RESULTS OF MAINSTEM COLUMBIA RIVER SURVIVAL COMPLIANCE STUDIES OR 2012

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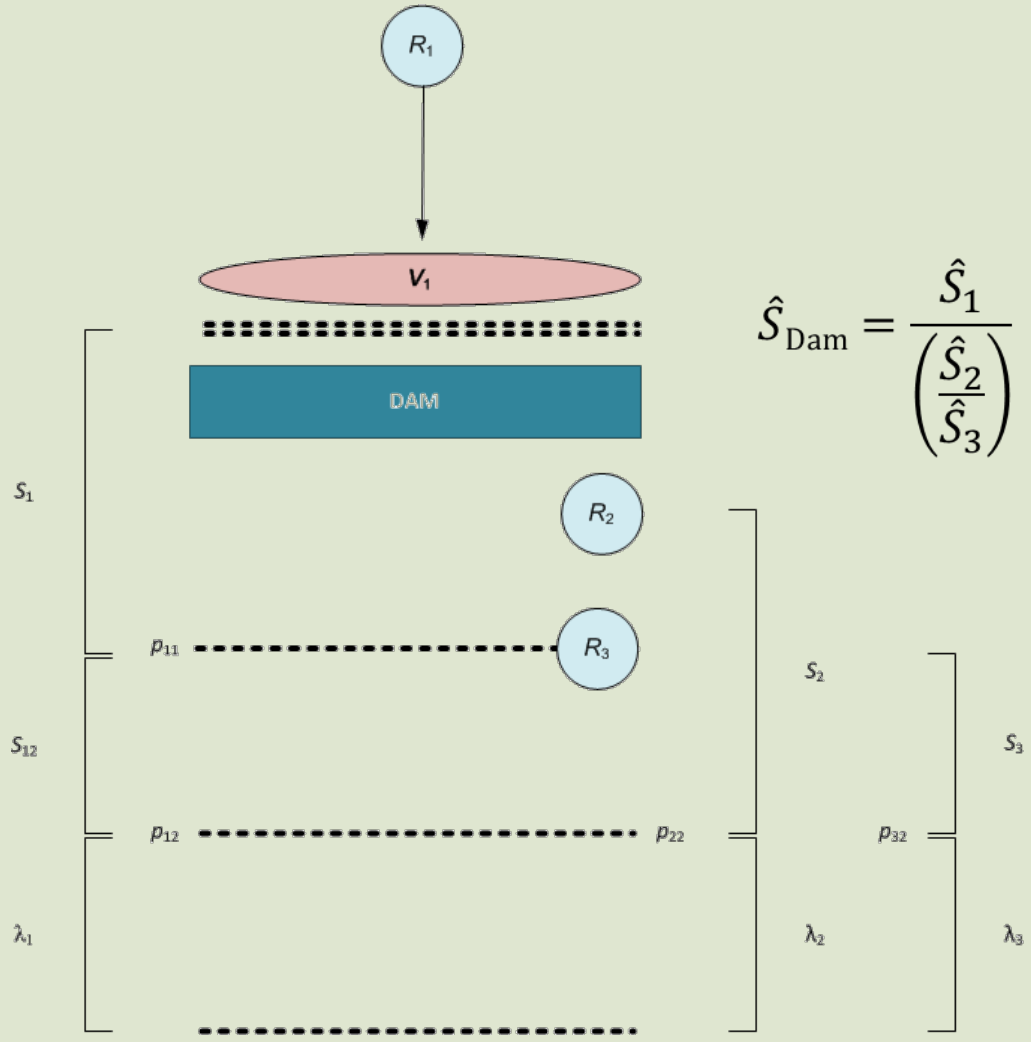
OBJECTIVES

- **Perform spring compliance studies at:**
  - McNary Dam
  - John Day Dam

  2008 BiOp: $\hat{S}_{\text{Dam}} \geq 0.96$ **with** $\widehat{\text{SE}} \leq 0.015$
- **Perform summer compliance studies at:**
  - McNary Dam
  - John Day
  - The Dalles Dam
  - Bonneville Dam

