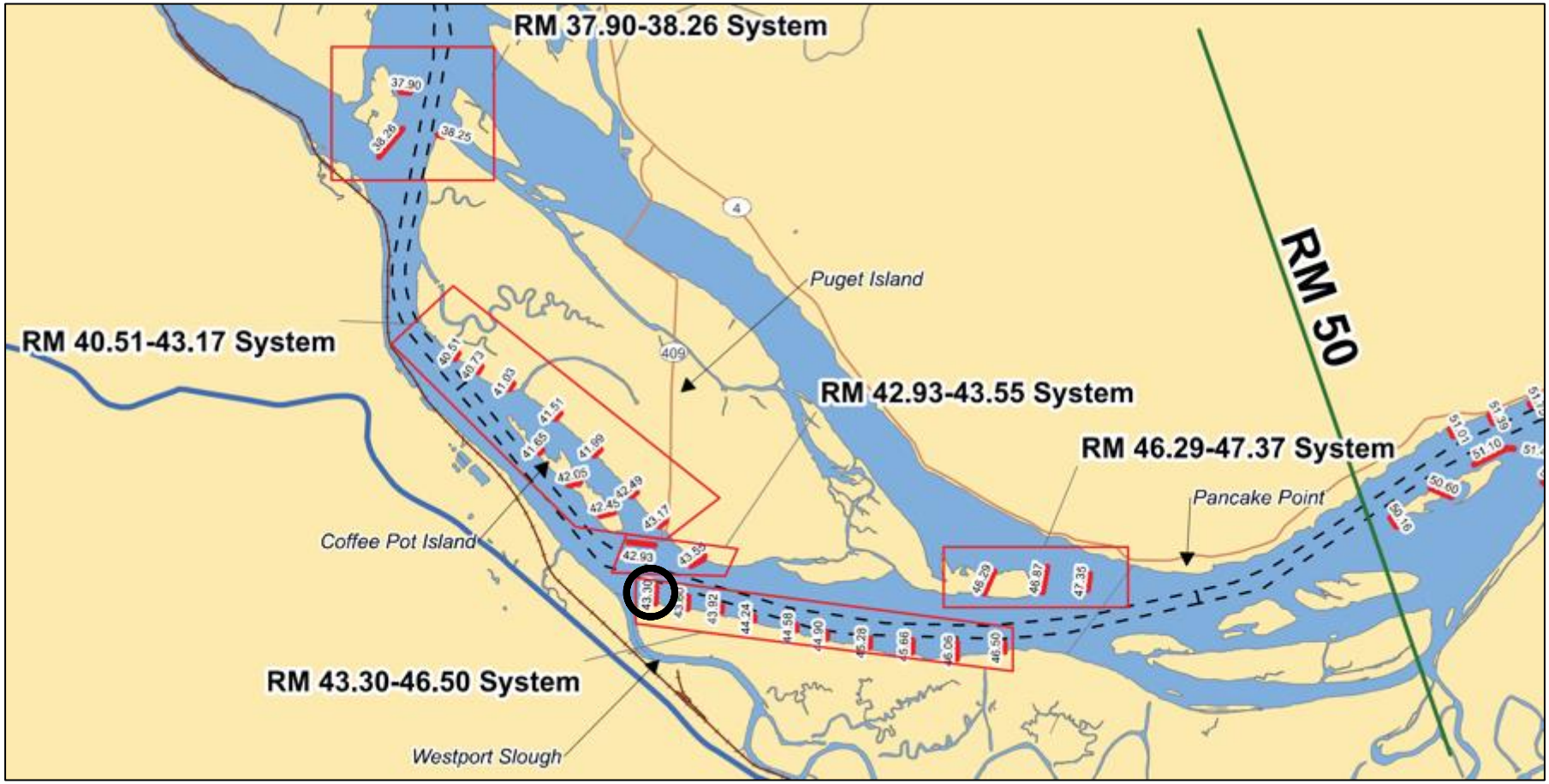


Figure 2-5 Typical Pile Dike Elevation (USACE, 1988)

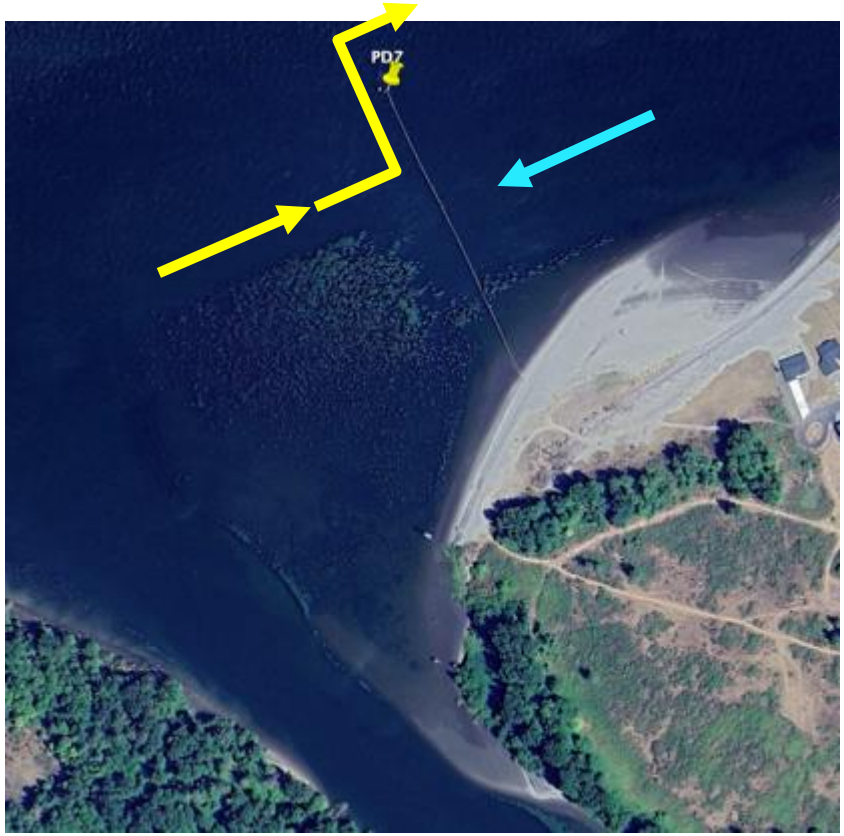
Pile Dike Sites



Pile Dike Sites – PD7 (RM43.30)

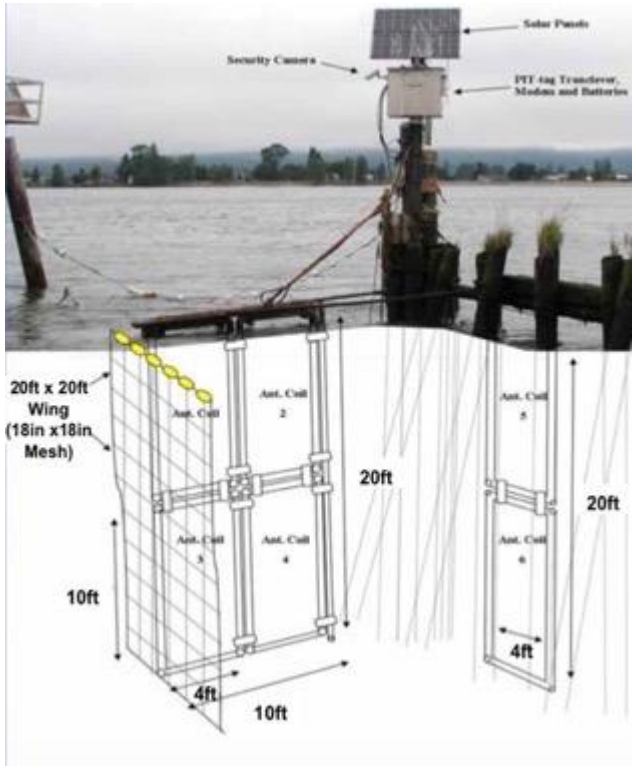


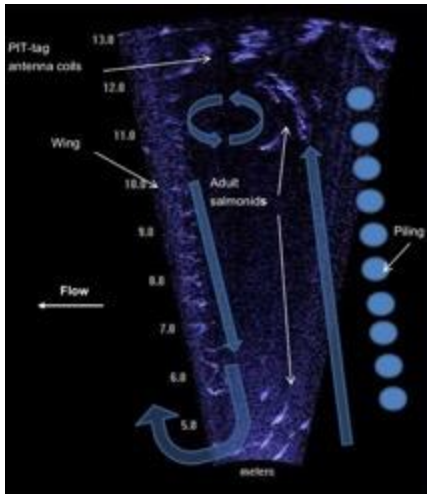
PD7

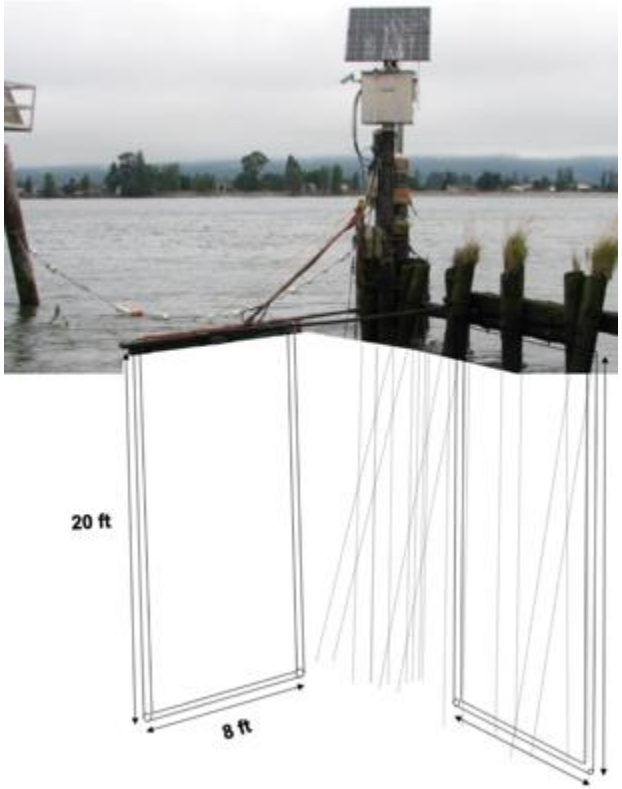


- Installed in 2011 – six antennas
- Primary focus was on upstream returning adults
- Run timing and survival to BON

