



US Army Corps of Engineers



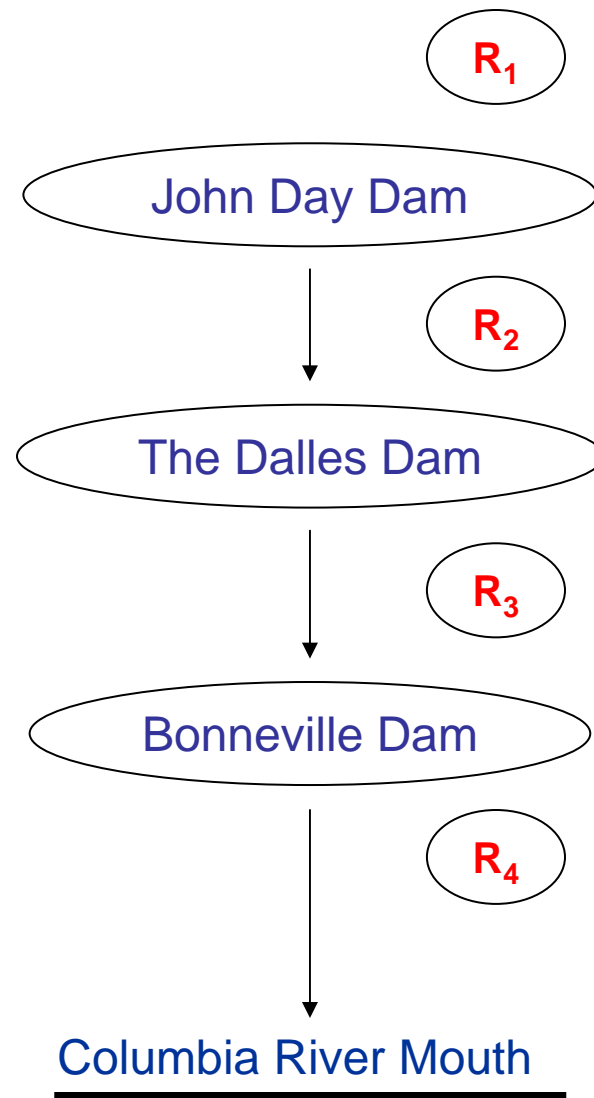
# Juvenile Salmon Acoustic Telemetry System What's Ahead

M. Brad Eppard  
U.S. Army Corps of Engineers  
Portland District



## 2010 LCR Survival Studies

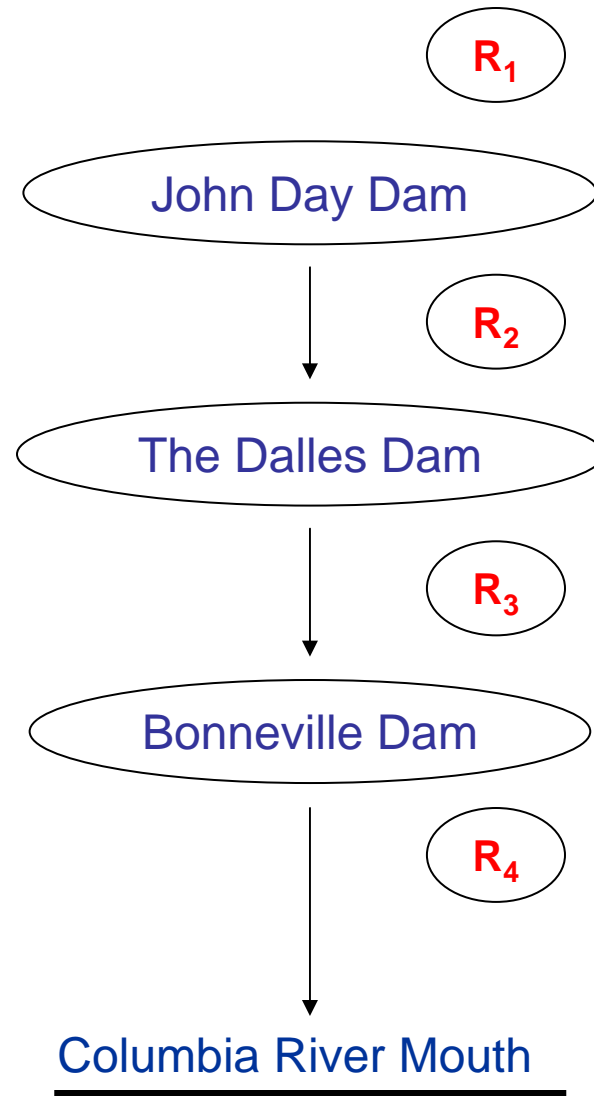
- JDA: *Ongoing configuration studies*
- TDA: *Post-Construction and Year 1 BiOp performance standard measurement*
- BON: *Post-Construction and Year 1 BiOp performance standard measurement*
- POST-BON: *Estimate reach survival to CR mouth and relate passage history to survival*





