RFID JOURNAL

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NOAA Uses RFID to Track Fish at High Speed in Washington Dam

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Low Frequency ISO 11784/5 RFID Tags

- In use in the CRB since 1980's
- Low frequency tags work under water
- Size allows for use in all life stages of salmonids (12.5 x 2.03 mm to 8.5 x 1.4 mm)
- Passive tags last the life of the tagged species
- FDX-B quick read speed (~32ms)

Figure 1. 12mm glass encapsulated FDX RFID tag

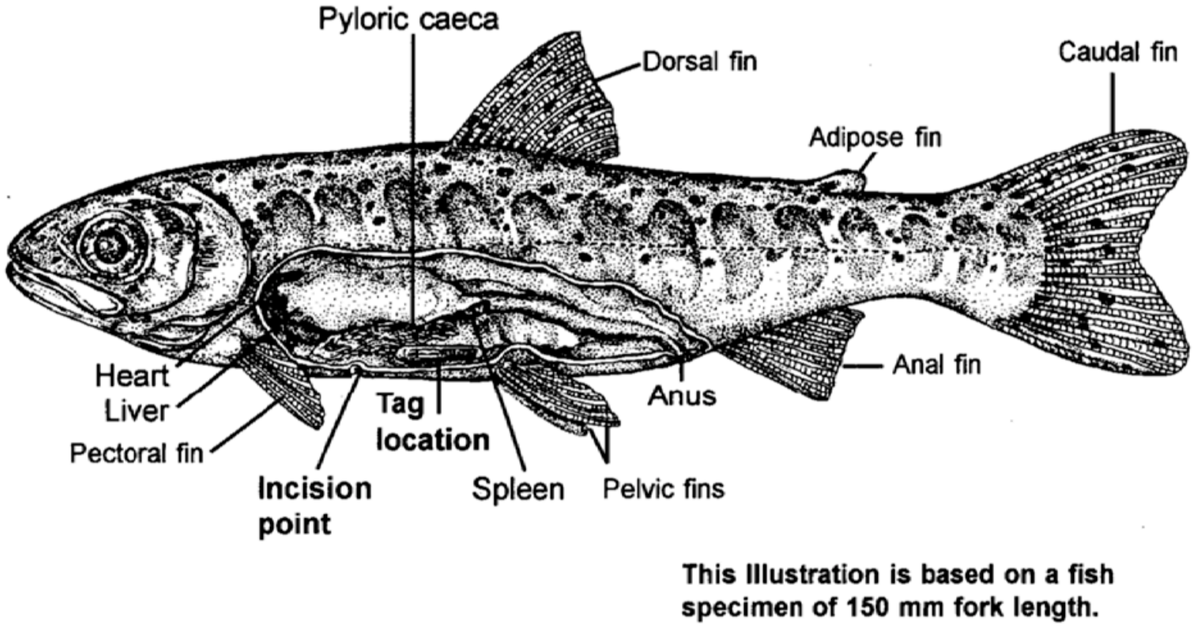

Figure 2. PIT tag location within a juvenile salmonid from 2014 Mark Procedure Manual – PTAGIS.ORG

Use of RFID Tags in CRB

- ~ 2 million PIT tags released per year in the CRB
- 359 different release sites