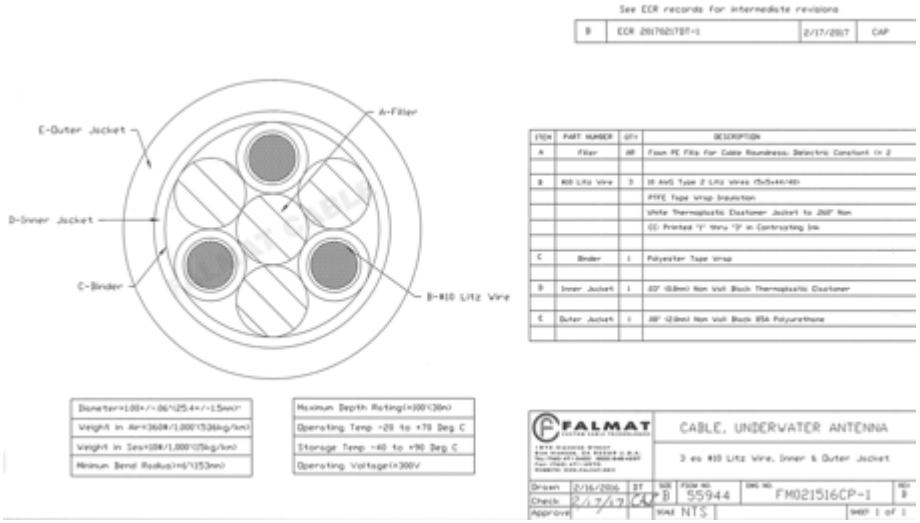
PD7- 2011 (MUX) to 2012 (MTS) - current



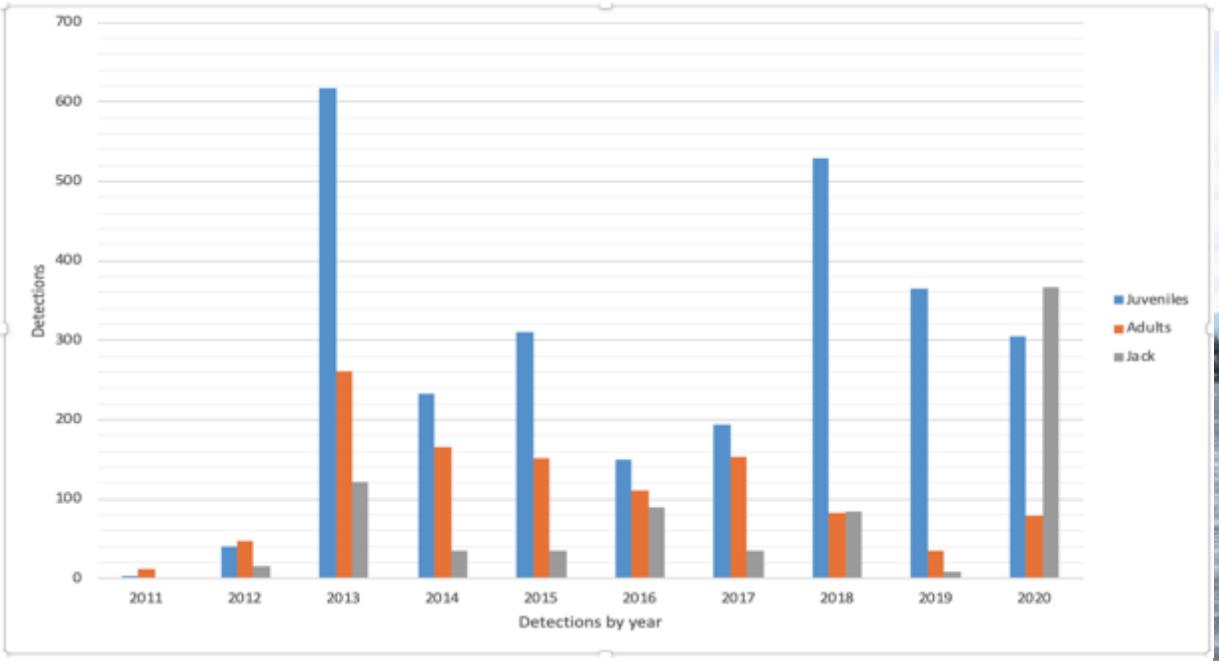




PD7 - Flexible Array Cable Development

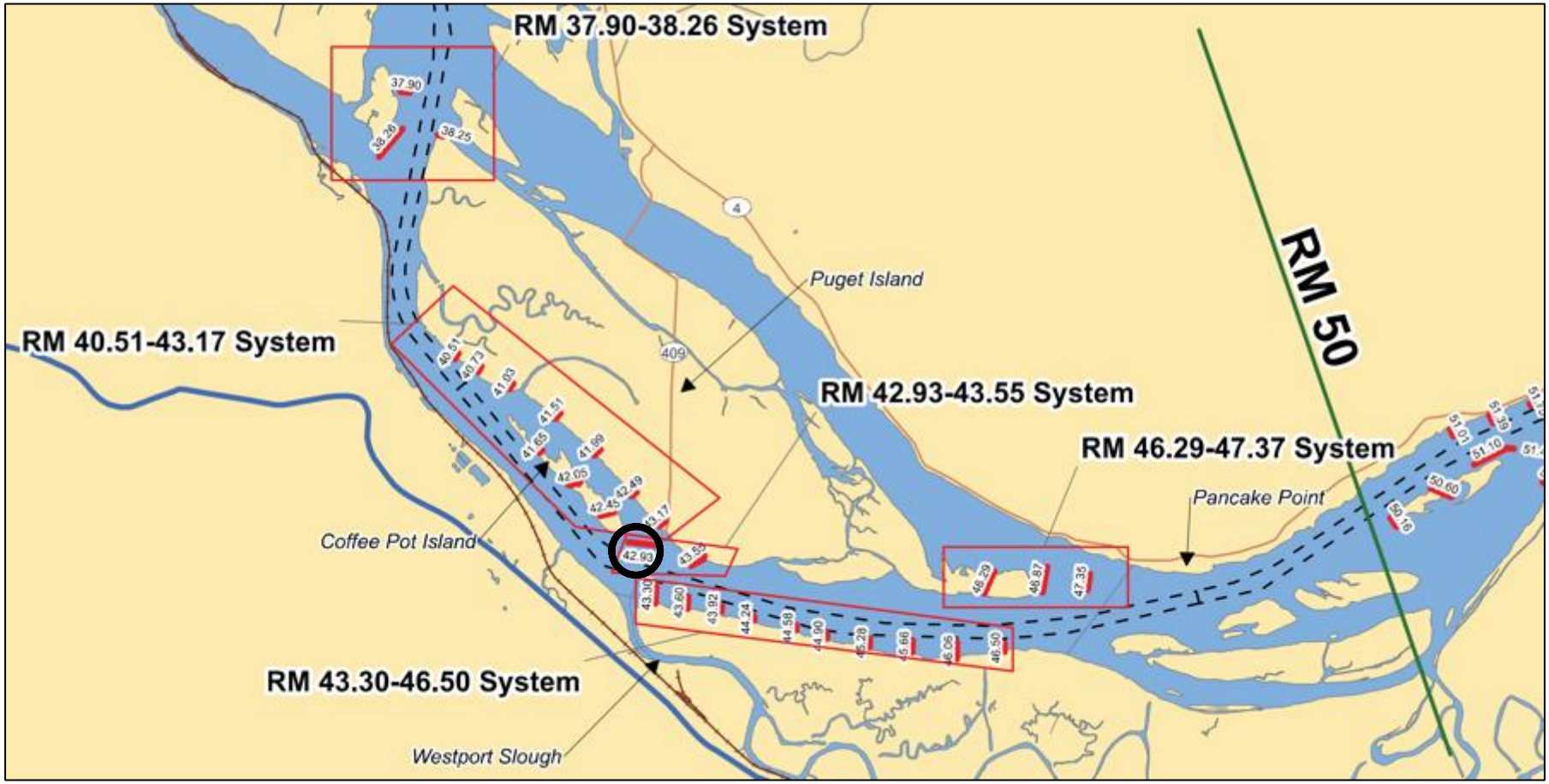


PD7

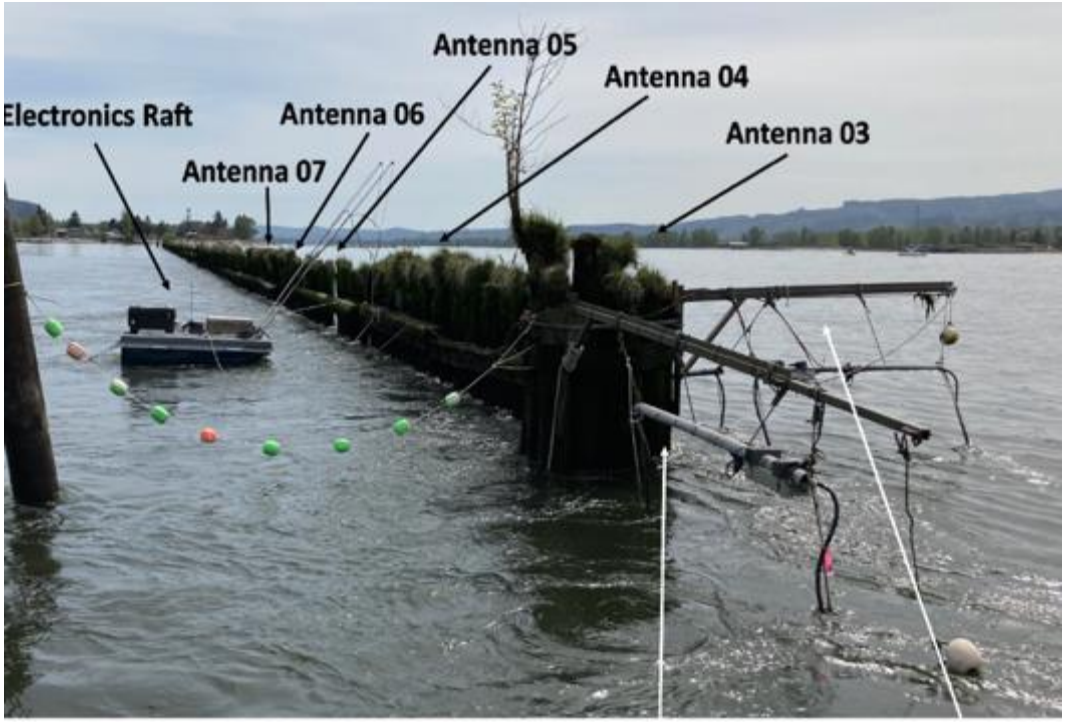


- 1,098 - Total adult detections from 2011 – 2020
- 2,747 - Total juvenile detections from 2011 – 2020