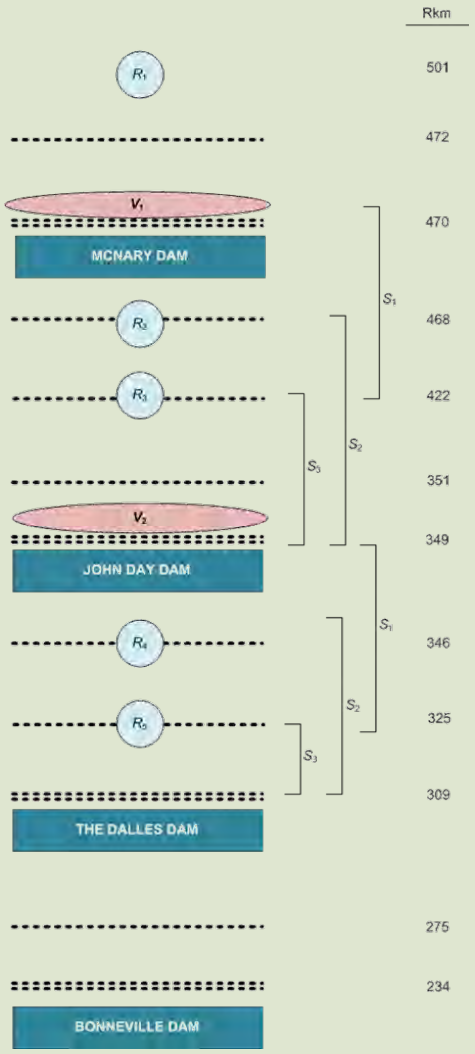
  2008 BiOp: $\hat{S}_{\text{Dam}} \geq 0.93$ **with** $\widehat{\text{SE}} \leq 0.015$

OVERVIEW OF VIRTUAL/PAIRED-RELEASE DESIGN



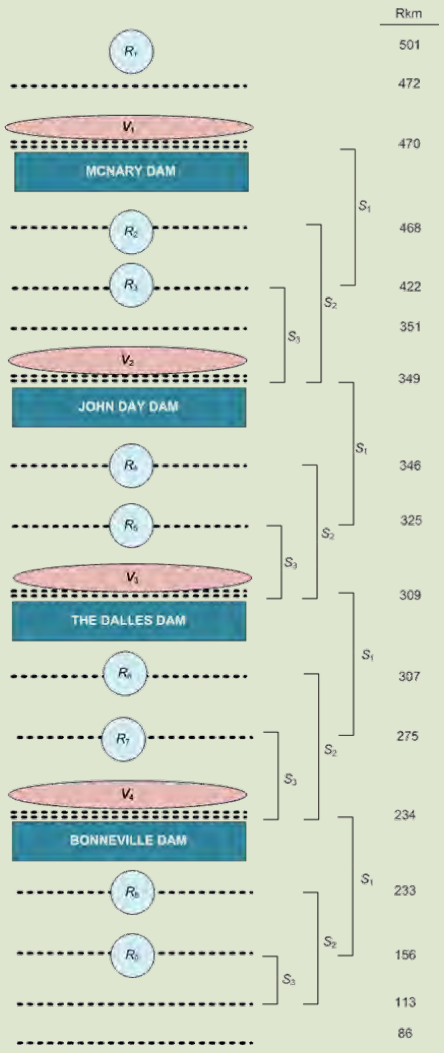
$$\hat{S}_{\text{Dam}} = \frac{\hat{S}_1}{\left(\frac{\hat{S}_2}{\hat{S}_3}\right)}$$