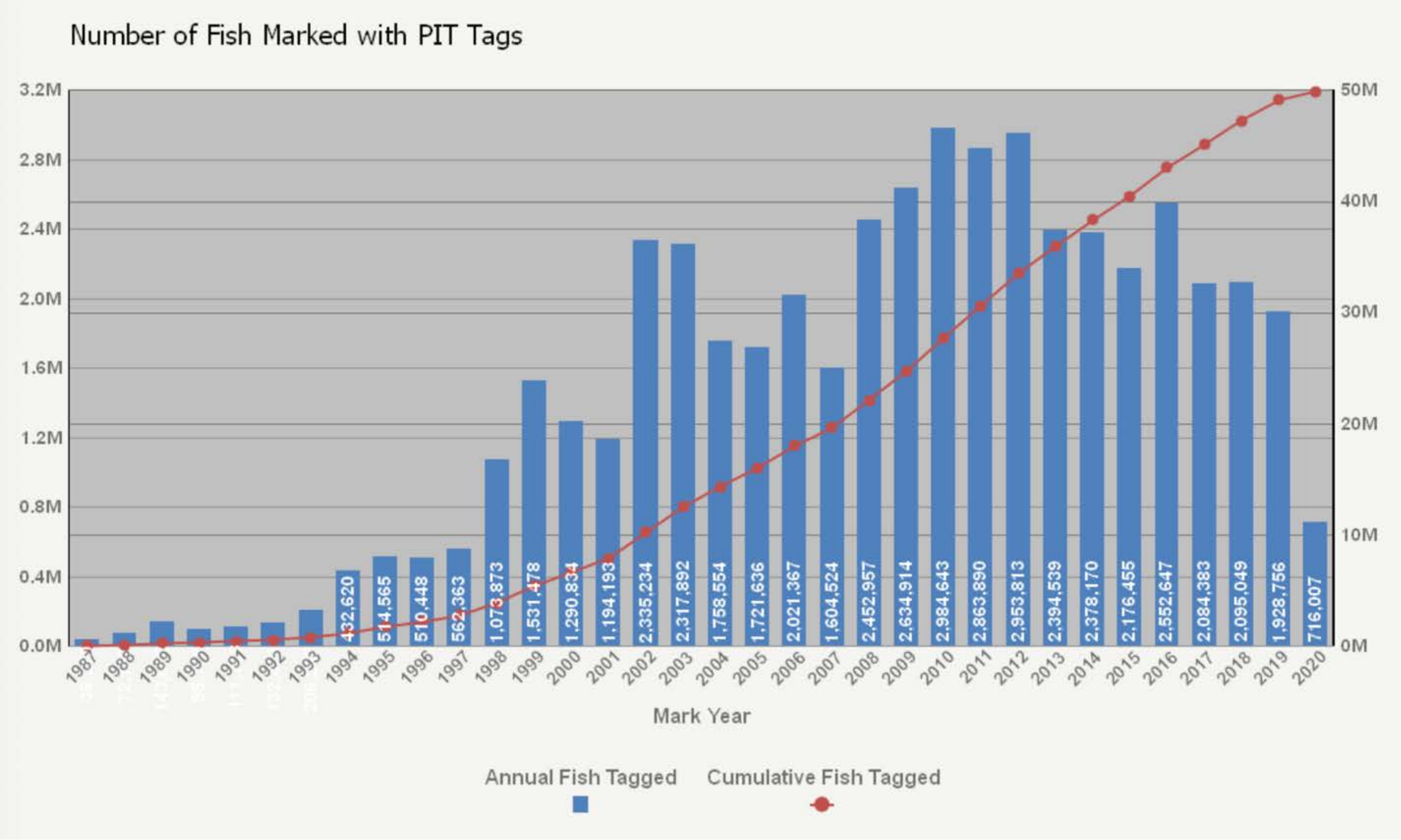

Figure 3. Total fish PIT tagged in CRB – PTAGIS.ORG

Map of RFID detection sites in the CRB

- 293 remote detection sites
- 29 Organizations (Government (Federal, State, Local), NGO (Tribal, Power Utilities, Water Districts) etc.

