

2012 LOWER COLUMBIA RIVER SURVIVAL STUDY:

METHODS

Christa Woodley

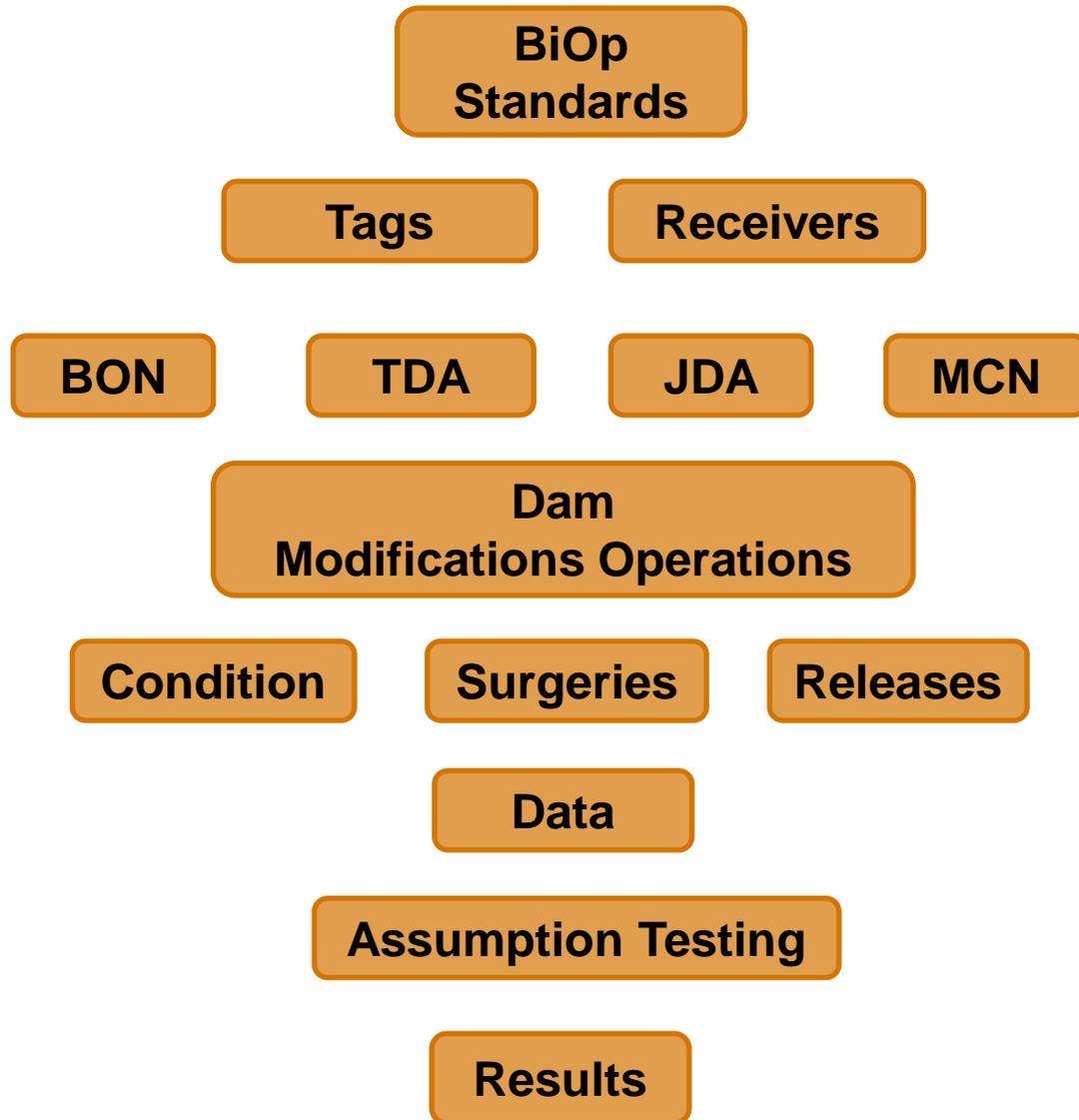
Gene Ploskey, James Hughes, Mark Weiland, Eric Fischer,
Aaron Cushing*, Tyler Mitchell*, Darin Etherington*, Scott Carpenter*,
Matt Hennen*, Katie Wagner, George Batten*, Shon Zimmerman,
Jina Kim, Tao Fu, Jayson Martinez, Yong Yuan, Marty Ingraham, Tylor
Abel, Xinya Li, Michael Greiner, Bishes Rayamajhi, Daniel Deng
and Tom Carlson