Pile Dike Sites – PD6 (RM42.93) - 2022

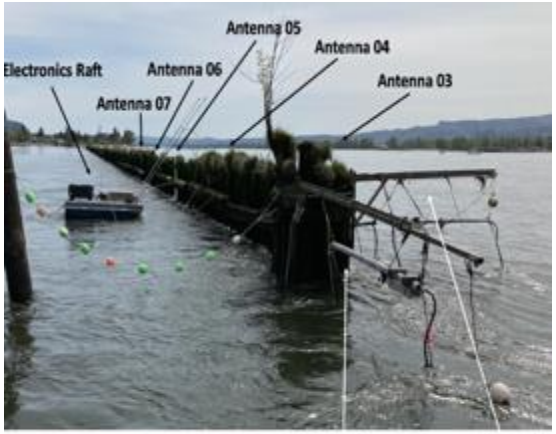


PD6 - 2022



- Installed in 2022 – seven antennas and a floating electronics platform
- Primary focus was to test detection of out-migrating smolts
- Supplement decreasing trawl detections

2022 - PD6, PD7 and TWX Performance



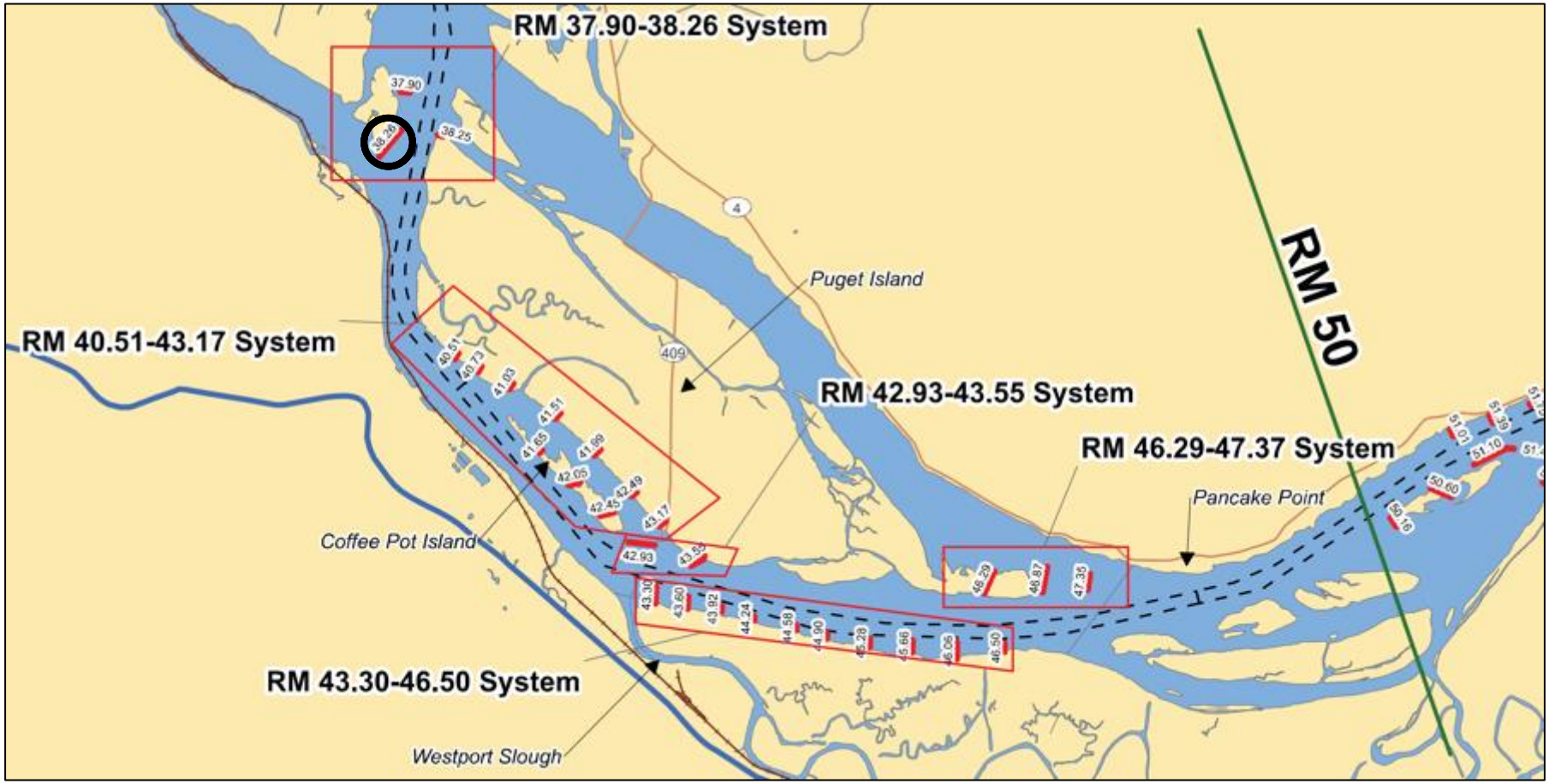
- PD7 – **491**
- PD6 – **3,232**
- TWX – 9,838

2023 - Pile Dike Season

- Funding for MCN and ITS stalled, worked with BPA to move R&D funds to estuary work
- Expansion to four sites, permits allow for up to seven
- Supplemental funding provided by WDFW for adult detections

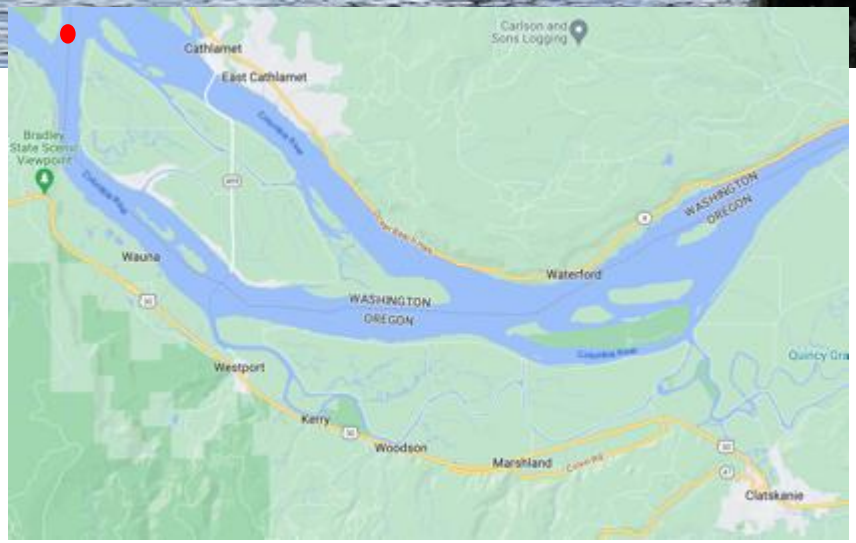
2023 - PD6

Pile Dike Sites – PD5 (RM 38.26)

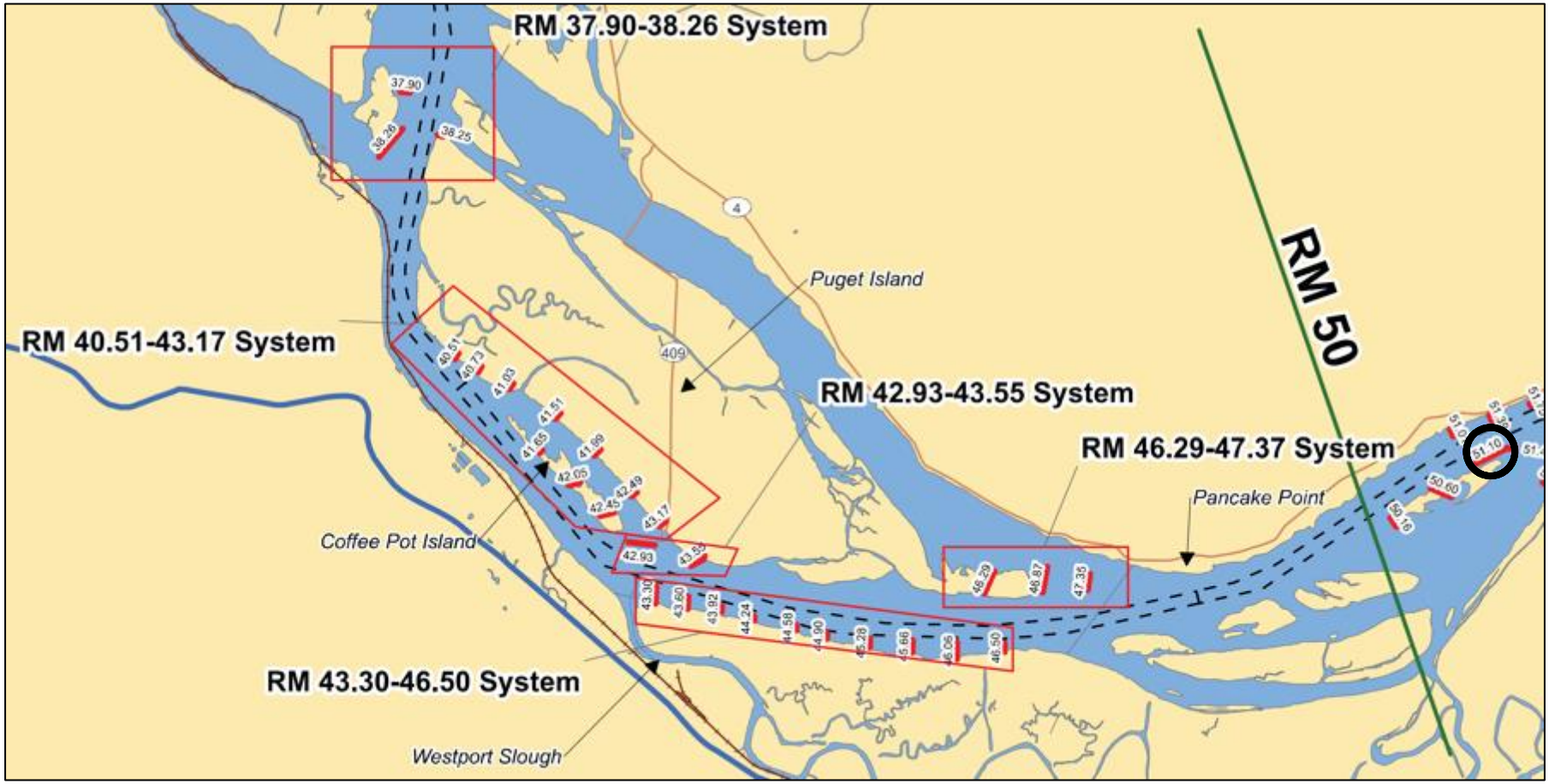


2023 - PD5


PD5
2029 ft
Google Earth

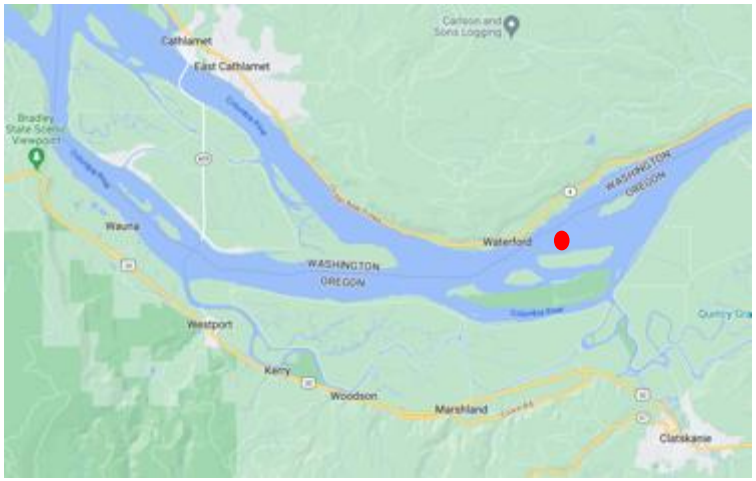

Cathlamet
East Cathlamet
Carlson and Sons Logging
Bradley State Scenic Viewpoint
Wauna
Waterford
WASHINGTON
OREGON
Westport
Kerry
Woodson
Marshland
Clatskanie