## Implementation

- Standardization of handling and surgical tagging
- Development/identification of survival model and study design applying what we know about tag and tagging effects
- Standardization of data analysis across studies
- Standardization of data management
- Complete competitive JSATS receiver procurement
- Initiate and complete competitive JSATS transmitter procurement



## JSATS Transmitters



- Developed for monitoring juvenile salmonids in a riverine and estuarine environment
- Specifications driven by bioeffects and deployment environment
- First competitive procurement in 2006
- Through procurement both size and cost reduced
  - tag weight by 51%
  - tag cost by 28%

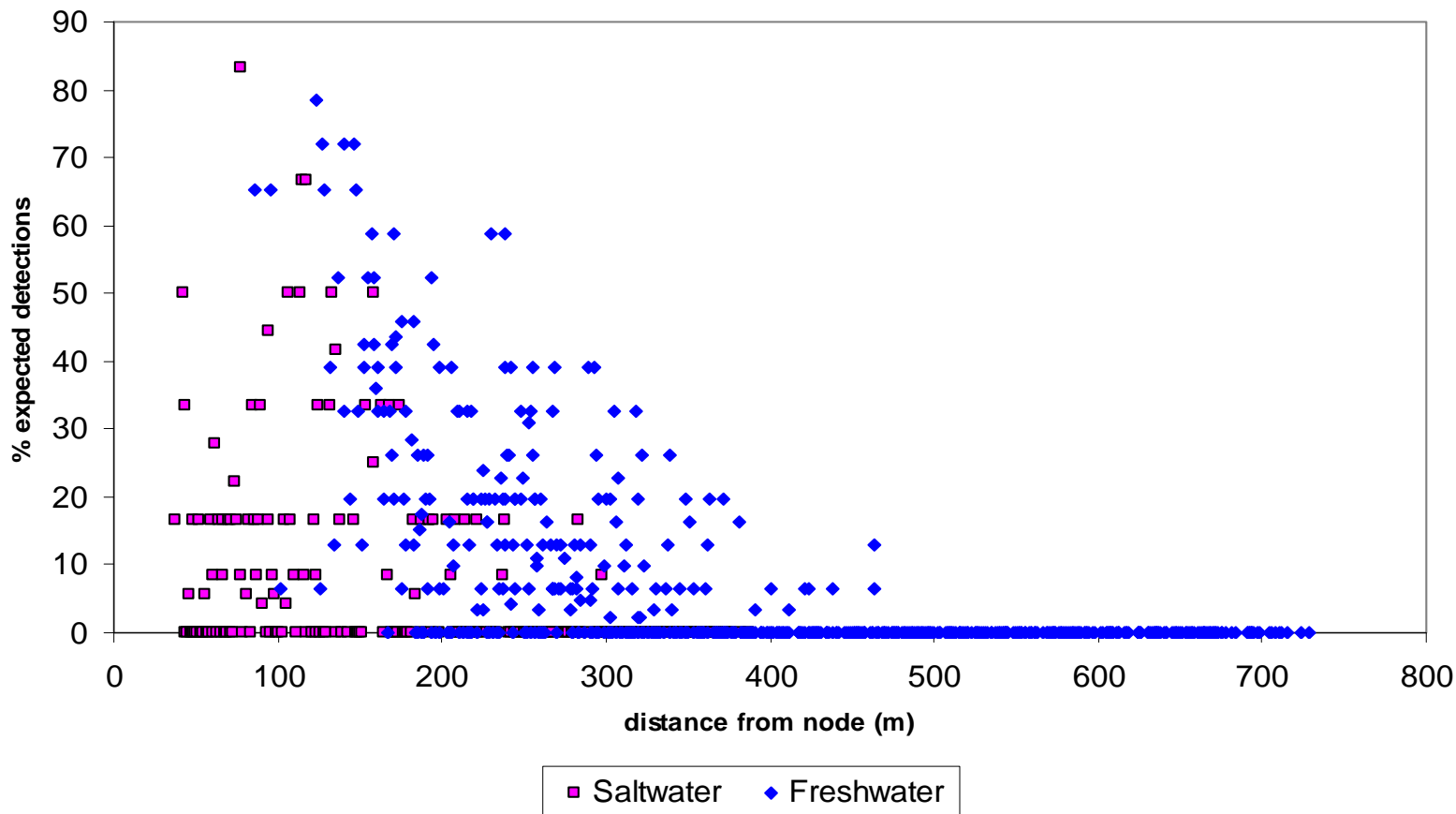
## ATS Model SS130 JSATS 2008 Acoustic Transmitter