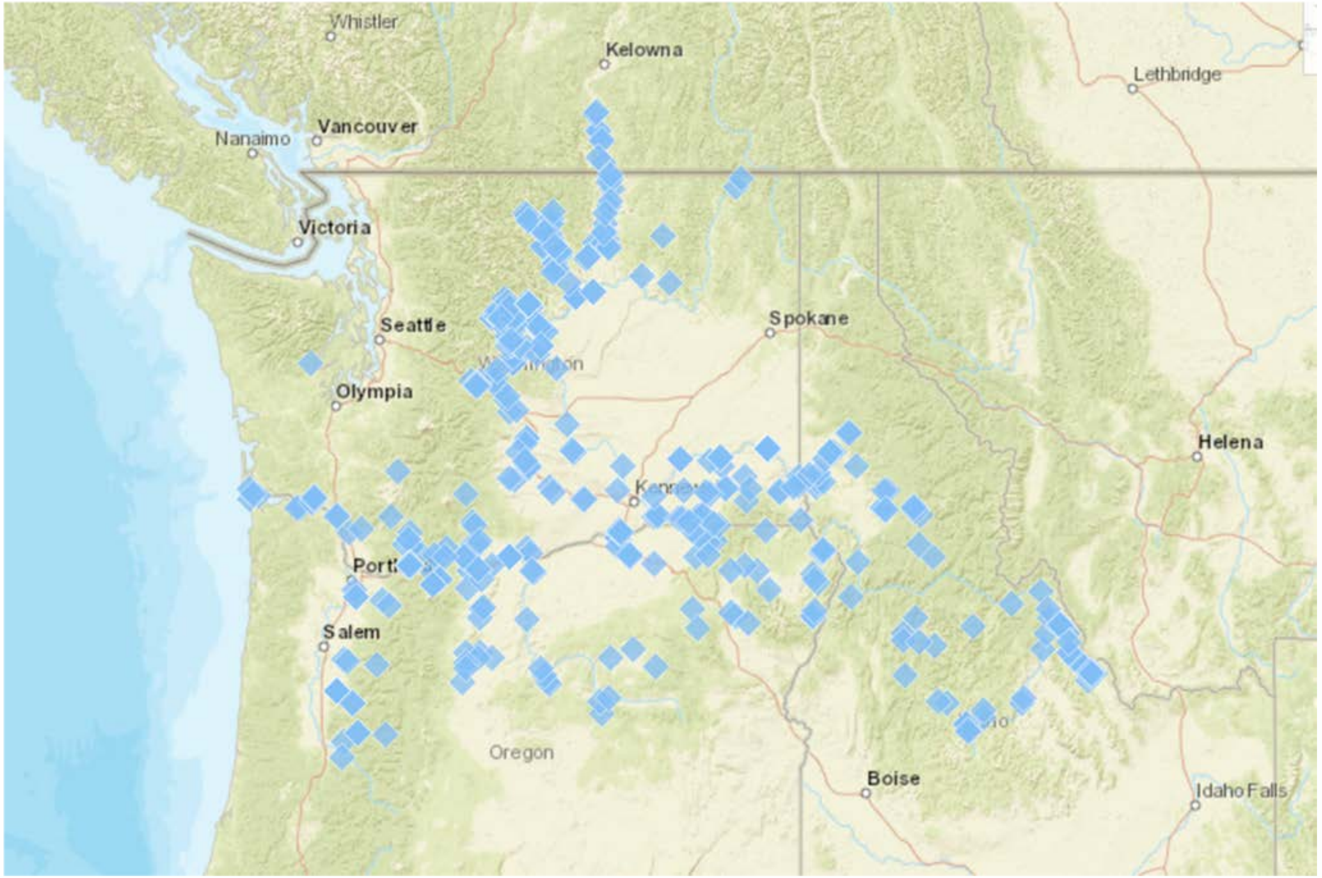

Figure 4. PIT tag sites throughout the CRB – PTAGIS.ORG

Figure 5. Typical instream antenna site – Gabriel Brooks, NOAA

Lower Granite Lock and Dam

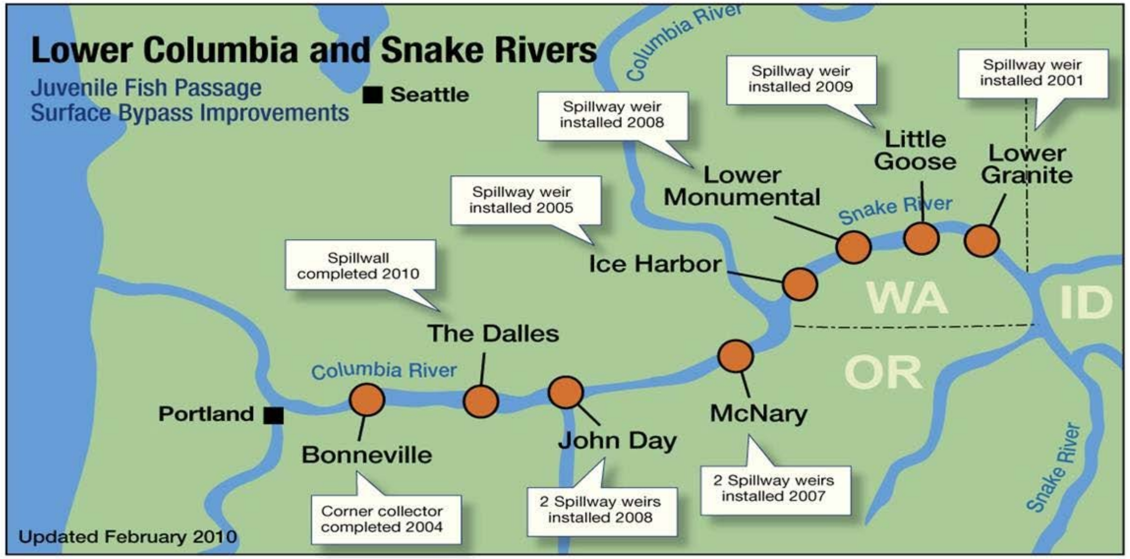

Figure 6. Mainstem Dams for Snake Basin and Lower Columbia – PTAGIS.ORG

Figure 7. Lower Granite Dam, retrieved from www.nwd-wc.usace.army.mil

Lower Granite Juvenile Bypass Facility

Figure 8. GRS JBS structure – David Trachtenbarg, USACE

Spillway detection at Lower Granite Dam

Figure 9. LGR spillbay one – Scott Livingston, PSMFC

Figure 10. LGR spillbay one, dewatered – Gabriel Brooks, NOAA

Design Criteria for Lower Granite Dam

- 27' x 50' of space to install (on a 1:1 slope)
- Maximum antenna height of 12"
- Develop a system that would minimize tag "collision"
- Must be permanent and operate through ~7" of concrete
- Detect 12 mm tags traveling at 75 fps (82.3 kph/ 51.1 mph) up to 24" above the antenna