Pacific Northwest National Laboratory

***Pacific States Marine Fisheries Commission**



Project Overview

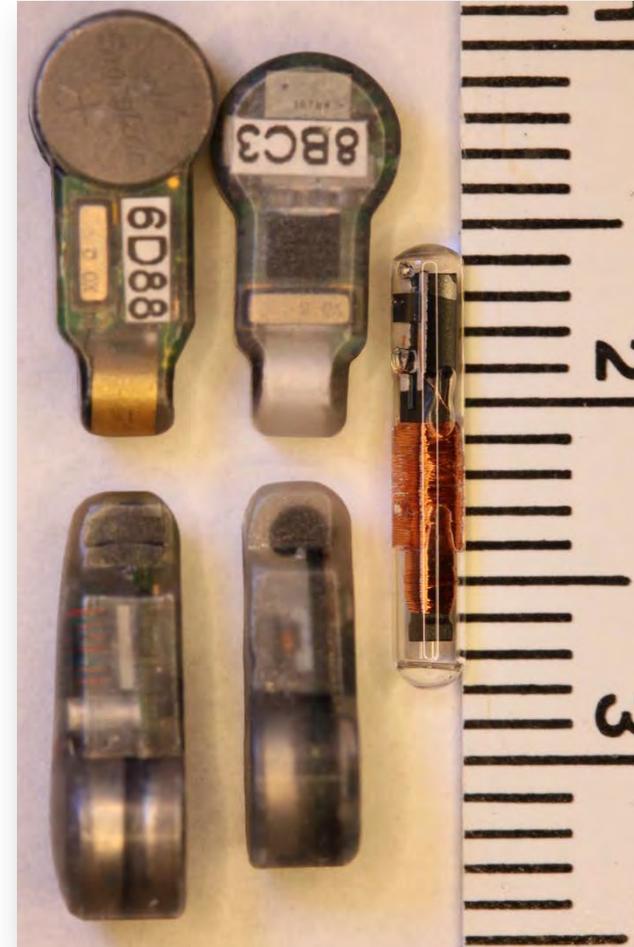


Goal

- ▶ To evaluate survival and associated passage metrics for juvenile yearling and subyearling Chinook and steelhead when compared to performance standards stipulated in the 2008 FCRPS BiOp and the 2008 Fish Accords
 - Spring
 - Yearling Chinook and Steelhead
 - MCN, JDA
 - Summer
 - Subyearling Chinook
 - MCN, TDA, JDA, and BON

Acoustic Transmitters

- ▶ JSATS acoustic transmitters (AT)
 - Advanced Telemetry Systems
 - Source level: 156dB re:1 μ Pa@1m
 - Double battery AT:
 - Steelhead
 - 0.43 g in air, 0.29 g in water
 - 12.00 x 5.21 x 3.77 mm
 - Single battery AT:
 - Chinook: Yearling & Subyearling
 - 0.30 g in air, 0.19 g in water
 - 10.79 x 5.26 x 3.44 mm



Acoustic Transmitters

▶ Double Battery JSATS AT

- Spring, Steelhead
- Pulse rate interval (PRI): 3 sec
- Mean Tag Life: 32.16 ± 0.19 days (SE)

▶ Single Battery JSATS AT

- Spring, Yearling Chinook
 - PRI: 3 sec
 - Mean Tag Life: 23.19 ± 0.22 days (SE)
- Summer, Subyearling Chinook

| Metric | Upstream BON | Downstream BON |
|---------------|-----------------|-------------------|
| PRI | 3 | 2 |
| Mean Tag Life | 23.51 | 15.31 |
| SE Tag Life | 0.15 | 0.14 |

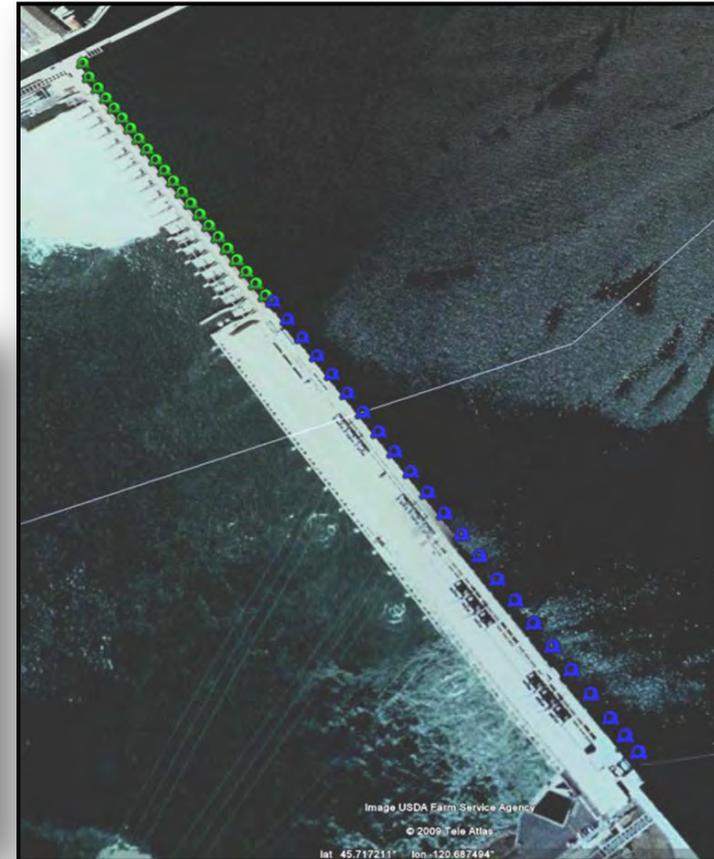
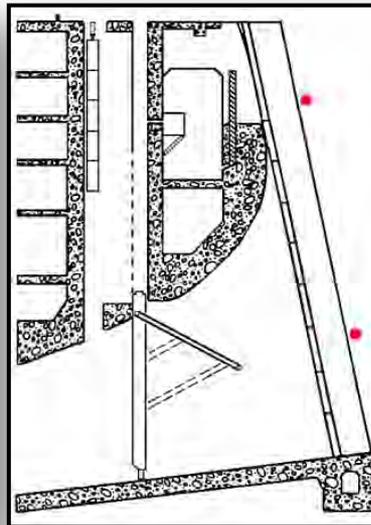
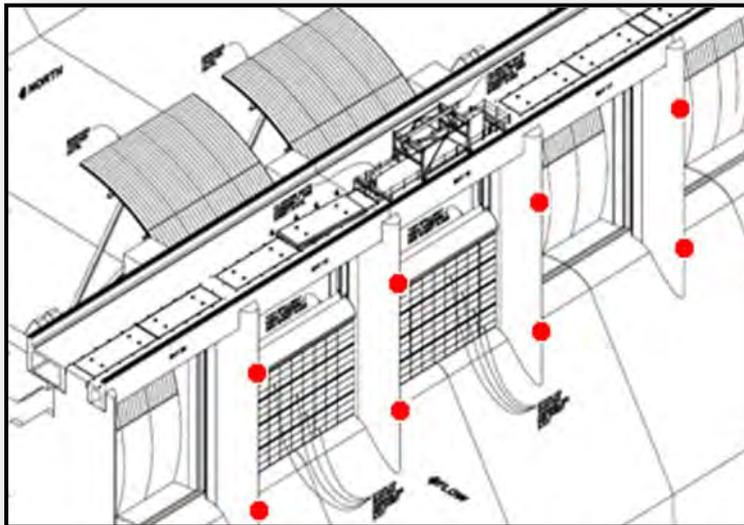