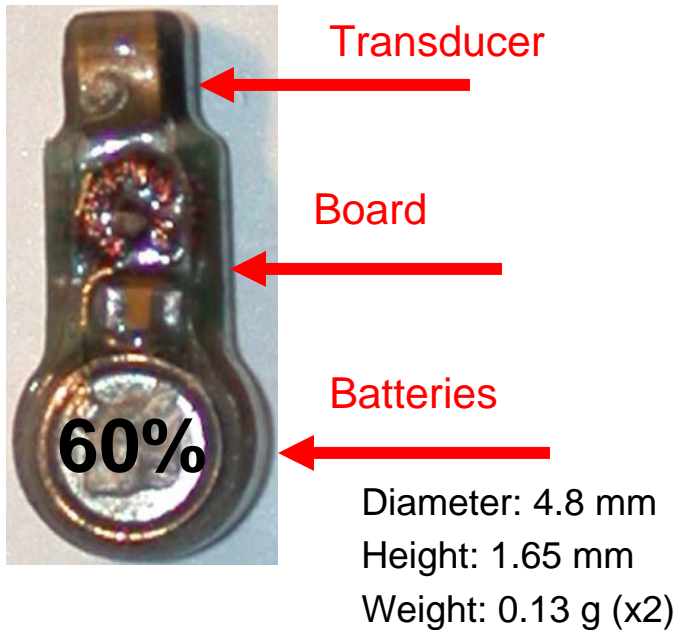
- Tag Size
  - 12.0 x 5.2 x 3.7 mm
  - Wt. in Air: 0.43 g
  - Wt. in water: 0.28 g
  - Volume: 0.14 ml
- Acoustic Output
  - 156 dB (re: 1uPa @ 1 meter)
- Encoding
  - 31-bit BPSK (65k unique codes)
- Tag life
  - 40 days at 5 s PRI
  - 21 days at 3 s PRI
- Detection Range