Pile Dike Sites – PD8 (RM 51.10)



2023 - PD8


PD8


Cathlamet
East Cathlamet
Bradley State Scenic Viewpoint
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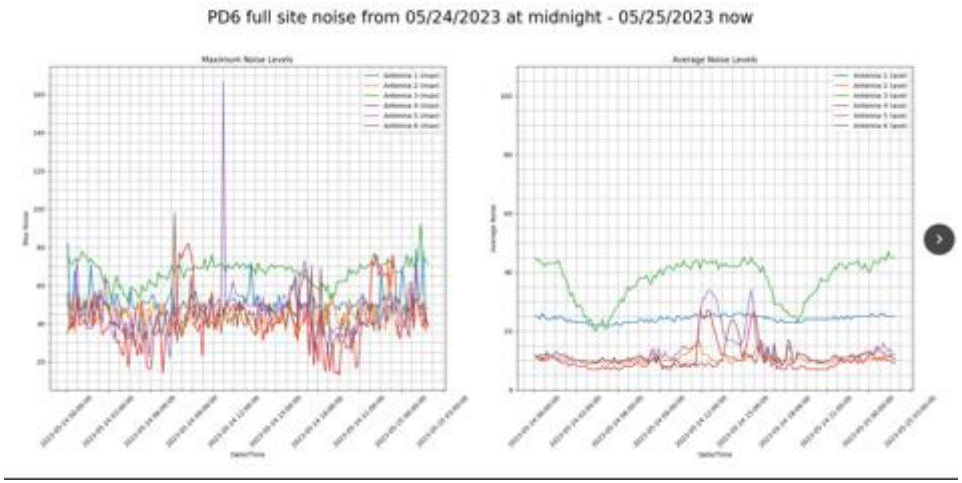
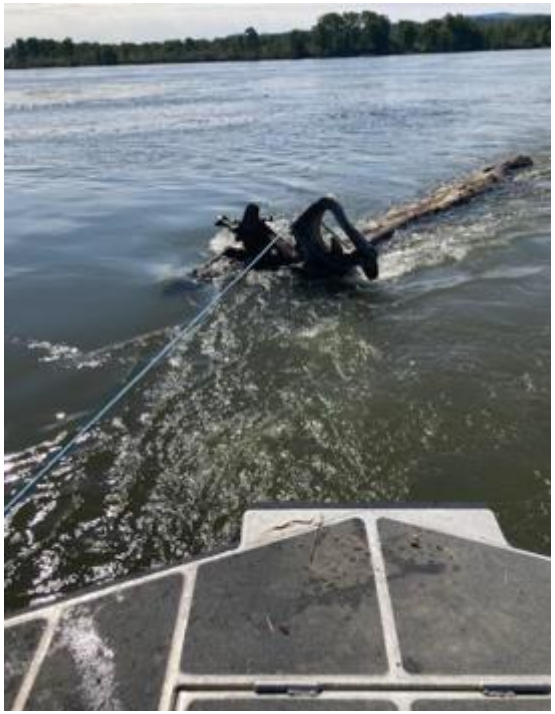
Waterford
WASHINGTON
OREGON
Westport
Kerry
Woodson
Marshland
Clatskanie

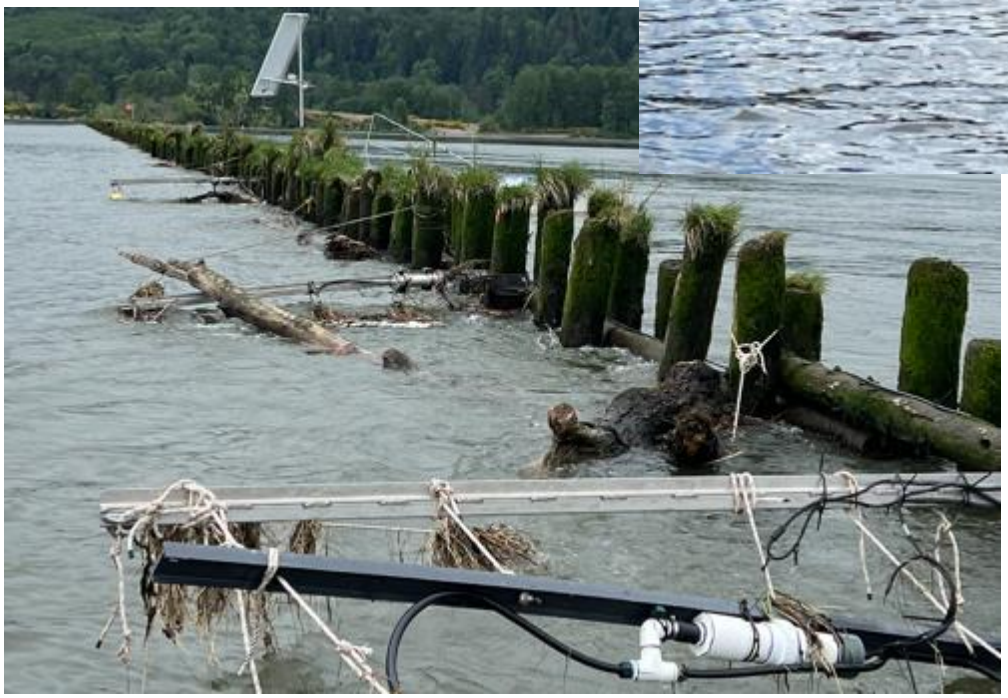
Pile Dike O&M



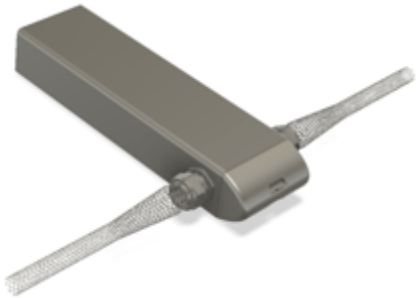

```
Number of unique tags detected: 10

Number of unique tags detected per antenna:
Antenna 03: 7
Antenna 04: 3
Antenna 05: 1
Antenna 06: 5
Antenna 07: 4

Cumulative detections per antenna:
Antenna 03: 10
Antenna 04: 4
Antenna 05: 1
Antenna 06: 6
Antenna 07: 10

Detections by Release Year:
2022: 6
2021: 3
2020: 1
Orphans: 0

VTT results:
3E7.0000001D01: 01
3E7.0000001D03: 03 03 03 03
3E7.0000001D04: 04 04 04 04 04 04 04 04 04 04
3E7.0000001D05: 05 05 05 05 05 05 05 05 05 05 05 05 05 05 05 05 05 05 05 05
3E7.0000001D07: 07 07 07 07 07 07 07 07 07 07 07 07 07 07 07 07 07 07 07 07

3DD.003D94FA52: 07:3 06:1 03:2
01/05/2021              Nat. Summer Steelhead   Dworshak NFH, release into mainstem Clearwater River

3DD.00304A1123: 03:1
04/22/2020              Nat. Fall Chinook       Captain John Rapids Acclimation Pond

3DD.003E2180SE: 07:1 03:1
05/11/2022              Wild Coho               Lewis River

3DD.003D865320: 06:1 04:2 03:1
01/19/2022              Nat. Coho               Rolfing Acclimation Pond, Wenatchee River Basin

3DD.003DF7B783: 04:1 03:3
10/28/2021              Nat. Summer Steelhead   Little Salmon River

3DD.003D864C41: 06:1 03:1
01/19/2022              Nat. Coho               Rolfing Acclimation Pond, Wenatchee River Basin

3DD.003D62021E: 07:2 06:1
11/22/2021              Nat. Coho               Mid-Valley Acclimation Pond, Methow River Watershed

384.0F9985A086: 07:4 06:2
07/21/2022              White Sturgeon          Columbia River - Three Tree Point, WA to Lewis River (km 69-140)

3DD.003E370B63: 05:1
09/15/2022              Nat. Fall Chinook       Rufus Woods Net Pens RV Park/Boat Launch

3DD.003D8665B7: 04:1 03:1
01/12/2022              Nat. Coho               Chewuch Acclimation Pond (WDFW)
```