RELEASE-RECAPTURE DESIGN FOR SPRING STUDIES: YEARLING CHINOOK SALMON, STEELHEAD



	CH1	STH
	1399	1400
	1360	1297
	1198	1199
	1200	1198
	3376	3239
	997	1000
	995	1000

RELEASE-RECAPTURE DESIGN FOR SUMMER STUDY: SUBYEARLING CHINOOK SALMON



CH0
2518
2362
1993
1984
5726
986
983
7289
788
786
3145
1994
1994

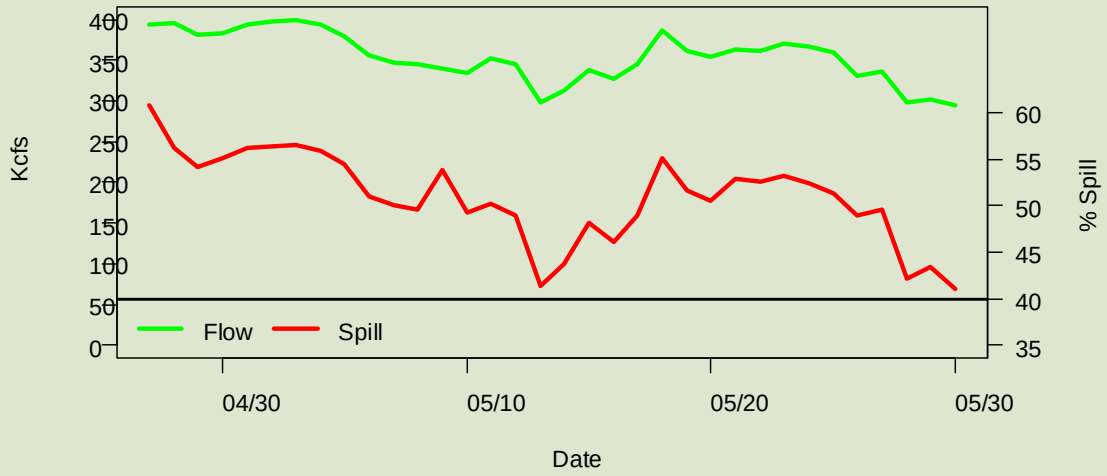
RESULTS

ASSUMPTION EVALUATIONS

- Downstream mixing – Yes
- Adequate tag life – Yes
- Balanced tagger effort – Yes
- Tagger effects – None found
- Delayed handling/tag effects
  - None found for first three projects
  - R_1, R_2, and R_3 too far for Bonneville study (used R_4–R_7)
- False-positive detections from dead tagged fish – None
- Size of tagged and ROR fish – Compared
- Study period vs. run timing – Compared

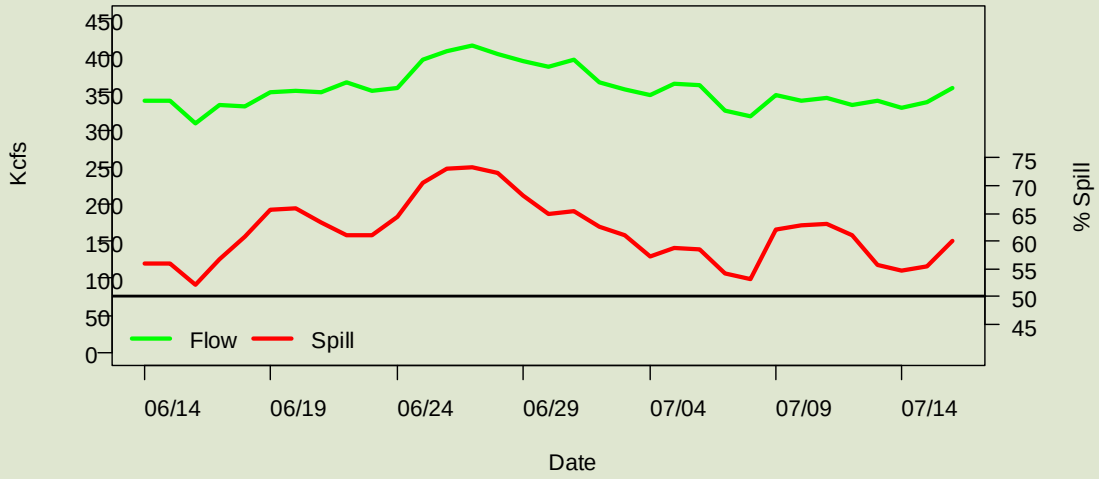
MCNARY DAM – SEASONAL FLOWS AND SPILL

- Spring



40% spill target

- Summer



50% spill target

MCNARY DAM – DAM PASSAGE SURVIVAL FIRST YEAR OF STUDY

- **Yearling Chinook Salmon**

$$\hat{S}_{\text{Dam}} = \frac{0.9171}{\left(\frac{0.9050}{0.9489}\right)} = \frac{0.9171}{0.9537} = 0.9616\left(\widehat{\text{SE}} = 0.0140\right)$$

- **Steelhead**

$$\hat{S}_{\text{Dam}} = \frac{0.9136}{\left(\frac{0.8286}{0.8982}\right)} = \frac{0.9136}{0.9221} = 0.9908\left(\widehat{\text{SE}} = 0.0183\right)$$

Note: $P\,(S_{\text{Dam}} \leq 0.96) = 0.0462$

- **Subyearling Chinook Salmon**

$$\hat{S}_{\text{Dam}} = \frac{0.9149}{\left(\frac{0.8864}{0.9443}\right)} = \frac{0.9149}{0.9387} = 0.9747\left(\widehat{\text{SE}} = 0.0114\right)$$