Detections Systems: Cable Array

► Dam Coverage

■ Cable Array

- JSATS cable deployed – 24 miles
- Hydrophones – 357
- CARPS – 93
- 3-D tracking



Detections Systems: Autonodes

► Autonomous Node Arrays

- 14 arrays in LCR
- 472 rkm uppermost
- 86 rkm lowest
- 386 rkm covered
- 3-12 autonodes per array
- 85 total autonodes deployed

Hydrophone
w/ protective sleeve

Beacon Inside Fin

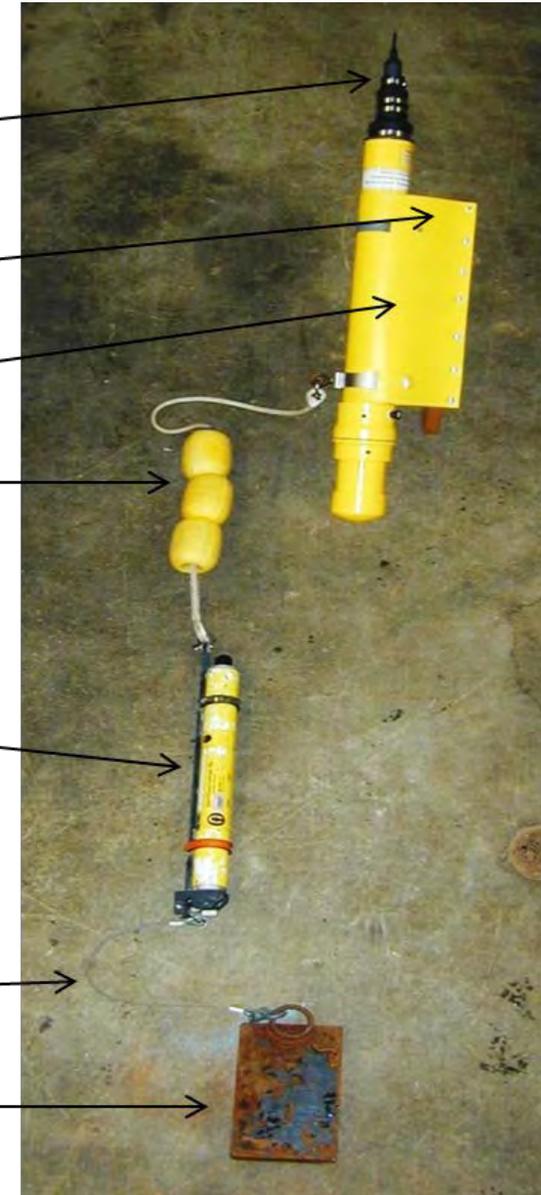
Fin

Float Line

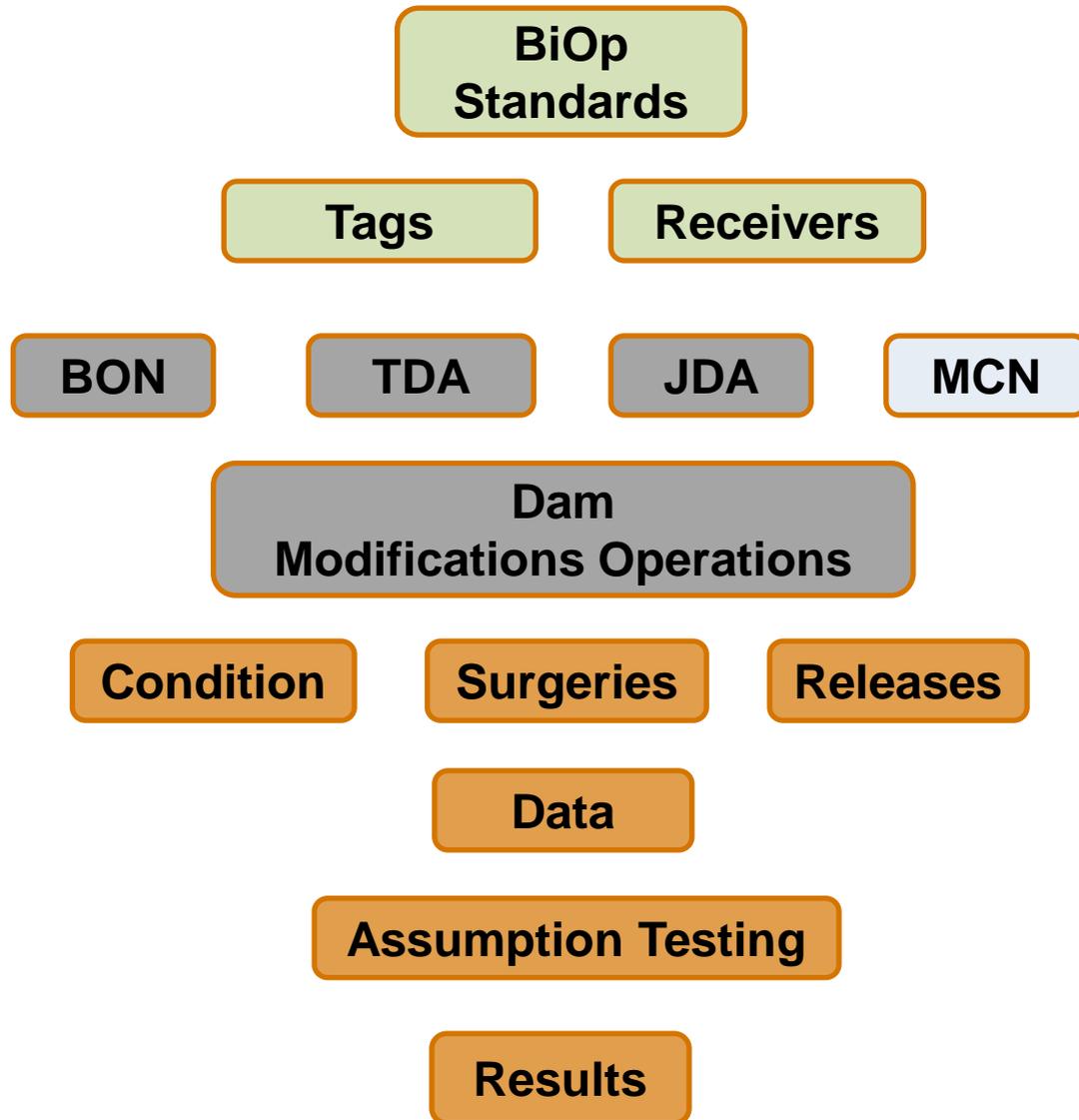
Acoustic Release

Anchor Line

Anchor



Project Overview



Collection: Non-Candidate Fish

- ▶ “Non-Candidate”
 - Fish not considered for project criteria

- ▶ Project Criteria
 - Species
 - Any fish not a Steelhead or Chinook
 - Previously Tagged Fish
 - Presence of a PIT tag or other active tag
 - Fish Size
 - <95mm in FL or >320mm in FL
 - Moribund/Mortalities
 - Fish that have severe or lethal symptoms



Collection: Candidate Fish

▶ “Candidate”

- Met project criteria, then assessed for maladies

▶ Exclusion Criteria for Candidate Fish

- Descaling
 - >20% on either flank, with no regrowth, mucous coat absent
- Disease
 - Fungus, ulcerations, necrotic gills, furunculosis;
 - ◆ >5% on either flank
 - >2 copepod on gill filaments (excl. arch, operculum, etc)
- Injury
 - Open wounds and active hemorrhaging; >5% on either flank
- Fin Damage
 - Caudal fin has eroded/disintegrated to stage 5
- Skeletal Deformities