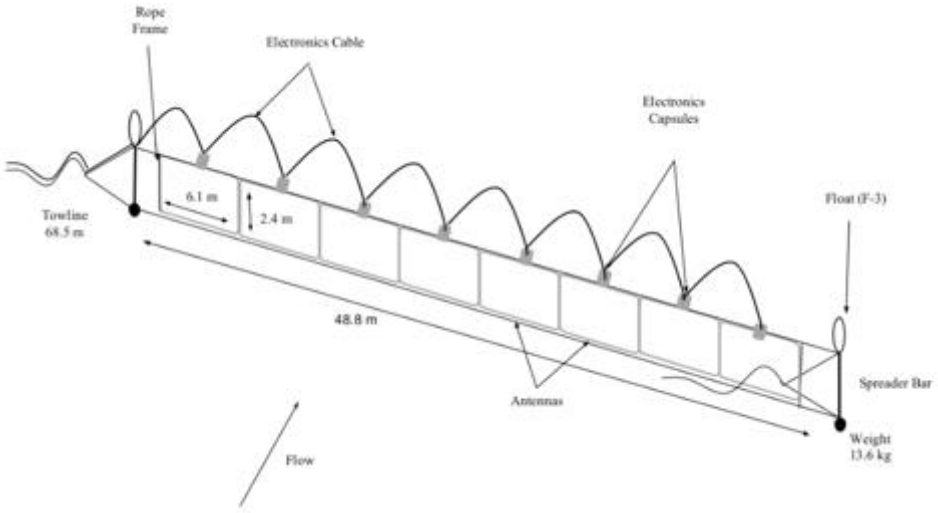
Pile Dike O&M





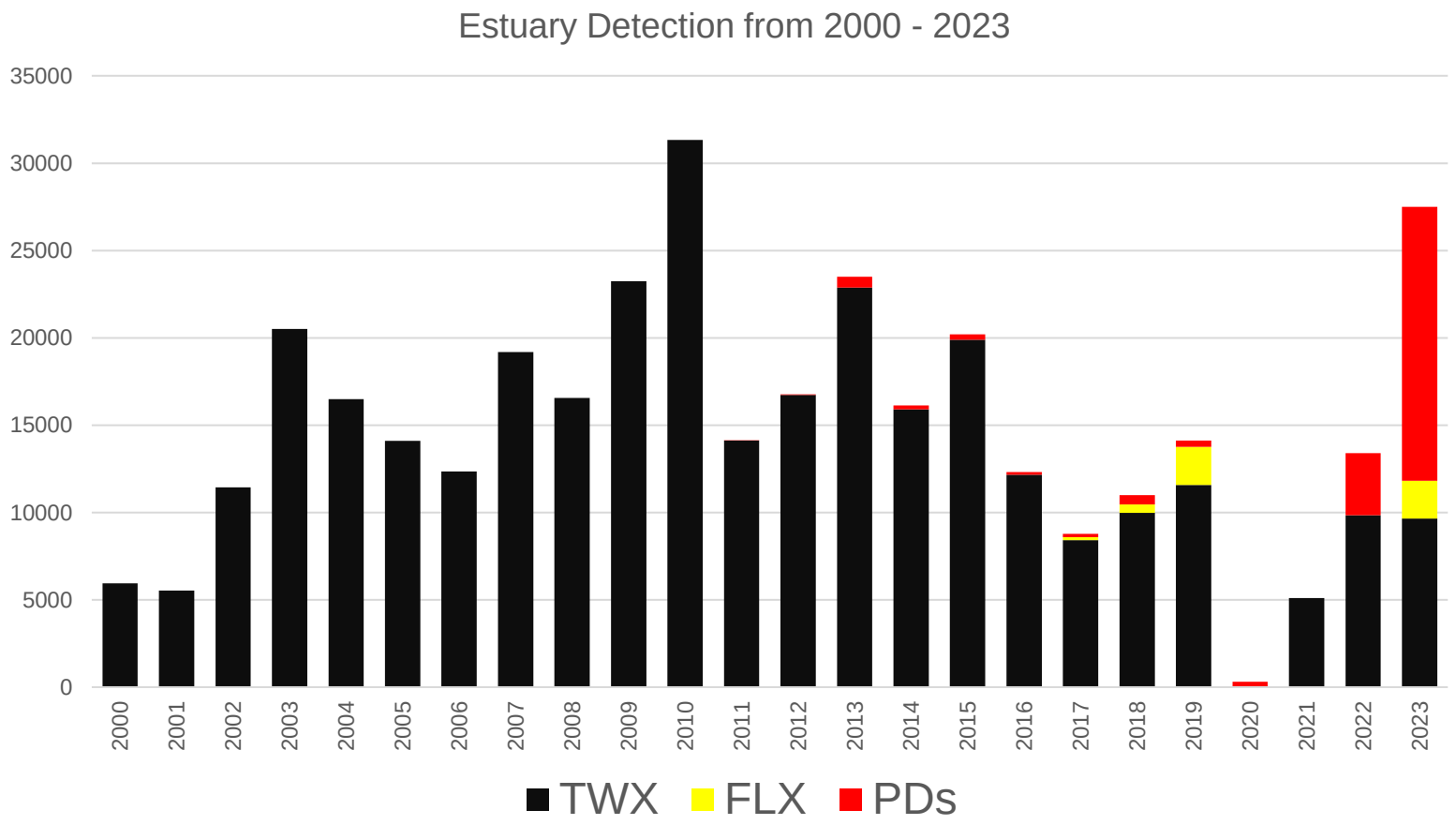
2023 Flexible Array



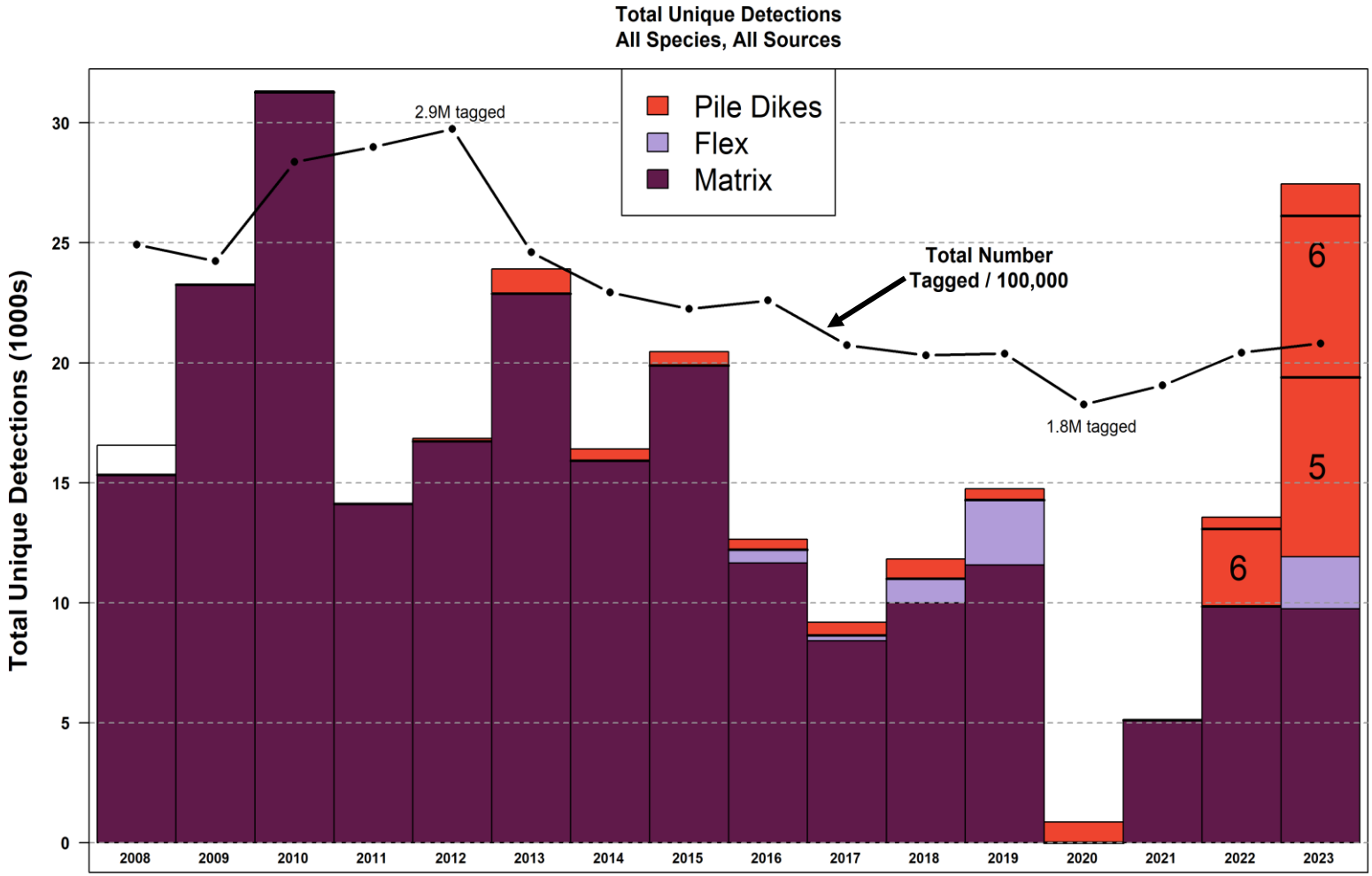


- Operated the FLX system horizontally and during daylight hours to target steelhead
- Installed and operated a net reel to ease deployment and retrieval, reducing staffing requirements and increasing operational safety