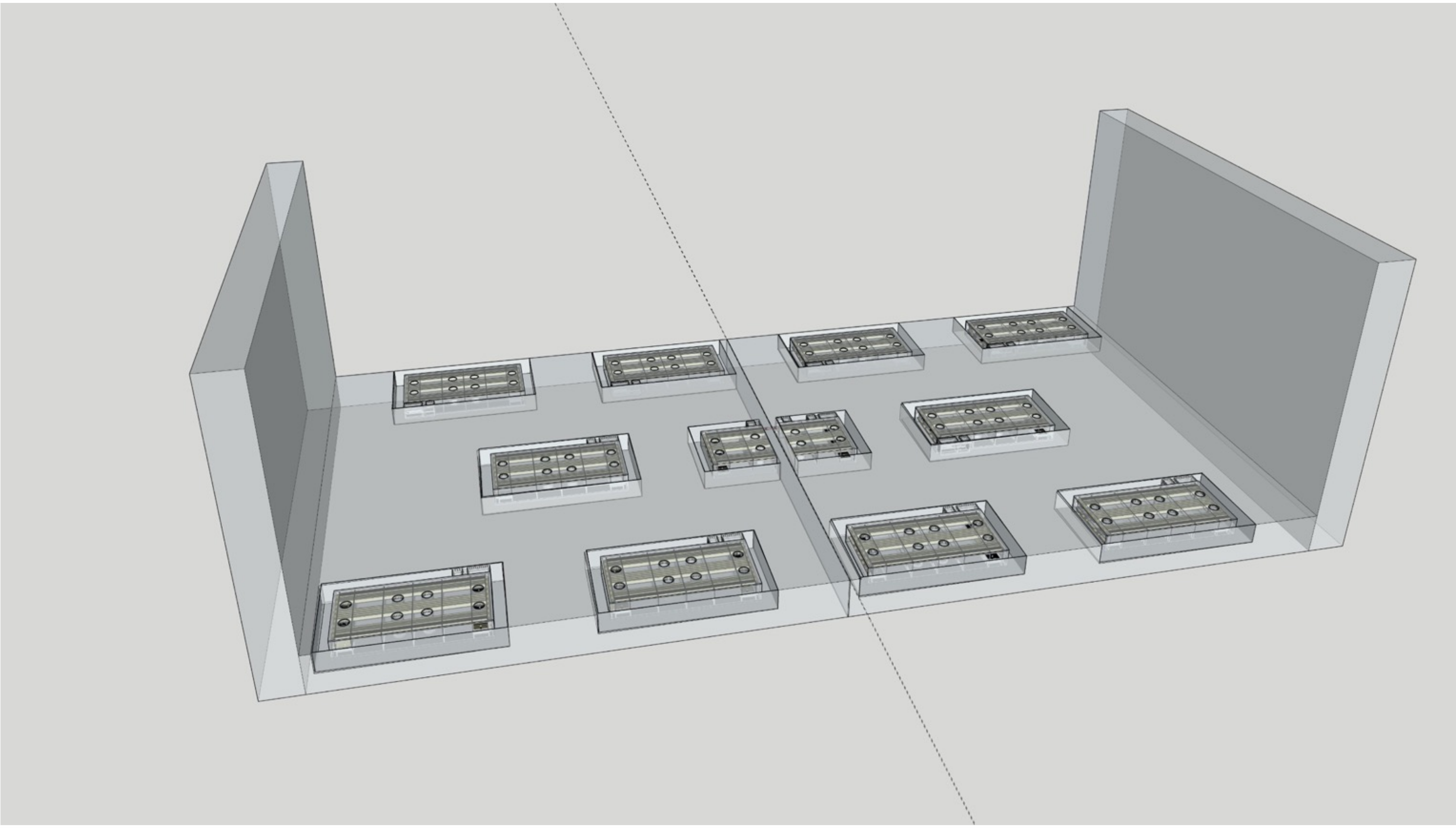

Figure 11. LGR Antenna Concept – Gabriel Brooks, NOAA

Electronics Development

Figure 12. GRS prototype Biomark antenna and prototype NOAA shield – Gabriel Brooks, NOAA

Figure 13. GRS Biomark FS3001 Transceiver with external capacitors – Gabriel Brooks, NOAA

Testing... Testing...