 - AT could not “fit” into cavity or swimming compromised

Collection: Inclusion

▶ Inclusion Statement

- If 5% of the sample on a given day has a particular malady/infection, fish with the same malady collected the following day are included as acceptable candidate fish for tagging.



Non-Candidate Fish

| Category | CH1 | % CH1 | ST | %ST | CH0 | % CH0 |
|--------------------------|------------|--------------|-----------|------------|------------|--------------|
| Total Handled | 7,041 | 100 | 7,309 | 100 | 16,331 | 100 |
| Previously Tagged | 228 | 3.5 | 299 | 4.1 | 482 | 3.0 |



Candidate Fish

| Category | CH1 | % CH1 | ST | %ST | CH0 | % CH0 |
|-------------------------------|------------|--------------|-----------|------------|------------|--------------|
| Retained for Tagging | 6,555 | 96.3 | 6,515 | 93.0 | 15,328 | 96.8 |
| Excluded for Condition | 253 | 3.7 | 494 | 7.0 | 500 | 3.2 |

Examples of Non-Candidate Fish



Tagging

- ▶ Dual tagged
 - Passive Integrated Transponder (PIT)
 - Biomark, HPT 12

- ▶ Surgical implantation protocol
 - <http://www.nwp.usace.army.mil/enviro>
 - AFEP Program Reports
 - System Wide
 - Panel approved exceptions
 - 1x1x1 knot
 - Hot bead “sterilizers”
 - Chlorhexidine



Tagging

- ▶ Spring tagging @ JDA SMF
 - Tagging days – 37
 - April 26 to June 1, 2012
 - Yearling Chinook – 5848
 - Steelhead – 5838
 - Tagged 24 hr mortalities – 17