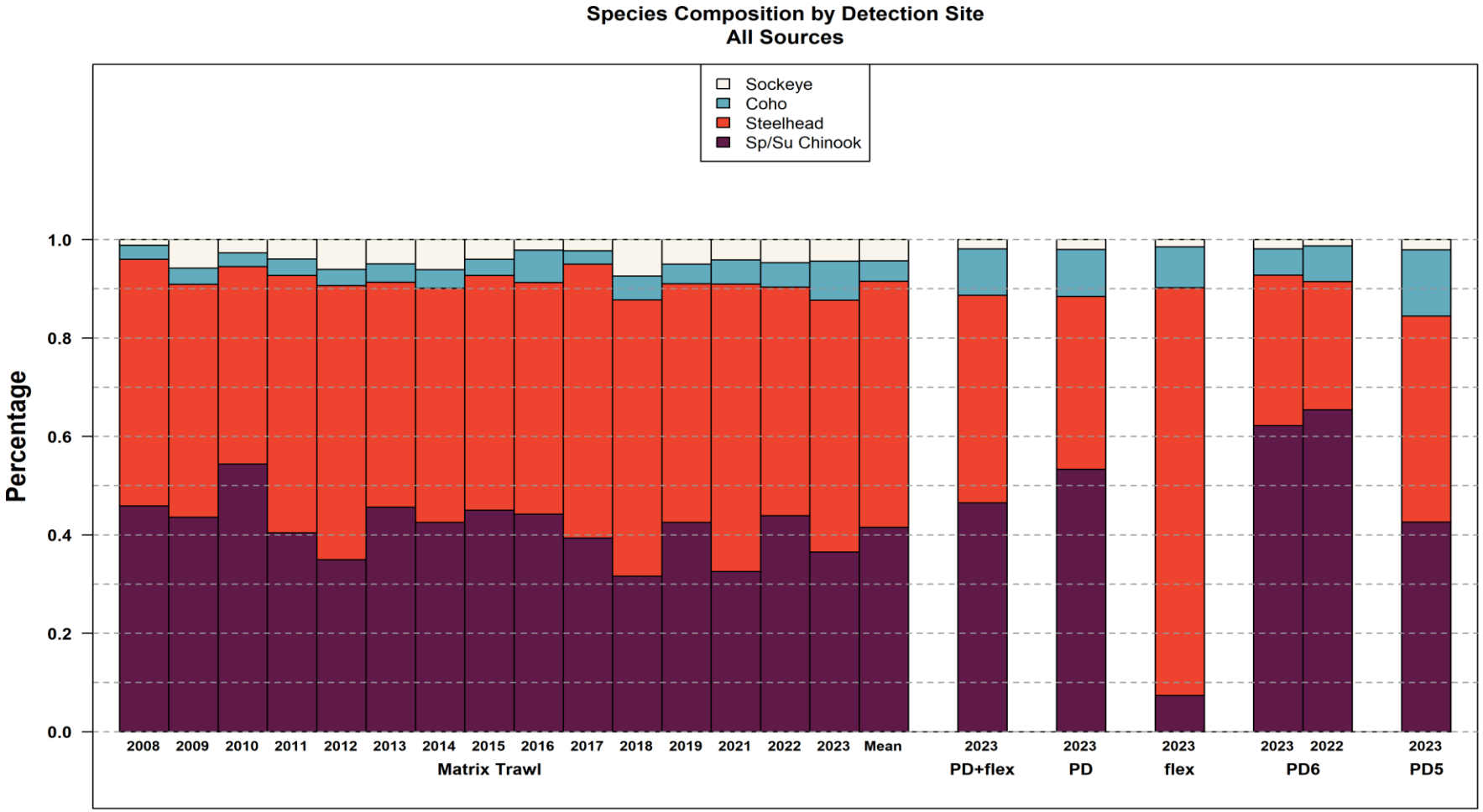
Lower River Detection for All Years



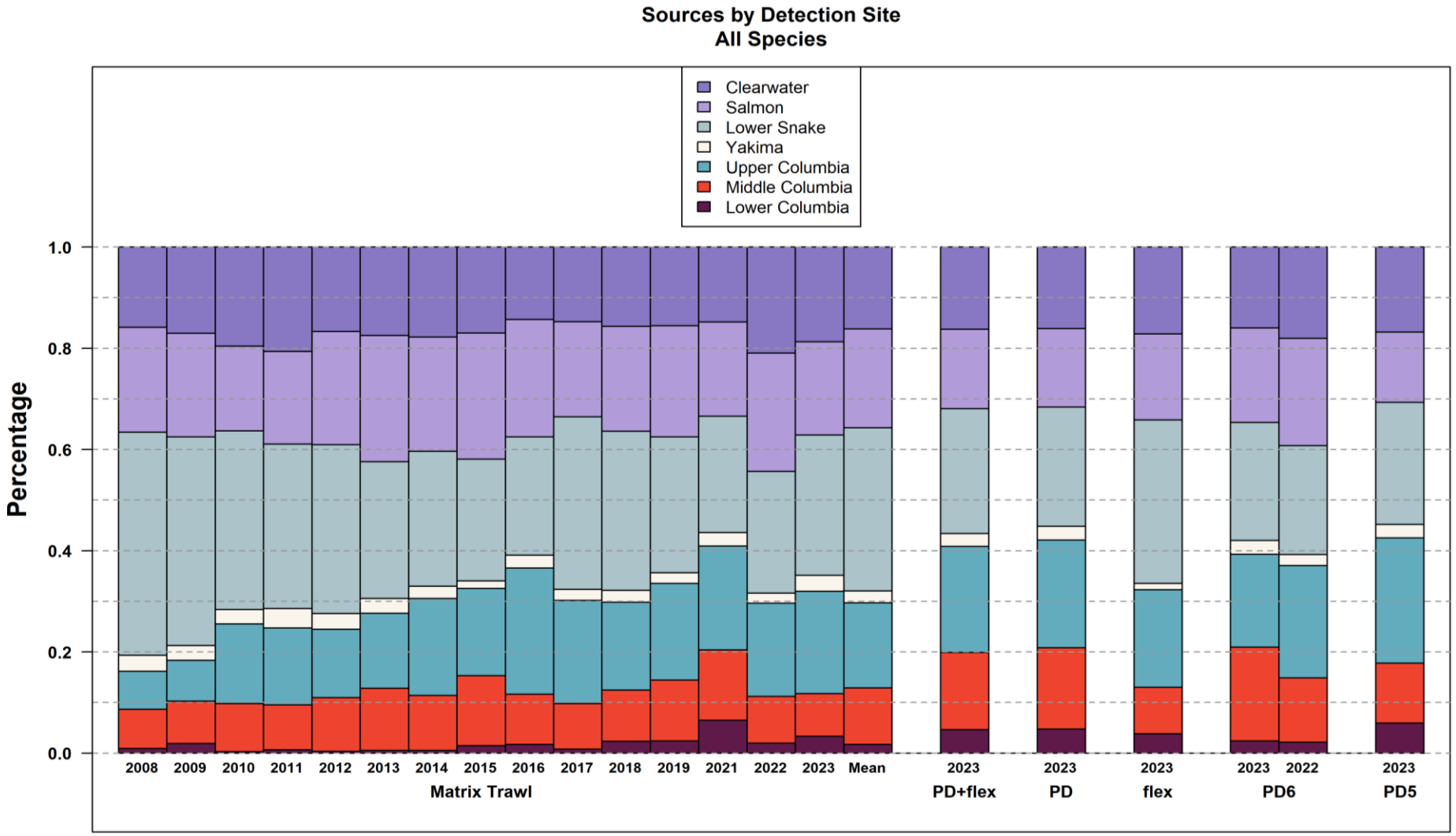
2023 – Estuary Results



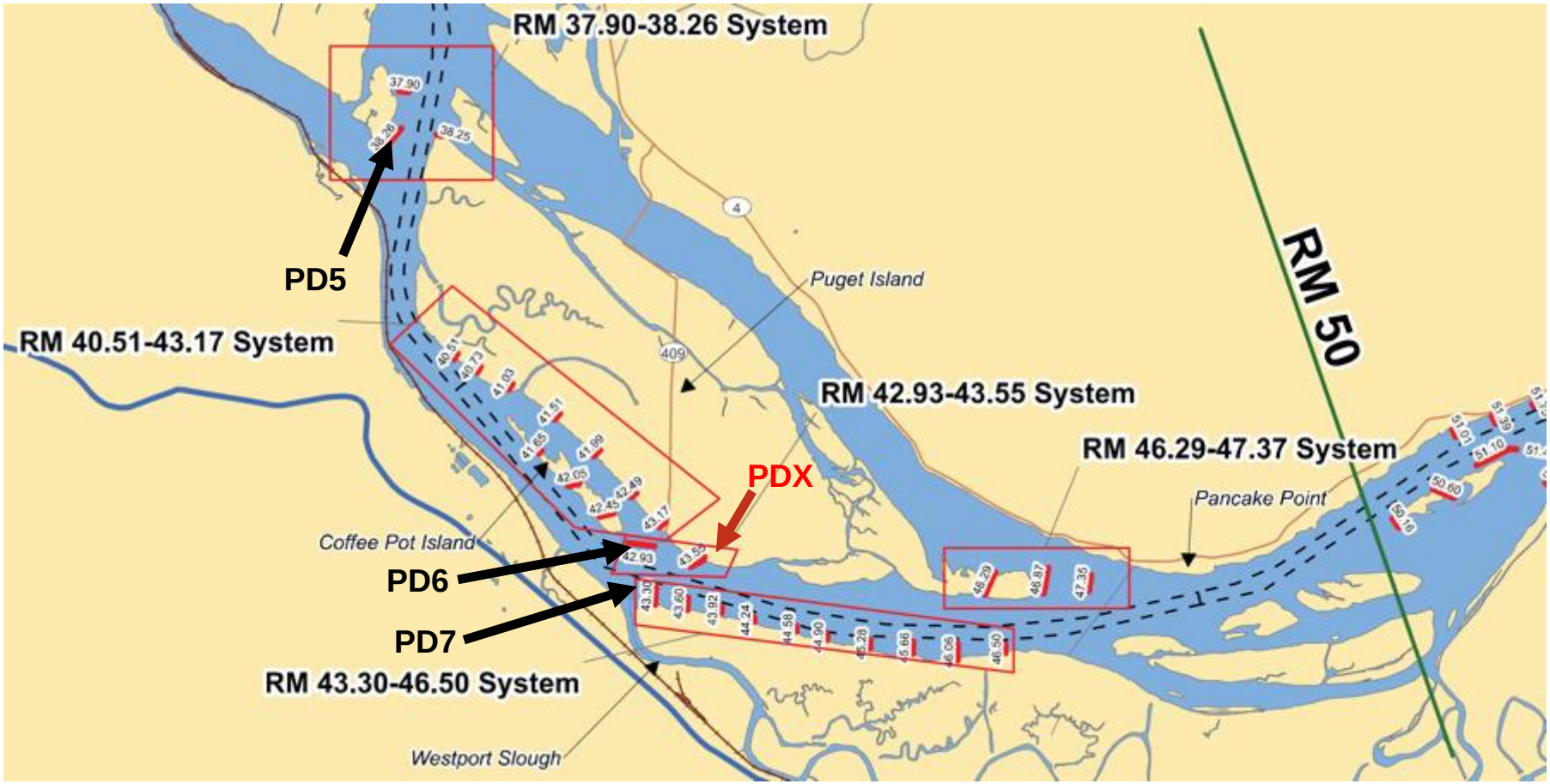
2023 – Estuary Results – Species Comp.