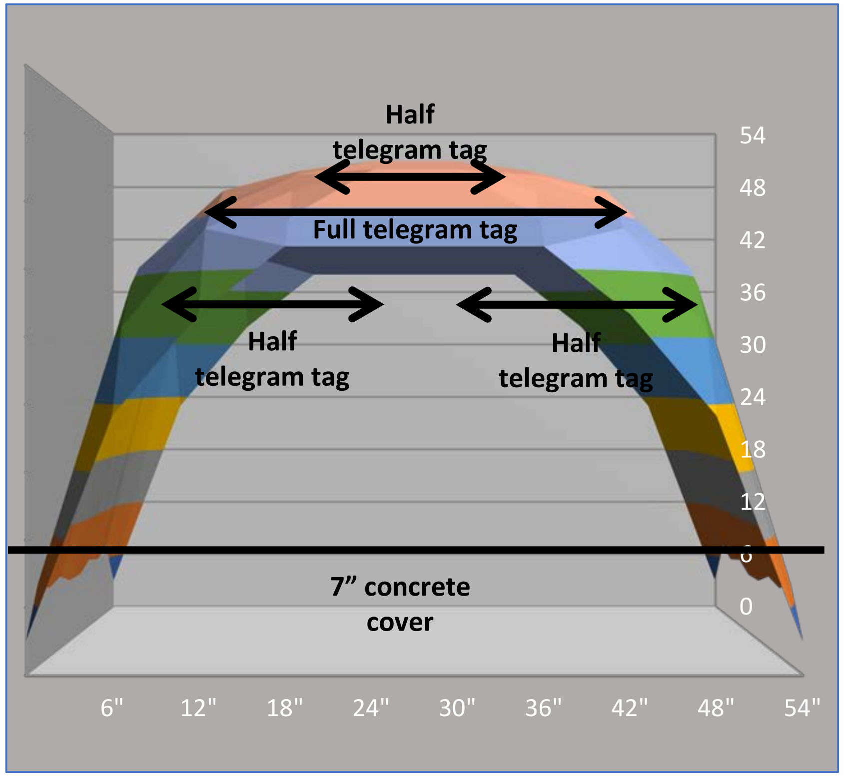

Figure 14. Antenna read range results – Gabriel Brooks, NOAA

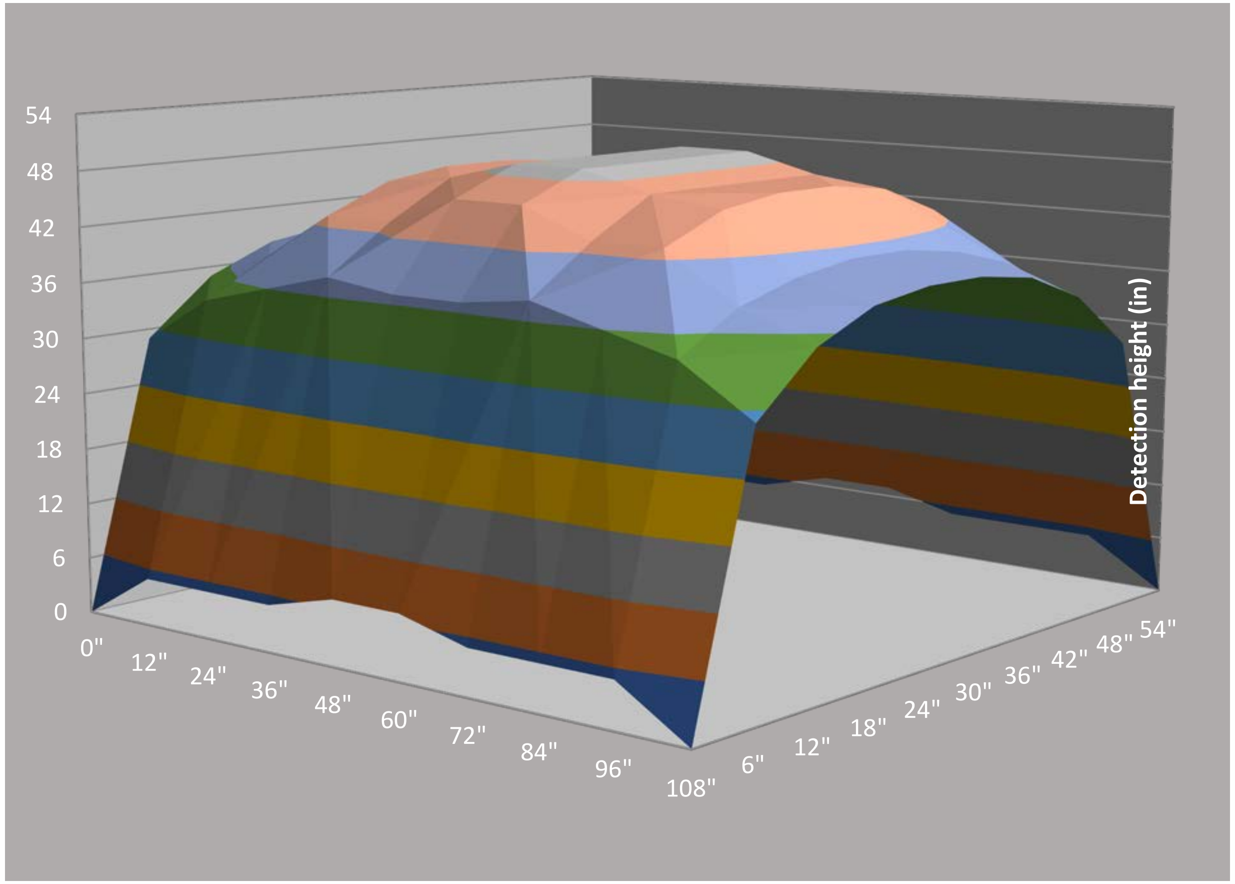

Figure 15. Antenna read range results – Gabriel Brooks, NOAA

Full System Testing

- 11 antennas will be synchronized and operating simultaneously
- Shielding fields from adjacent antennas
- Capacitor selection
- Excitation cable proximity
- Grounding schema