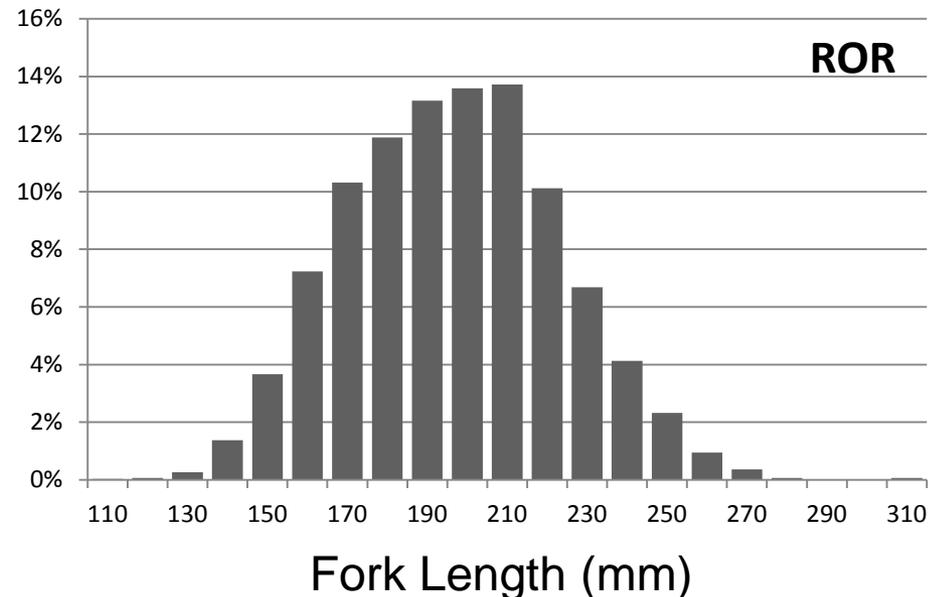
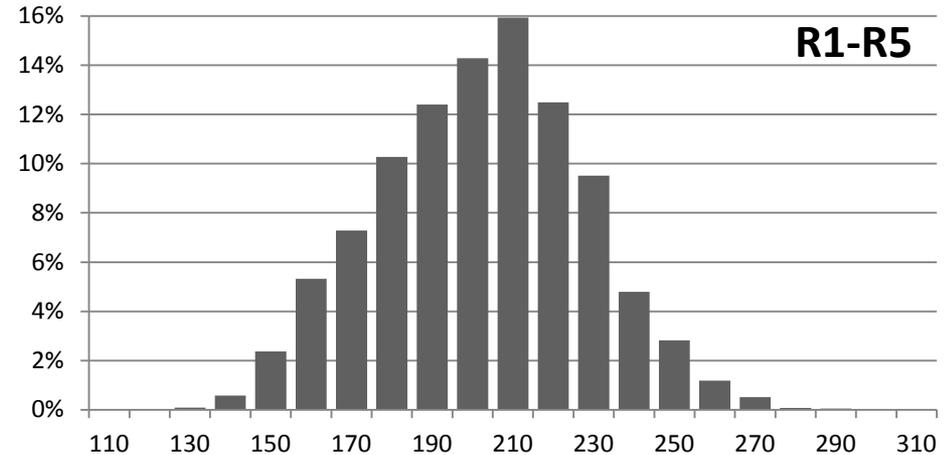
- ▶ Summer tagging @ JDA SMF
 - Tagging days – 40
 - June 12 to July 21, 2012
 - Subyearling Chinook – 14161
 - Tagged 24 hr mortalities – 25



Comparison of Tagged to ROR Fish

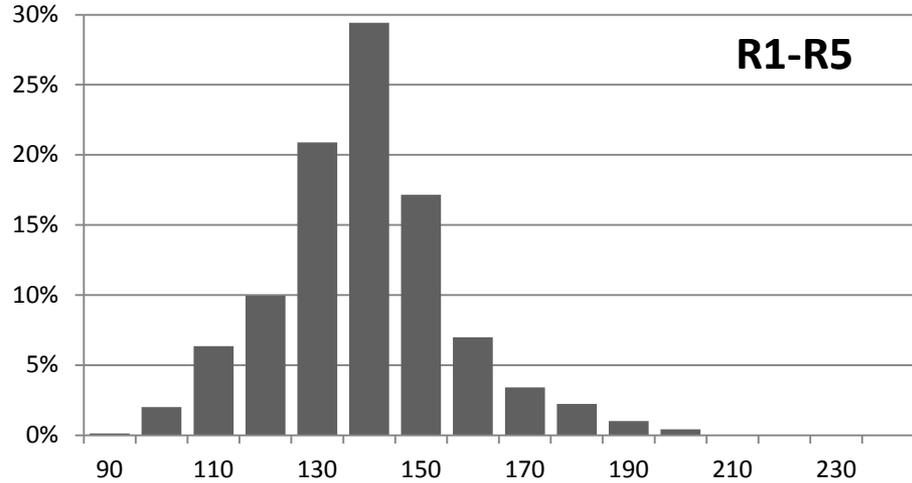
- ▶ Spring tagging
 - Steelhead
 - 116-314 mm FL
 - Yearling Chinook
 - 93-247 mm FL
- ▶ Summer tagging
 - Subyearling Chinook
 - 72-149 mm FL

