

Wells Dam Juvenile Bypass Baffle PIT Detection System

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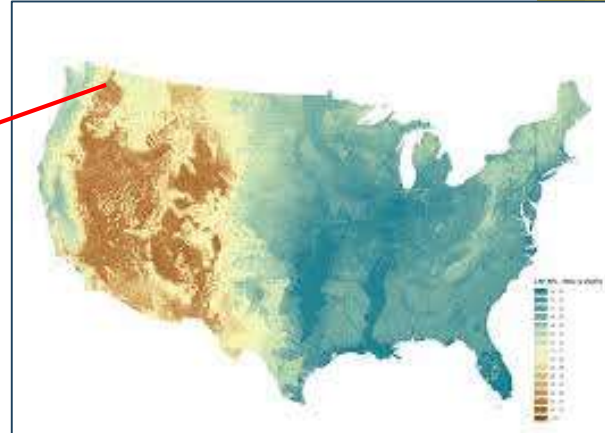
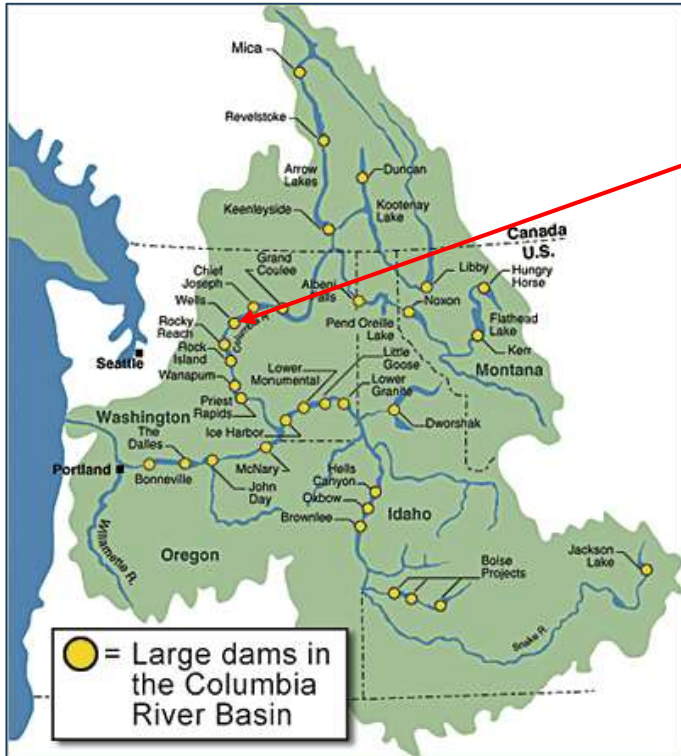
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Presentation Outline

1. Wells Dam Hydrocombine
 - a. Location
 - b. Design
2. PIT-tag Detection System Design and Testing
 - a. Antenna Design
 - b. Year 1 Configuration: CAN Bus
 - c. Year 2 Configuration: Data-Over-Power
3. Summary Data
 - a. Vertical Distribution
 - b. Travel Time
 - c. Diel Distribution

Where is Wells Dam?