## Autonomous node detection range testing, 2008



## Acoustic Transmitter Basics



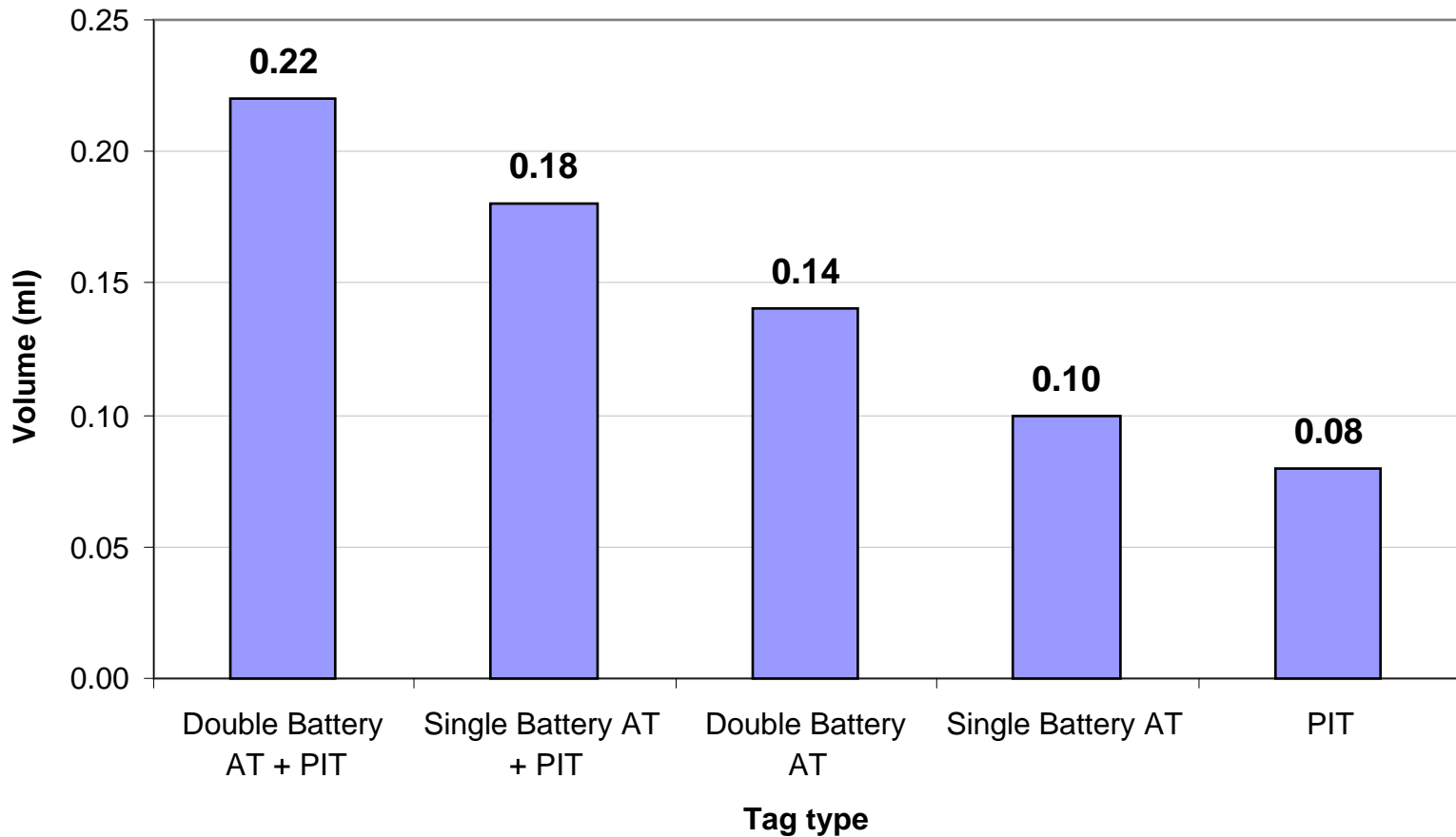
- Transmitter Components
- Determiners of transmitter size and active tag life
  - System frequency
  - Acoustic output
  - Transmission interval
  - Tag coding scheme



# US Army Corps of Engineers



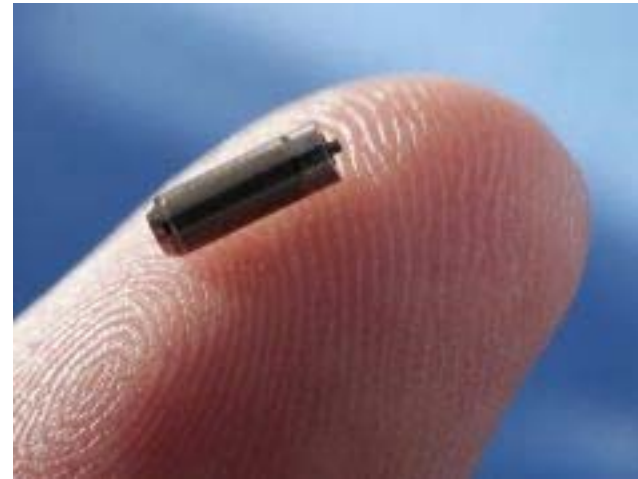
Volume (ml) of 2008 JSATS double and single battery transmitters





Quallion Model QL00031

- Diameter: 2.9 mm
- Height: 11.8 mm
- Weight: 0.2 g
- Volume: 0.08 ml



EaglePicher

- Diameter: 2.3 mm
- Length: 6.6 mm



## Model for Development

1. Identify Needs/Specifications
  - Bioeffects (establish size, shape, weight goals)
  - Environment of detection
  - Examine tradeoffs (tag life, source level, acoustic signal type, frequency)
2. Develop and test prototypes
3. Competitively procure production tags
4. Identify and understand the limitations of the tag



## Summary

- JSATS offers the smallest coded acoustic transmitter on the market today, further advances are expected
- Open-source specifications
  - Functional specifications are open source allowing the user to define size specifications and competitively procure
  - Receivers are software driven making changes in encoding possible without significant hardware changes
- NWP has successfully implemented a model for development and procurement of system components that reduces cost and spurs innovation within the acoustic telemetry market
- Continue to keep a watchful eye on advances in technology
- We've furthered our understanding of the limitations as a tool in the context of its intended and anticipated uses and are applying it to our research. This understanding continues to feed into development of future specifications