Steelhead

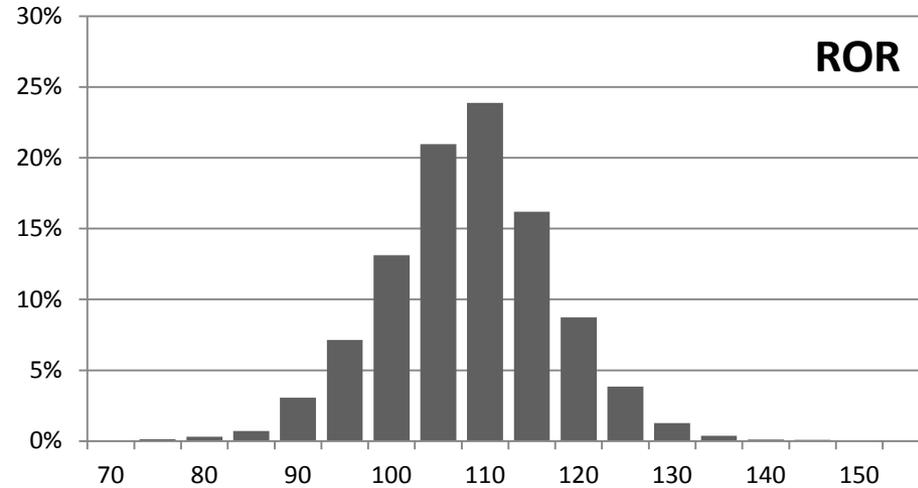
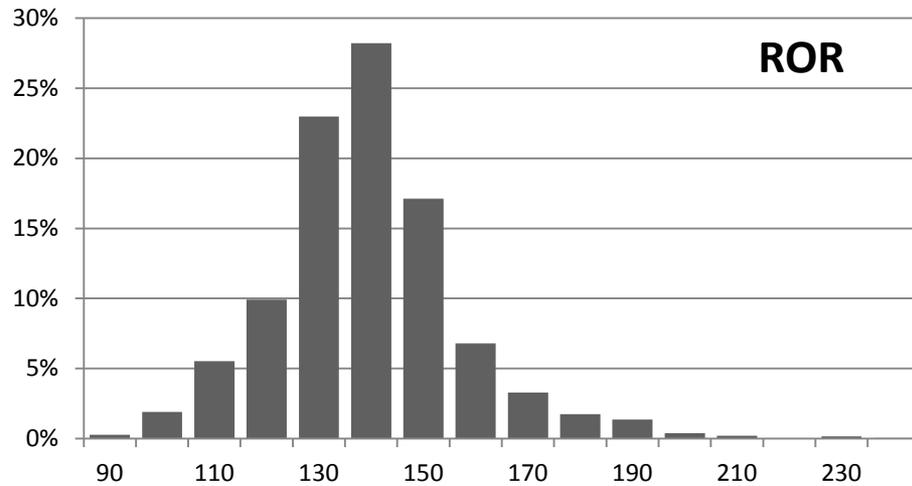
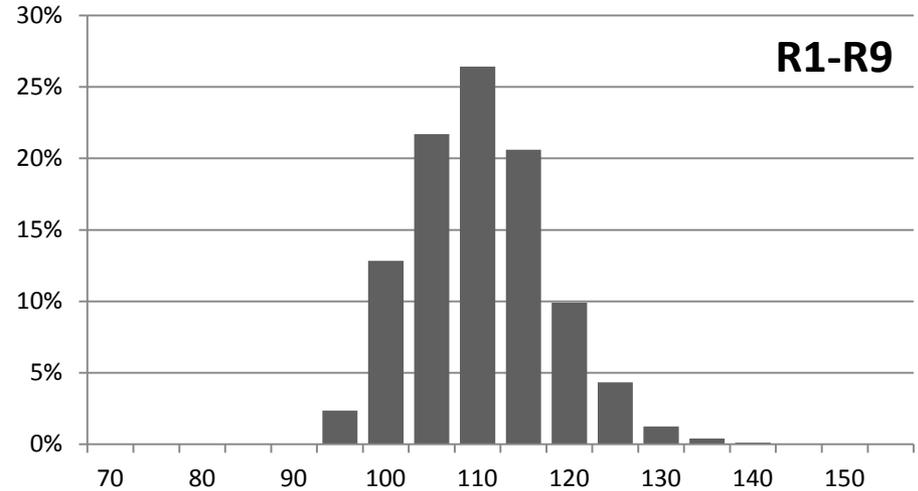


Comparison of Tagged to ROR Fish

Yearling Chinook Salmon



Subyearling Chinook Salmon



Fork Length (mm)

Fork Length (mm)

Releases and Tracking- Spring

▶ Spring Releases

- Total fish released – 11,686
 - 503 rkm uppermost release
 - 325 rkm lowest release
 - Over 178 rkm covered
 - 5 release “locations”
 - ◆ 5 release points per location
 - ◆ 32 releases at each location
 - 1-6 releases per day
 - Day and night “balanced”



Releases and Tracking- Summer

▶ Summer Releases

- Total fish released – 14,164
 - 503 rkm uppermost release
 - 156 rkm lowest release
 - Over 347 rkm covered
 - 9 release “locations”
 - ◆ 5 release points per location
 - ▶ TDA tailrace 4 release points
 - ◆ 32 releases at each location
 - 1-11 releases per day
 - Day and night “balanced”