2023 – Estuary Results – Basin of Origin



2024 Season Proposal

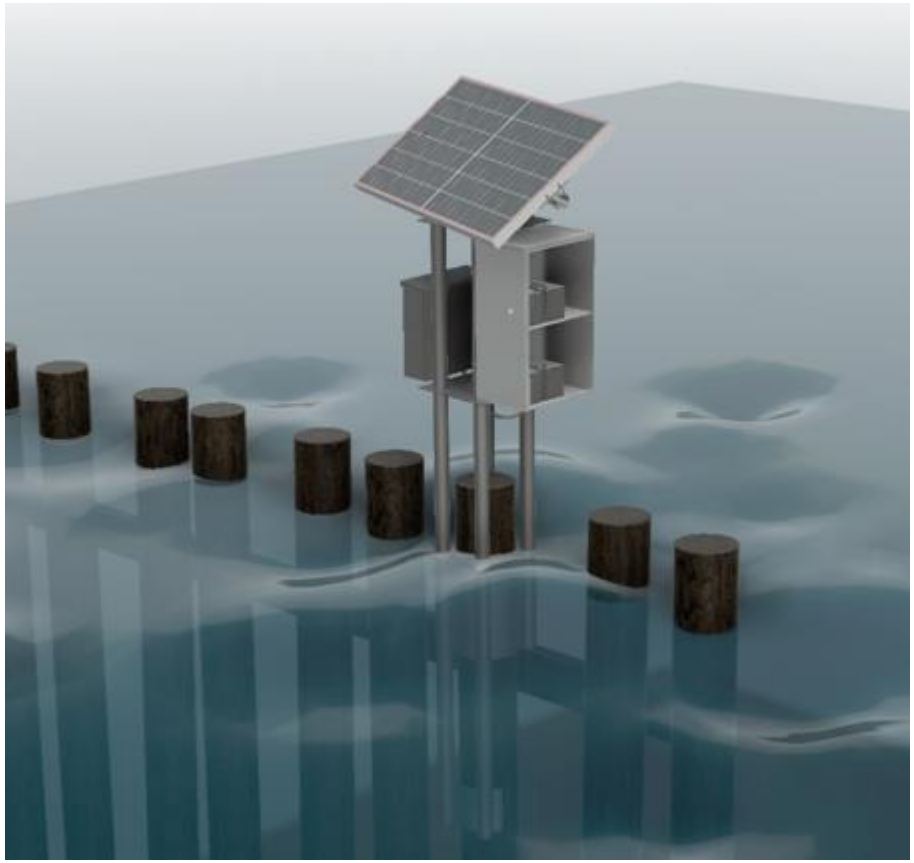


2024 Pile Dike - Upgrades

PD5	01	02	03	04	05	06	07	Total	
# first detection (unique)	945	388	1,772	630	3,350	212	160	7,457	
# tags with subsequent detection	18	32	302	217	782	79	96	1,526	
# 'true' unique tags	**927**	**356**	**1,470**	**413**	**2,568**	**133**	**64**	**5,931**	
% Duplicate (overlap)	1.90%	8.25%	17.04%	34.44%	23.34%	37.26%	60.00%	20.46%	
% unique	98.10%	91.75%	82.96%	65.56%	76.66%	62.74%	40.00%	79.54%	
PD6	01	02	03	04	05	06	07	08	Total
# first detection (unique)	904	897	363	2040	2279	115	37	99	6,734
# tags with subsequent detection	3	53	86	658	980	16	17	40	1,853
# 'true' unique tags	**901**	**844**	**277**	**1,382**	**1,299**	**99**	**20**	**59**	**4,881**
% Duplicate (overlap)	0.33%	5.91%	23.69%	32.25%	43.00%	13.91%	45.95%	40.40%	27.52%
% unique	99.67%	94.09%	76.31%	67.75%	57.00%	86.09%	54.05%	59.60%	72.48%

- PD5 had 5 antennas most of the season (1&2 stacked), averaging ~1,186 per antenna
  - 1,186 * 16 = **~18,976 (potentially)**
- PD6 had 7 antennas most of the season, averaging ~ 697 per antenna
  - 697 * 16 = **~11,152 (potentially)**

2024 Pile Dike - Upgrades



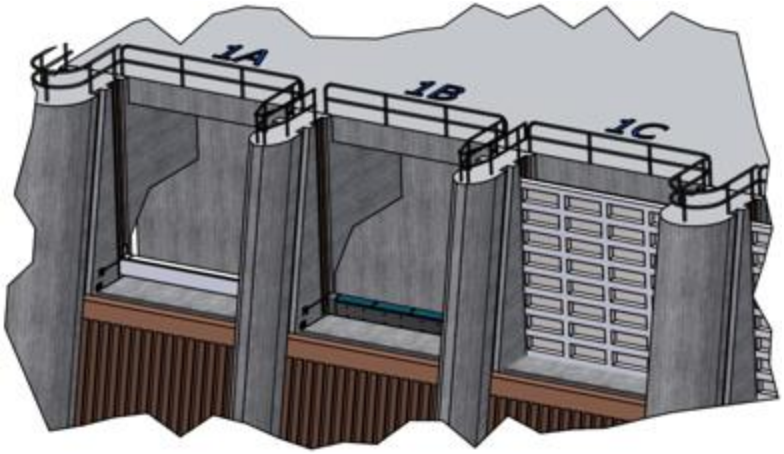
- Four PD sites
  - 3 – “Permanent” (PD5, PD6, PD7)
  - 1 – Additional test site (PDX)
- Expand PD5 and PD6 to 16 antennas each with two “permanent” equipment platforms on each site.

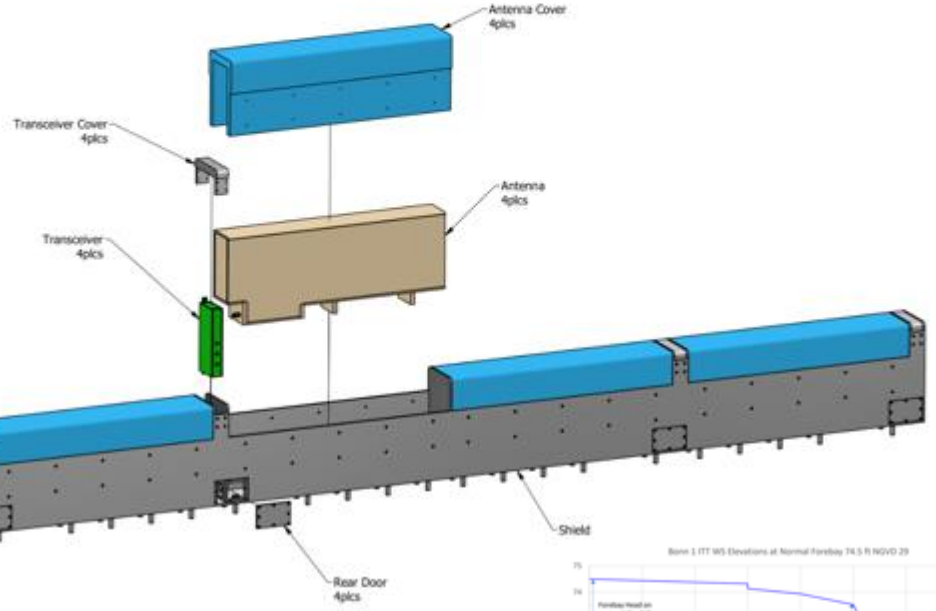
2024 Project Overview

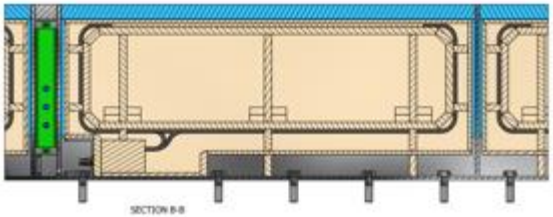
- Expansion of existing sites (PD5 and PD6):
  - Two “year round” mounts per site to reduce install burden
  - 16 antennas at each site (not limited to this)
  - Two synchronized MTSs at each site for expansion and redundancy
- Add an additional test site(s):
  - Fabricate a “seasonal” platforms for testing any PD structure
  - Up to six antennas per test site
- Evaluate PD performance
  - Do additional antennas add significantly more data?
  - How does seasonal variability impact detections?
  - What are the short and long term operational costs?
- Operate the Pair Trawl Project in tandem to continue to validate species/basin comp.
- Operate the Flexible array with a focus on steelhead detections

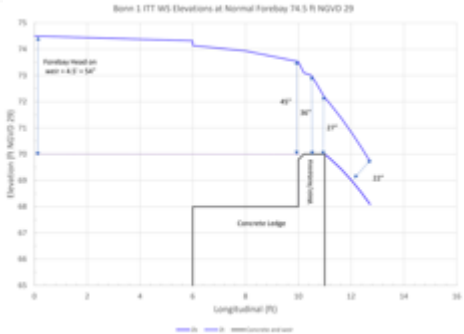
2024 Bonneville ITS Development

BONNEVILLE PH1 ICE AND TRASH SLUICEWAY PIT TAG ARRAY FOR GATE 1B

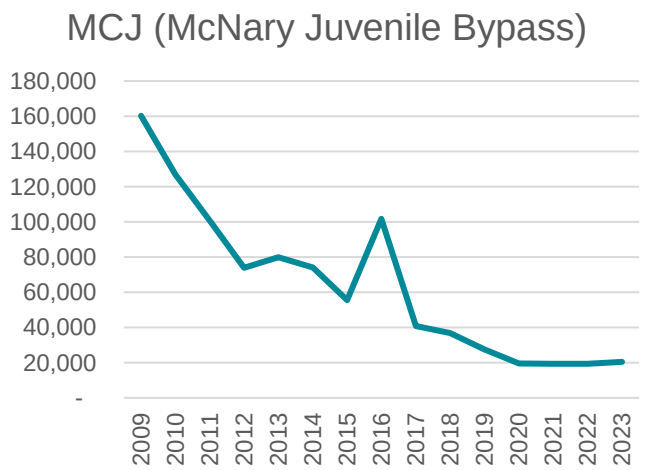






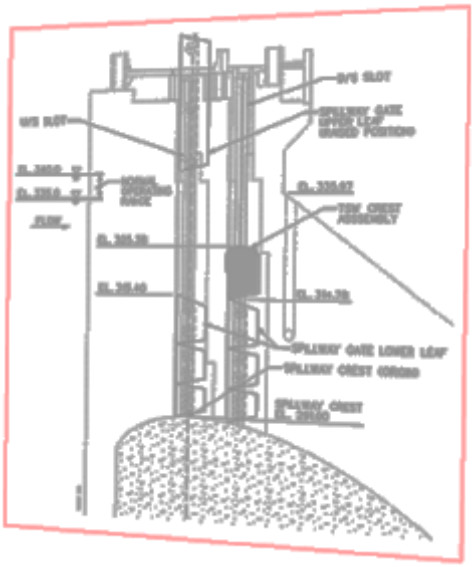


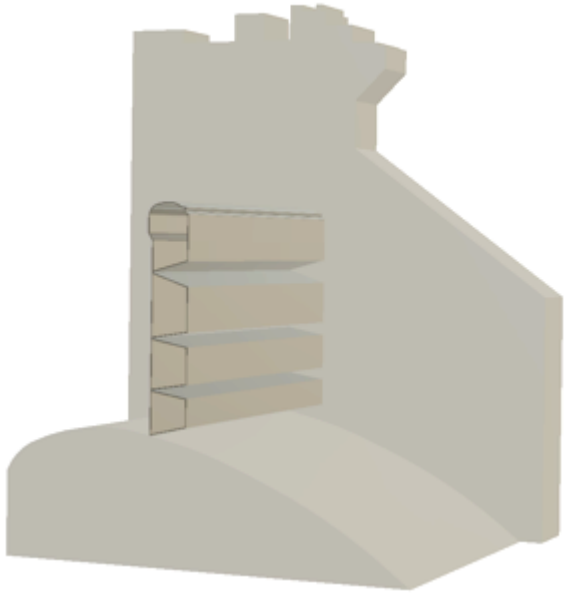
McNary


MCJ (McNary Juvenile Bypass)
180,000
160,000
140,000
120,000
100,000
80,000
60,000
40,000
20,000
-
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023