Figure 16. "Full" system evaluation – Gabriel Brooks, NOAA

Concrete Testing

Figure 17. SA Concrete evaluation – Gabriel Brooks, NOAA

Figure 18. NMA evaluation – Gabriel Brooks, NOAA

Figure 19. Concrete saturation testing – Gabriel Brooks, NOAA

Installation

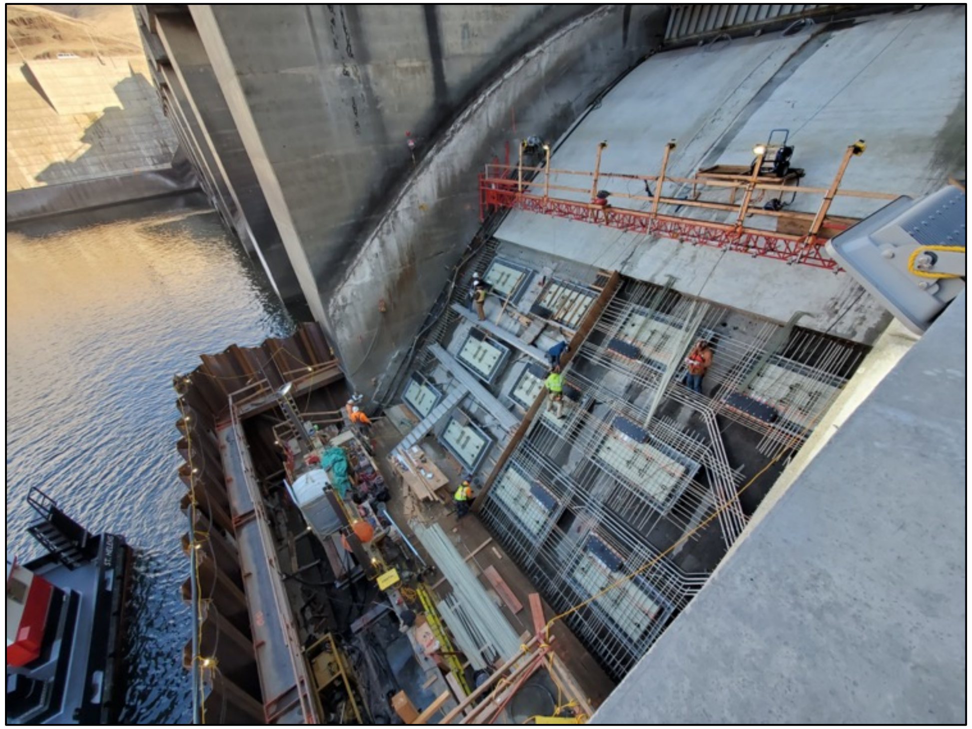

Figure 20. LGR GRS Antenna Install – Gabriel Brooks, NOAA

Figure 21. Post-concrete – Gabriel Brooks, NOAA

Figure 22. LGR Transceiver and Data Collection CONEXs – Gabriel Brooks, NOAA