Study Area and Release Locations



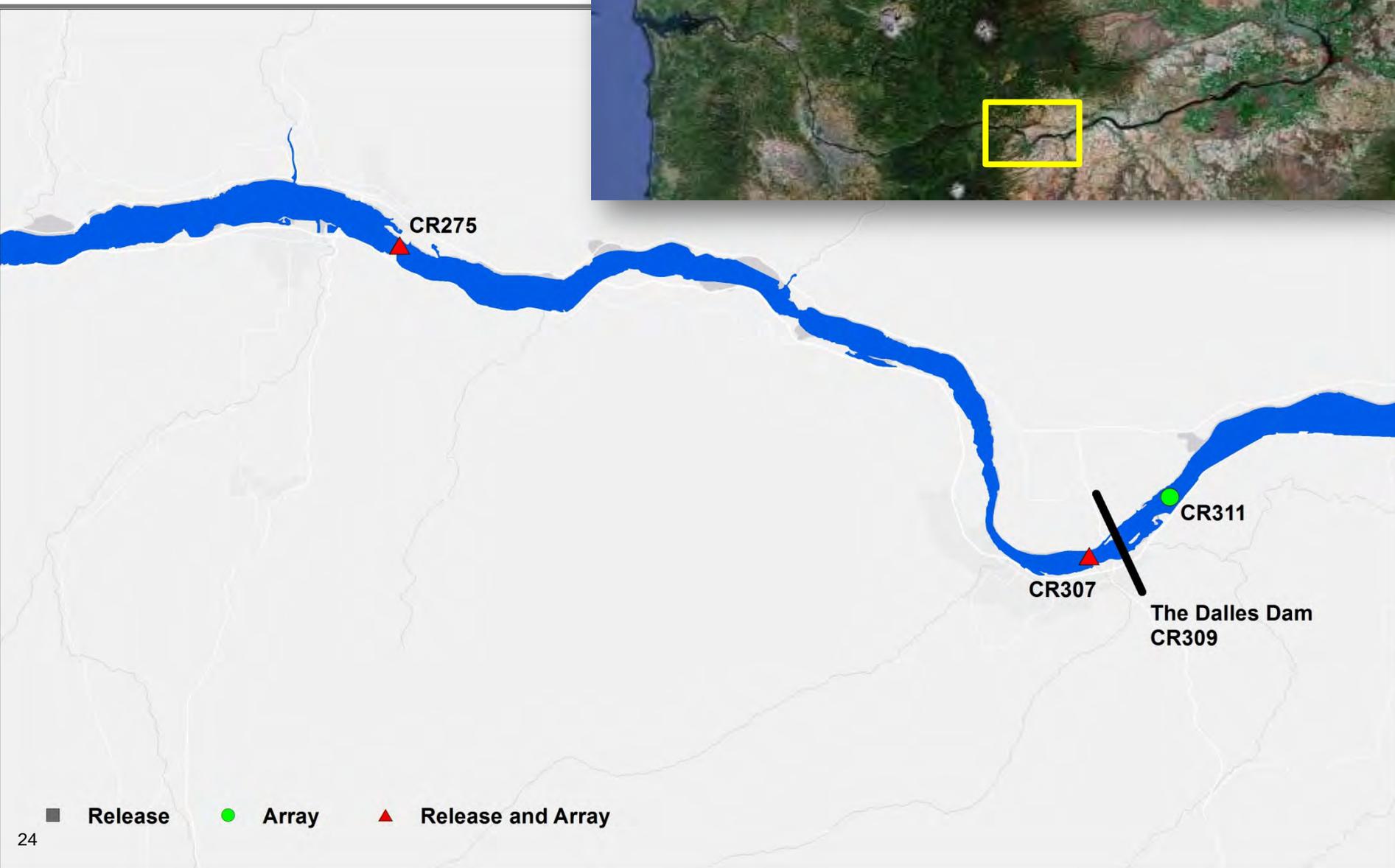
MCN Node and Release Locations



JDA Node and Release Locations



TDA Node and Release Locations



CR275

CR311

CR307

The Dalles Dam
CR309

- Release
- Array
- ▲ Release and Array

BON Node and Release Locations



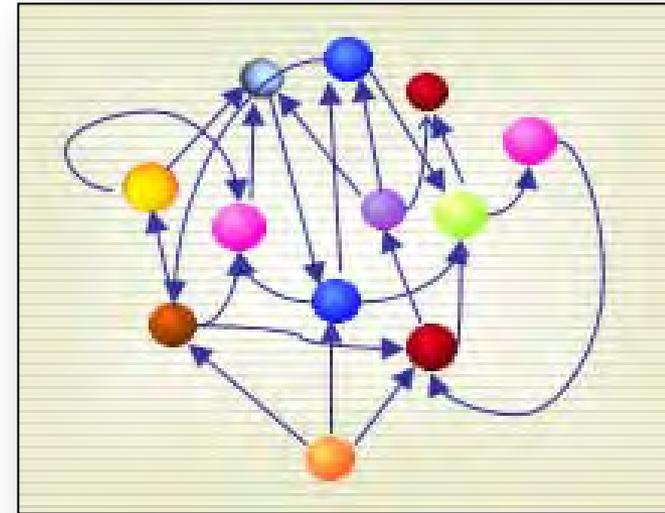
Data Flow

▶ Data is

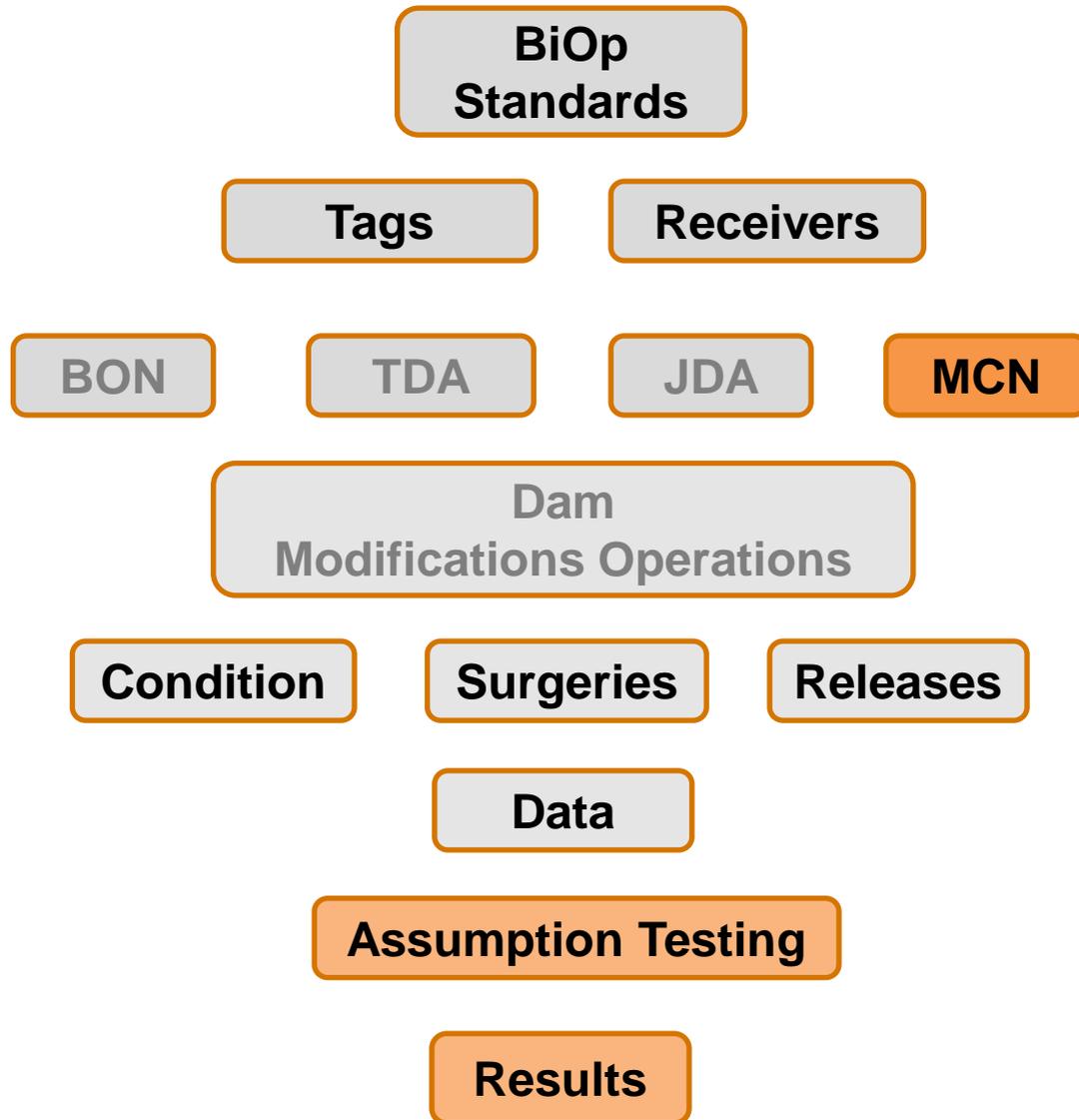
- Generated at 20 physical locations
- Processed at 7 physical locations

▶ Data “Systems” – 23

- A System has an identifiable start and end
- Most have discrete data origination
- Most have in- and out-flow processes
- All are dependent on other Systems
 - Operate in sequence and in parallel
- *QA/QC is extensively conducted within/between Systems*



Project Overview



Acknowledgements



- ▶ **Cascade Aquatics:** B Ben James, P James, E Anderson, C Green, E Green, J Herdman, K Martin, H Watson
- ▶ **PNNL:** C Brandt, A Bryson, E Choi, G Dirkes, J Duncan, A Flory, T Fu, D Geist, K Hall, K Ham, R Herrington, J Horner, G Johnson, R Karls, F Khan, R Kaufman, B Lamarche, K Lavender, A Miracle, A Phillips, N Phillips, G Roesijadi, D Saunders, S Southard, G Squeochs, A Thronas, N Trimble, J Varvinec, and C Vernon.
- ▶ **PSFMC:** R Martinson, G Kolvachuk and D Ballenger along with the helpful staff at John Day and Bonneville Dam Juvenile Smolt Facilities. Also we would like to thank PTAGIS and Nicole Tancreto for her help with BON SByC. In addition, A Ajmani M Bahnick, A Barnes, C Beyer, R Blanchard, A Collins, A Cook, J Cox, L Cushing, R Davis, T Elder, G George, D Grugett, B Harkleroad, T Levandowsky, S Marvin, M Neumann, G Ottoway, K Paine, K Prather, J Robertson, T Royal, G Schilperoort, G Seybert, D Spiteri, P Tramel, D Trott, R Wall, and L Wood.
- ▶ **USACE:** B Eppard, M Langeslay, F Higginbotham, T Wik, T Roberts, and electricians, mechanics, riggers, operators, and biologists at McNary (C. Dugger), John Day (M. Zyndol, T. Hurd), The Dalles (P. Keller, B. Cordie) and Bonneville dams (J. Rerecich, B. Hausmann, A. Traylor, I Royer).
- ▶ **UW:** J Skalski, J Lady, A Seaburg, R Townsend, and P Westhagen.