Columbia River Hydroprojects

- Wells Dam: Rkm 829
- Rocky Reach Dam: Rkm 761
- McNary Dam: Rkm 470

Wells Dam – a Hydrocombine



- 396 m wide
- Switchyard, spillway, turbines and fishway in single structure

Features of the Wells Hydrocombine



Switchyard

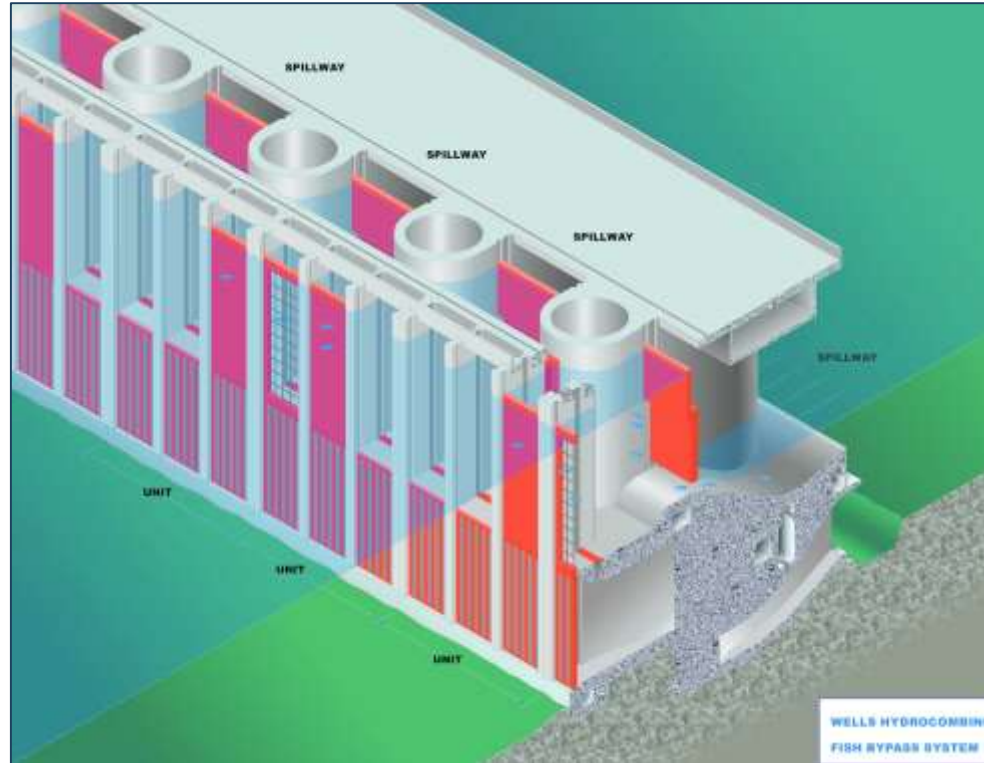
10 Kaplan Turbine Units
840 MW Capacity

2 Adult Fishways

Features of the Wells Hydrocombine



Wells Dam Juvenile Bypass System



Wells Dam Juvenile Bypass System



Wells Dam Bypass Baffle



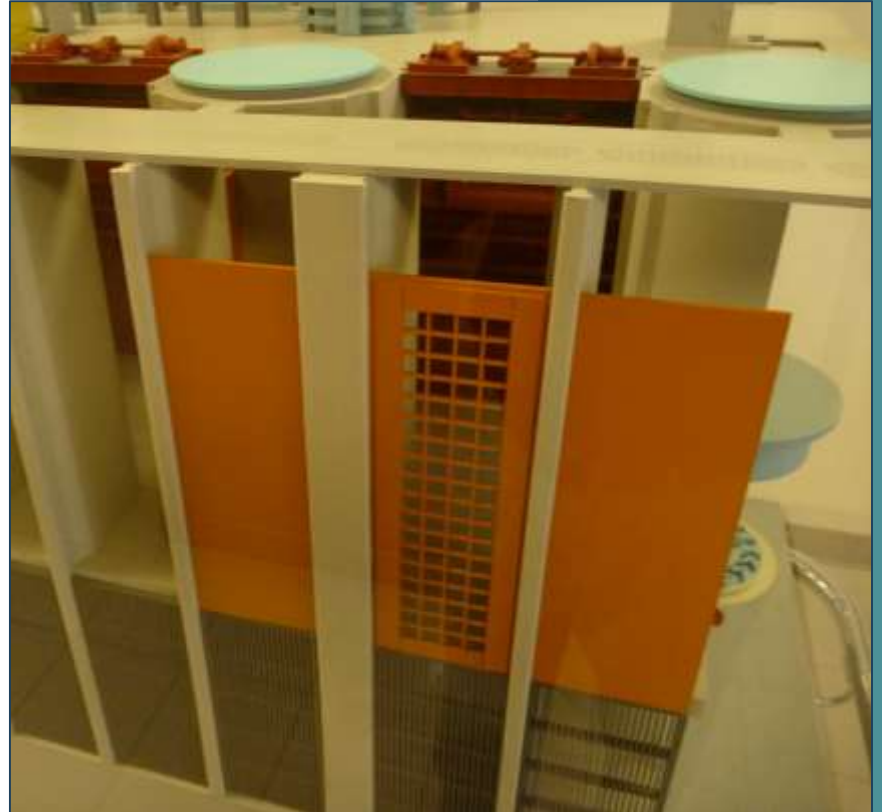
Wells Dam Bypass Baffle

- Bypass Baffles in 5 bays
- 1.2 m x 1.2 m openings
- 16 rows, 4 columns
- 23.5 m tall
- Bay 2 has highest passage

Fish Guidance Efficiency

(3-year hydroacoustic study):

- 92.0% for spring Chinook and steelhead
- 95.3% sockeye
- 96.2% sub-yearling Chinook



IS1001-MC CAN Bus & Data-Over-Power



- Biomark IS1001-Master Controllers