Umatilla

McNary





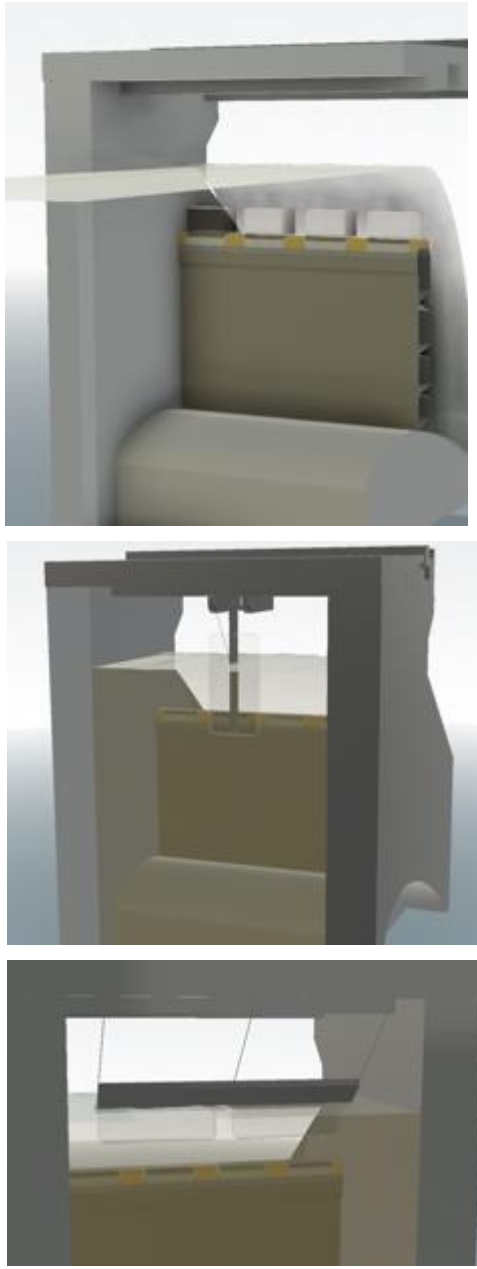
- Take lessons learned from GRS, BON ITS and develop an antenna system for use atop TSWs and ASWs
- Utilize the FS3001 readers and an ITS style antenna
- Antennas would hydraulically mimic weir crest, NOAA hydraulics will be consulted after initial design principles have been established
- Stainless steel structural housings/shields with cross members, pre-flooded compartments to reduce future O&M burden

McNary – Spillway Detection

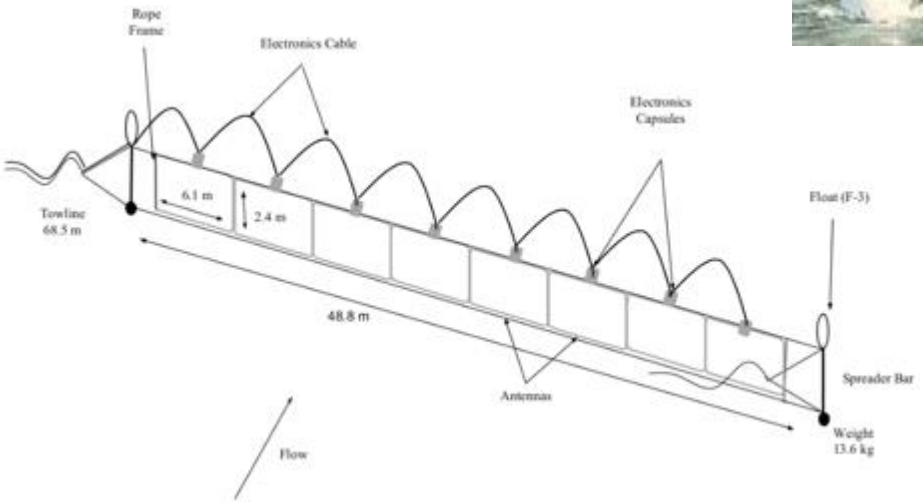
- Read range of 60” could capture approximately 25% of the water column at elev. 340

- Read range of 60” could capture approximately 20% of the water with one fin antenna

- Read range of 60” could capture approximately 30% of the water with two antennas

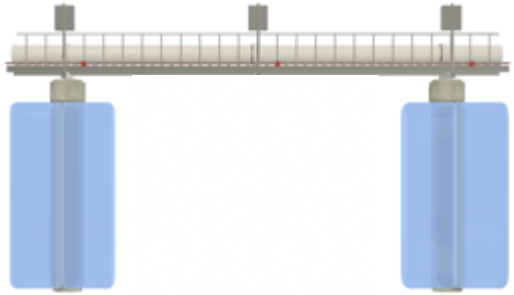


McNary – Spillway Detection



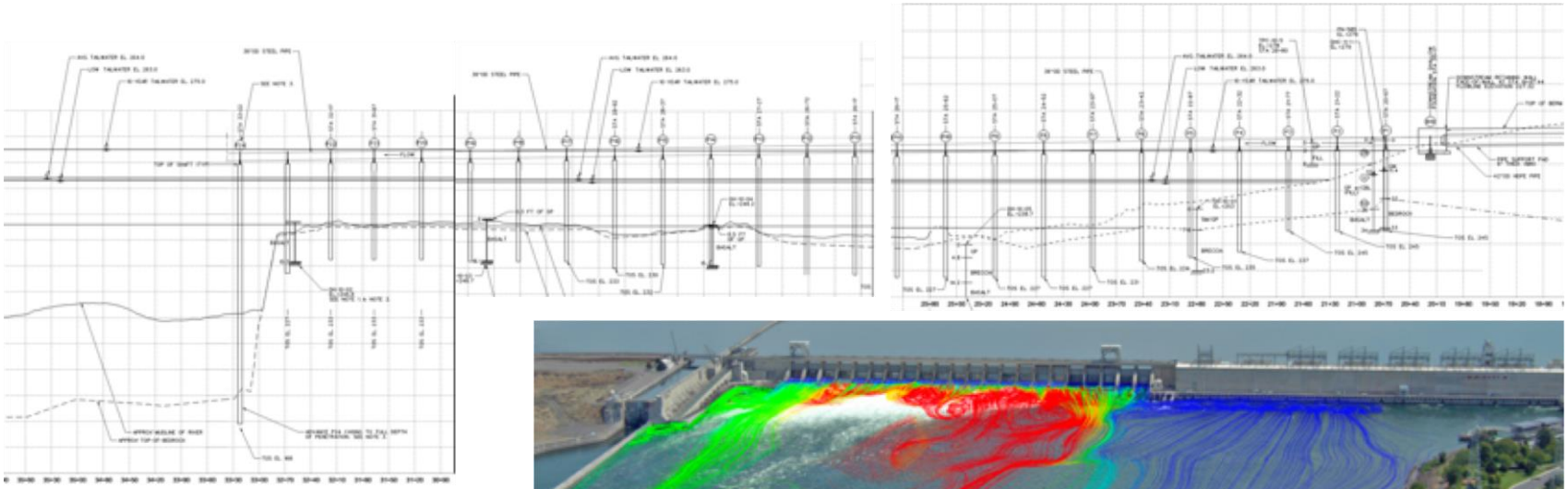
- Flexible antenna array
- PIT Barge placement

McNary – JBS Outfall Antenna



- Any structure in the river could be used as a “Pile Dike” type system
- Bridge Columns, outfall piers etc.
- Scalable – Could start with a single antenna

McNary



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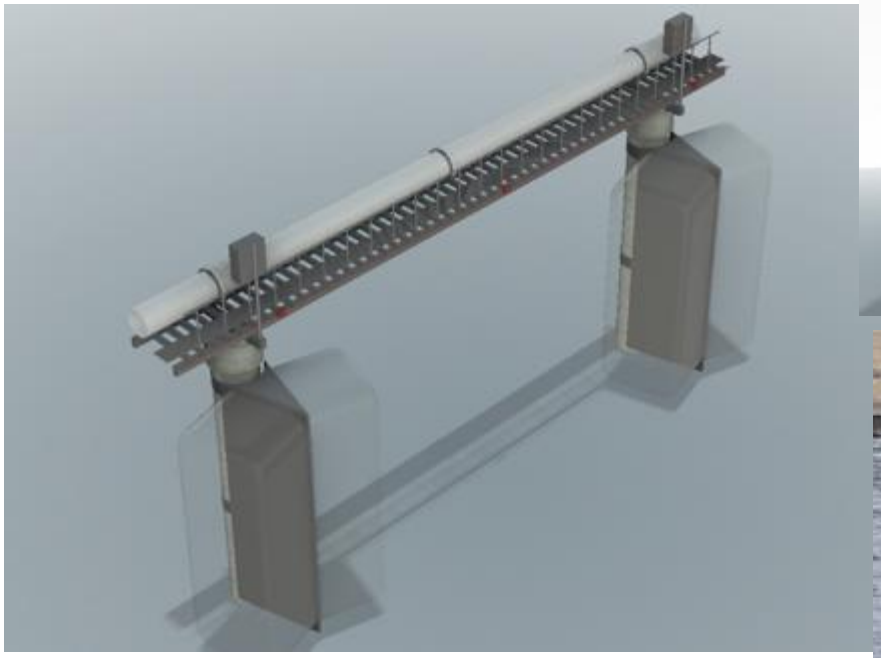
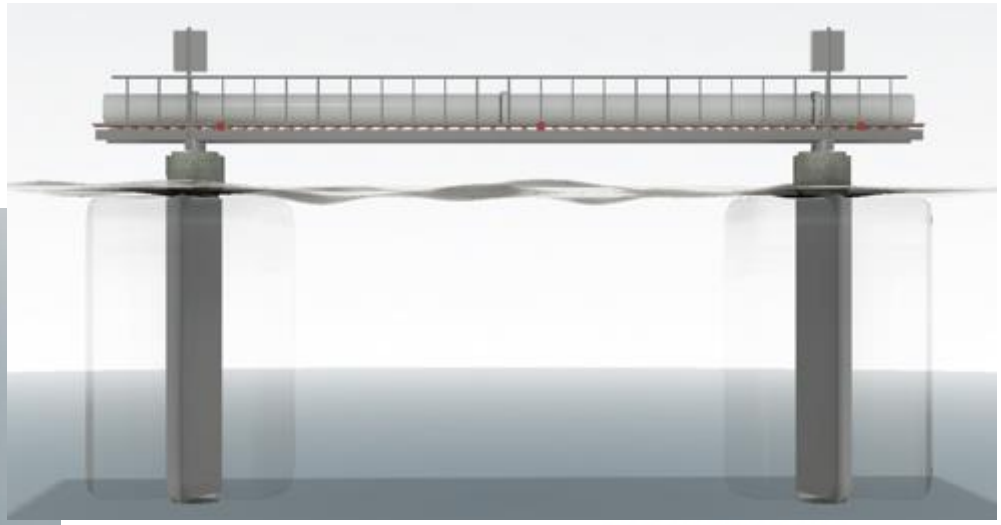
- Year-round detection possible
- Manageable depths across the entire structure
- 24 – 48” concrete pilings with 50’ spacing extending 1200’ into the river
- Option to target certain passage routes based on previous hydraulic and active tag studies

MCN Piling Antennas





Questions?

Photo by Dr. Jonathon Armstrong