Post-install Static Testing

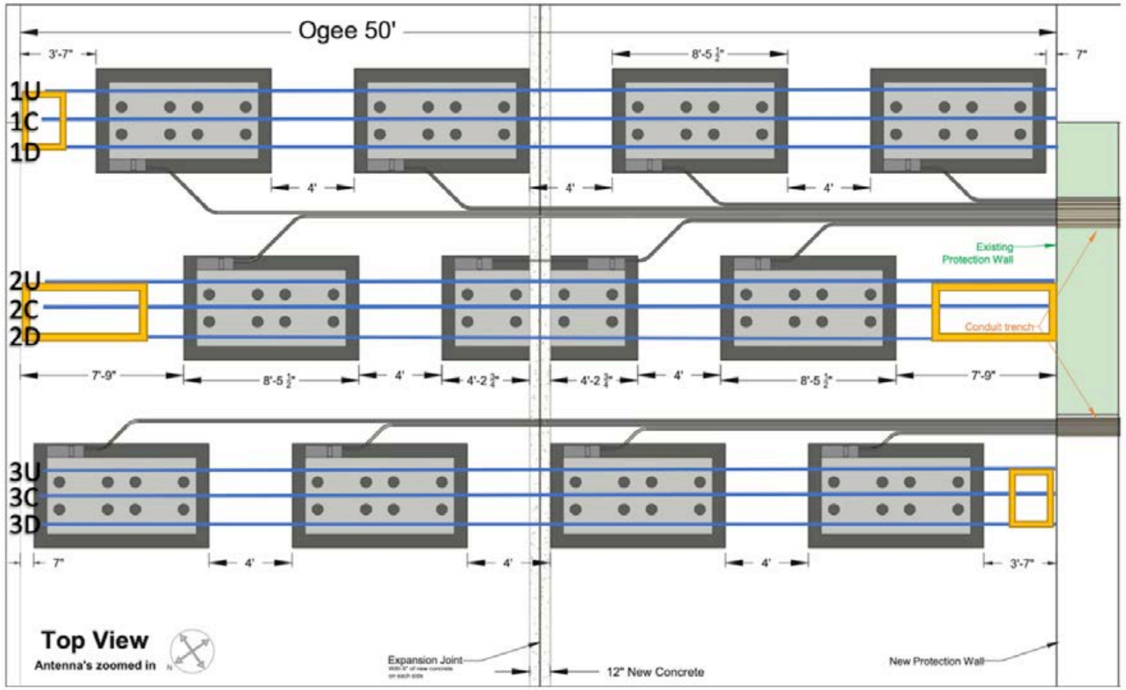

Figure 23. Post Install Test Plan – Gabriel Brooks, NOAA

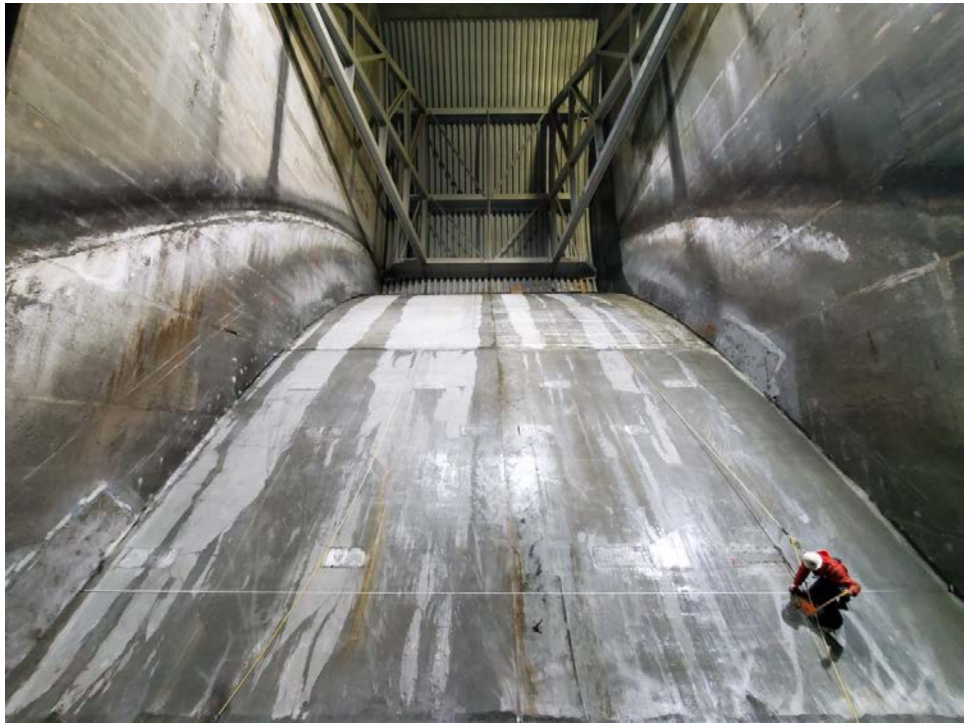

Figure 24. Post Install Testing – Alex Artyukhov, Biomark

Testing Results

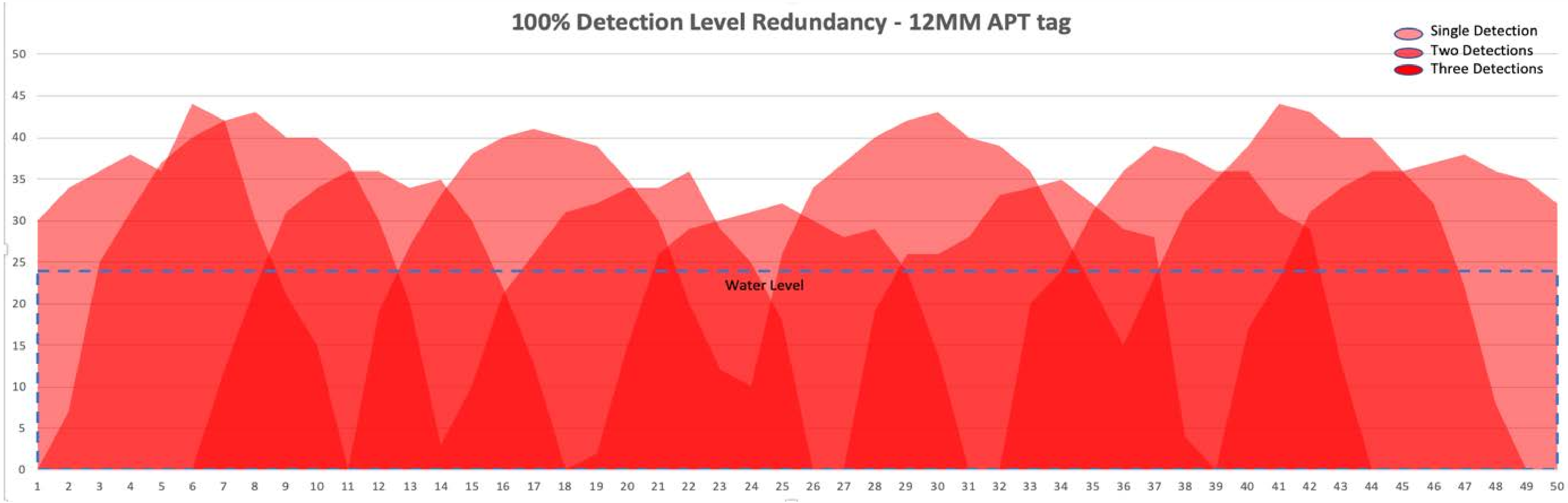

Figure 25. Post Install Read Range Results – Gabriel Brooks, NOAA

First Season Operation

GRJ- Juvenile Bypass

GRS – Spillway

GOJ – Little Goose Juvenile Bypass

Total Detections

(4-3-20 to 7-17-20):