- Biomark IS1001 transceivers
- AC power with isolation transformer
- Fiber Optic cable for data transmission



Antenna Development



- 1.2 m x 1.2 m OD antenna
- Mounted in steel frame
- External aluminum shield
- Internal ferrite tiles to enhance field
- Biomark 12-mm FDX-B Tag

Prototype Testing



- Confirm fitment
- Confirm grounding
- Discuss mounting with mechanical crew
- Read Range: 40 cm at 7% FDX-B noise
- 400 mV tag signal in center of opening
(0-900 mV range)

Antenna Construction



- Ramps for flow and to secure antenna in baffle opening
- 5.2 cm thick
- 18 cm wide

Year 1: 4 cells in upper two rows

- IS1001 in submersible nodes
- CAN bus network to MC
- Water velocity ~ 1.2 m/s

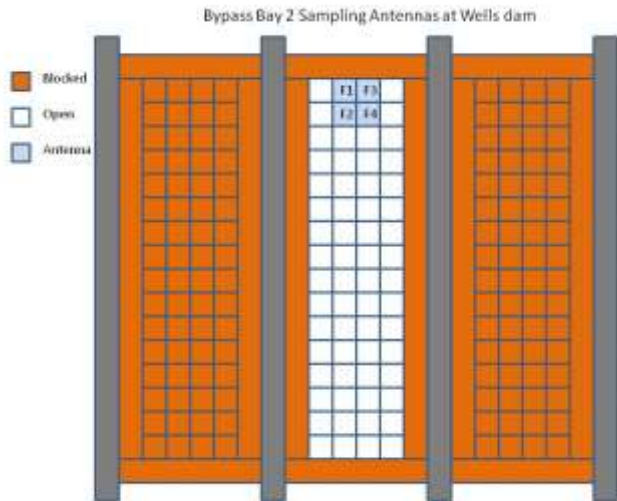


Year 2 – 16 antennas in single column

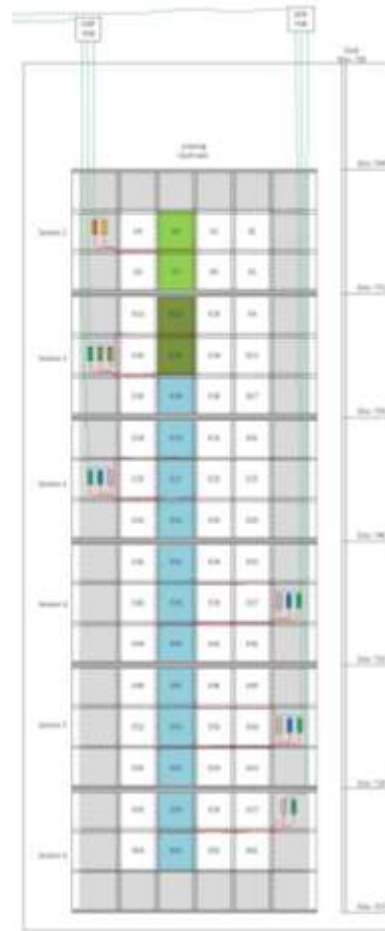


IS1001 & Antenna Placement

- Upper 2 rows in 2016 (CAN Bus) (4)
- 1 Column in 2017 (DOP) (16)



2016

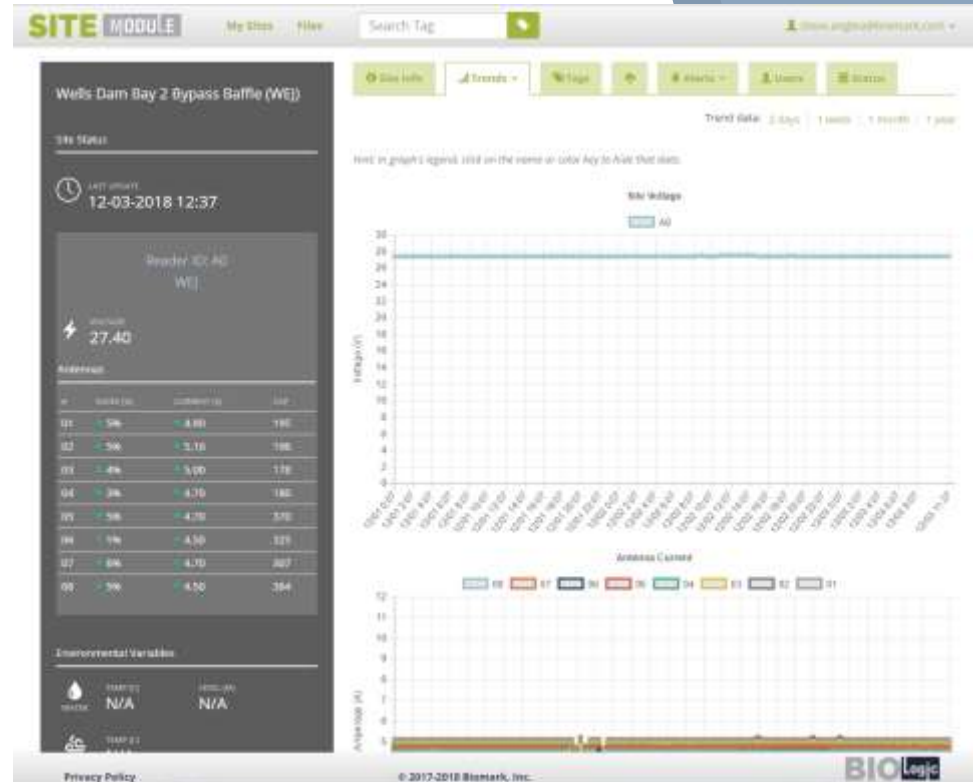


2017



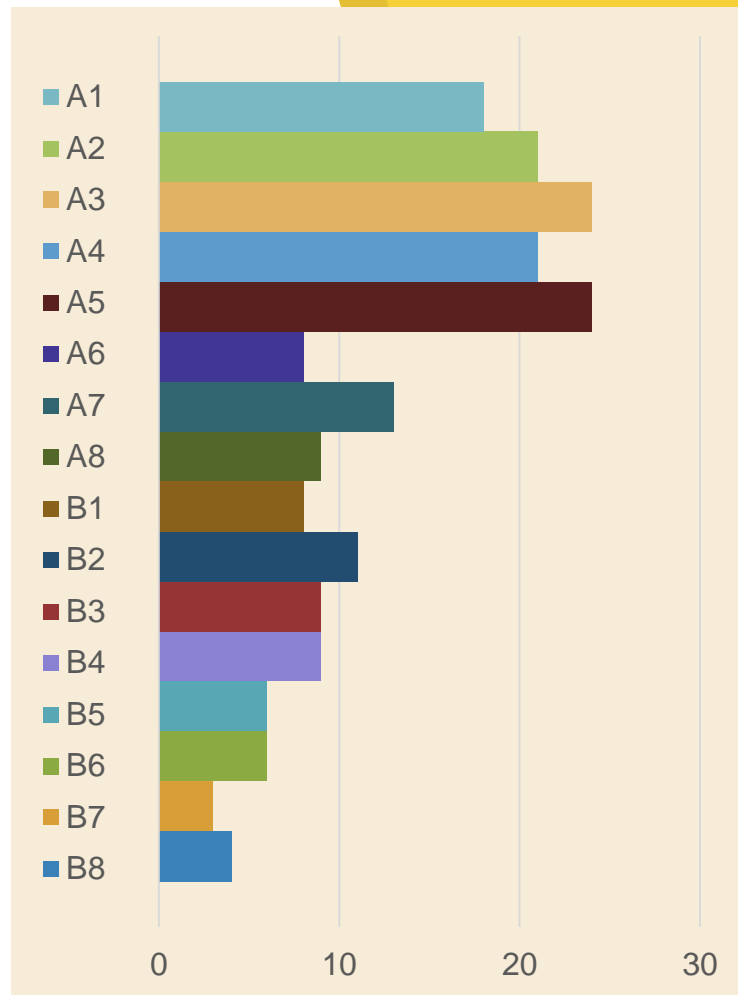
Remote Monitoring

- Biomark Data Collection Application
- Post data to Biomark BioLogic SM
- Alerts set for key variables: input voltage, antenna noise & current
- Automatically email users if variable goes out of specification
- Download diagnostic and tag data

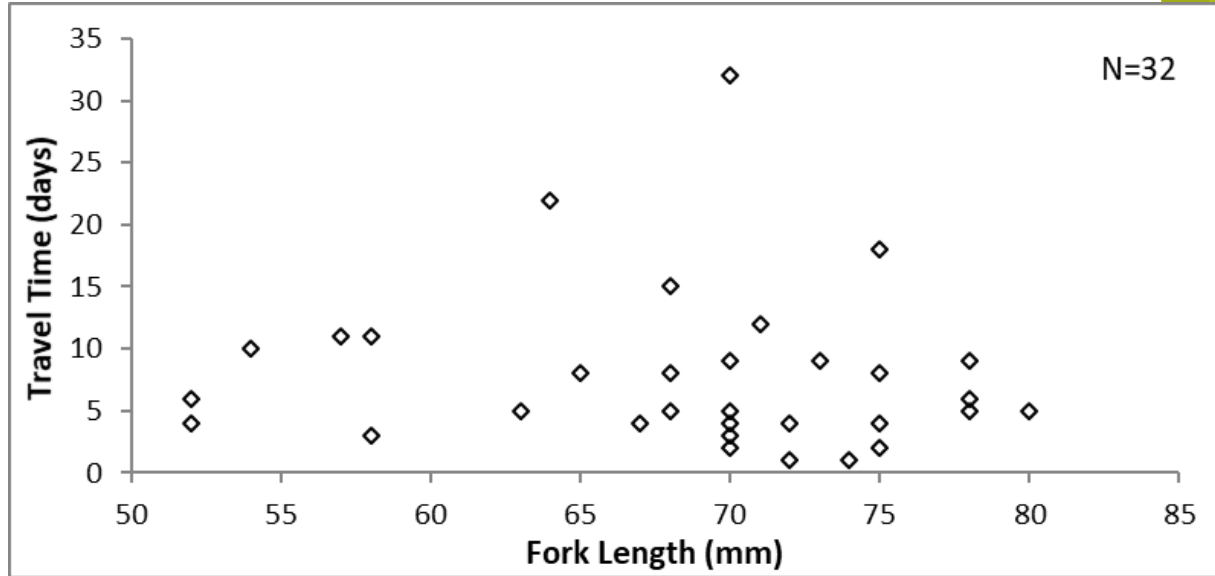


Vertical Distribution: April-May 2018

- PIT-tag fish detected on each antenna
- Detection skewed towards surface
- Confirm historic fyke-netting and hydroacoustic data
- Monitor the vertical distribution of without use of fyke net



Travel Time (Wells Reservoir to WEJ)



Travel Time (days) from release in Wells Reservoir to detection at WEJ by fish fork-length (mm) for all sub-yearling Chinook (N=32) detected at WEJ in 2017-2018.