- GRJ– 36,140
- GRS – 167,074
- 462% increase in detections

Sockeye

GRJ – 953

GRS - 10384

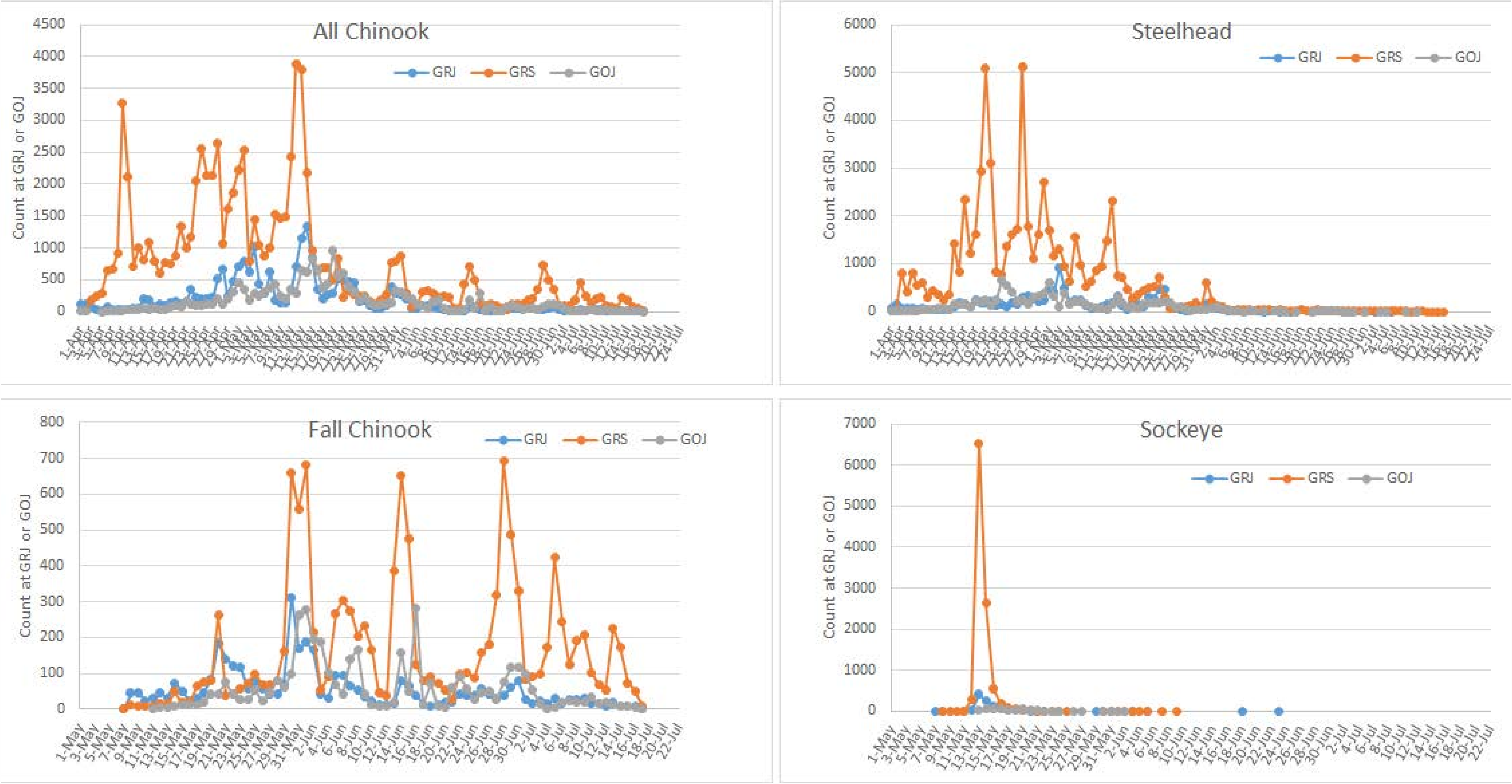

Figure 26. Operational Status – Benjamin Sandford, NOAA

How will these new data help -

- Improved mean survival estimates
- Increased accuracy of SARS (Smolt to Adult Return Estimate)
- Route survival estimates
- Fallback issues

Acknowledgements

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NORTHBANK Civil & Marine

THANK YOU

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