* Detections of PIT-tagged fish released by the Confederated Tribes of the Colville Reservation

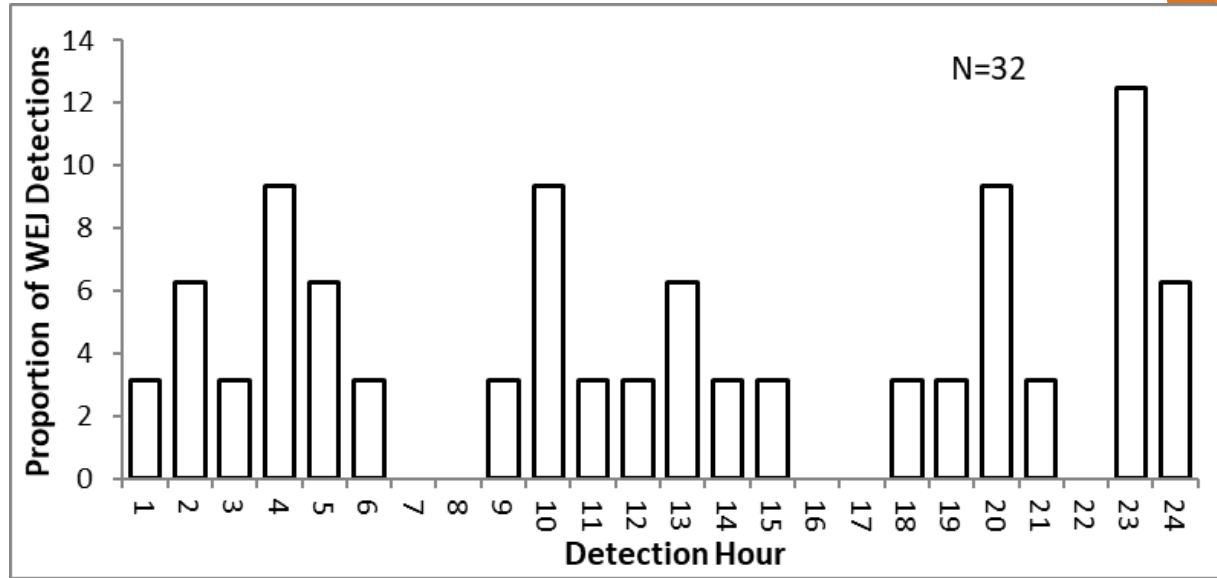
Travel Time

Seining site, length at marking, and travel times for fish PIT tagged by the CTCR in 2017 and 2018 in Wells Reservoir and detected at both WEJ and RRJ. “Release to WEJ” is days between release and detection at WEJ; “WEJ to RRJ” is days between detection at WEJ and detection at RRJ; “Release to RRJ” is days between release and detection at RRJ; “Proportion RR” is the proportion of total travel time below WEJ.

Capture Site	Mark Length (mm)	Travel Time (days)			
		Release to WEJ	WEJ to RRJ	Release to RRJ	Proportion RR
Gebber's	52	4	38	42	0.90
Gebber's	54	10	28	38	0.74
Gebber's	68	5	18	23	0.78
Gebber's	70	5	2	7	0.29
Gebber's	72	4	1	5	0.20
Gebber's	72	1	5	6	0.83
Washburn	75	4	14	18	0.78

* Detections of PIT-tagged fish released by the Confederated Tribes of the Colville Reservation

Diel Distribution



Proportion of fish detected during each hour of the day at WEJ for all sub-yearling Chinook (N=32) detected at WEJ in 2017-2018.

Summary

- Shielded ferrite tile in metal frame
- Vertical distribution
- Travel time
- Diel distribution
- Did not require handling of fish a second time





Biomark

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