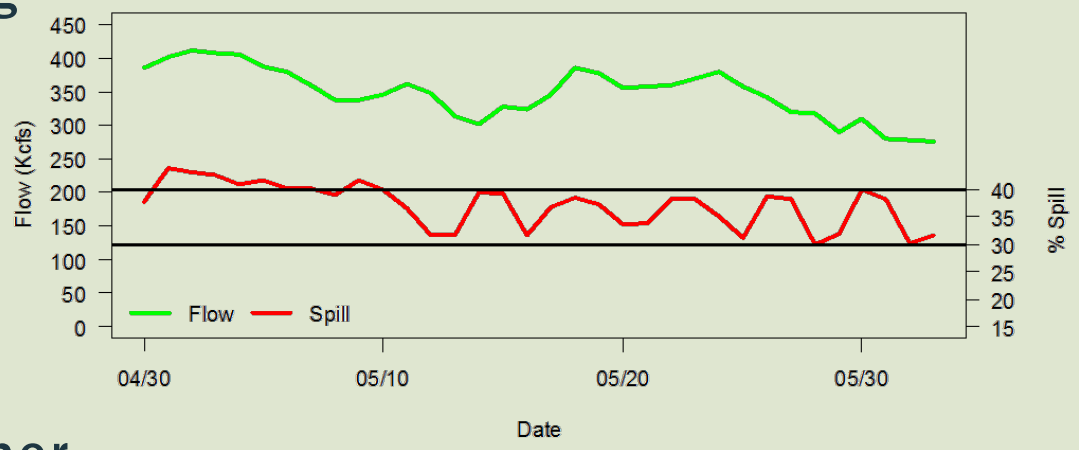
FISH ACCORDS: MCNARY DAM, 2012

Performance Measure	CH1	STH	CH0
$\hat{S}_{\mathrm{BRZ-BRZ}}$	0.9595 (0.0140)	0.9880 (0.0183)	0.9729 (0.0114)
Forebay residence time (median)	1.76 h	1.78 h	1.77 h
Tailrace egress time (median)	0.41 h	0.34 h	0.38 h
SPE*	0.725 (0.012)	0.832 (0.010)	0.783 (0.008)
FPE	0.968 (0.005)	0.977 (0.004)	0.909 (0.006)

*Includes spill and spillway weir

JOHN DAY DAM – SEASONAL FLOWS AND SPILL

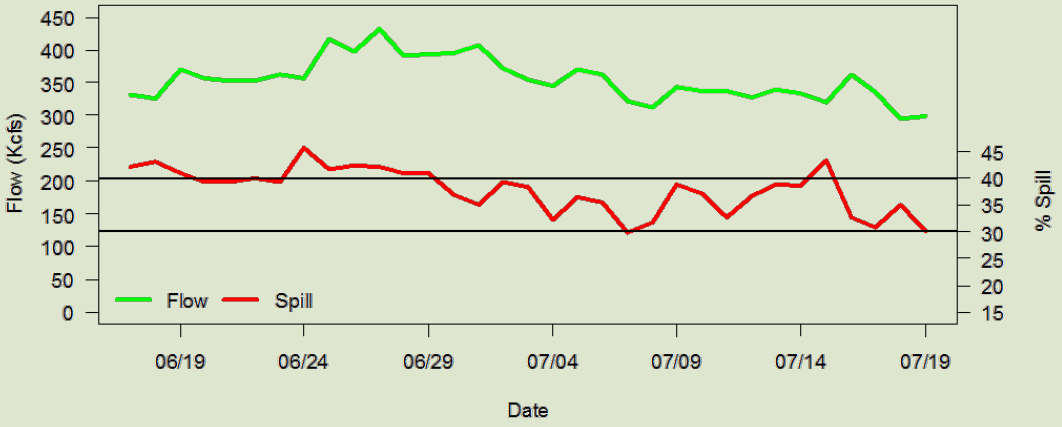
- Spring



Spill Treatments

- 30% spill D/N
- 40% spill D/N

- Summer



Spill Treatments

- 30% spill D/N
- 40% spill D/N

JOHN DAY DAM – DAM PASSAGE SURVIVAL SECOND YEAR OF STUDY

- **Yearling Chinook Salmon**

$$\hat{S}_{\text{Dam}} = \frac{0.9627}{\left(\frac{0.9848}{0.9896}\right)} = \frac{0.9627}{0.9951} = 0.9673\left(\widehat{\text{SE}} = 0.0065\right)$$

- **Steelhead**

$$\hat{S}_{\text{Dam}} = \frac{0.9744}{\left(\frac{0.9781}{0.9752}\right)} = \frac{0.9744}{1.0030} \overset{\text{set}}{=} 0.9744\left(\widehat{\text{SE}} = 0.0028\right)$$

- **Subyearling Chinook Salmon**

$$\hat{S}_{\text{Dam}} = \frac{0.9414}{\left(\frac{0.9966}{0.9925}\right)} = \frac{0.9414}{1.0041} \overset{\text{set}}{=} 0.9414\left(\widehat{\text{SE}} = 0.0031\right)$$

FISH ACCORDS: JOHN DAY 2012

Performance Measure	CH1	STH	CH0
$\hat{S}_{\mathrm{BRZ-BRZ}}$	0.9660 (0.0065)	0.9687 (0.0030)	0.9390 (0.0032)
Forebay residence time (median)	1.15 h	2.39 h	1.02 h
Tailrace egress time (median)	0.50 h	0.46 h	0.48 h
SPE*	0.746 (0.008)	0.745 (0.008)	0.696 (0.006)
FPE	0.927 (0.005)	0.970 (0.003)	0.858 (0.005)

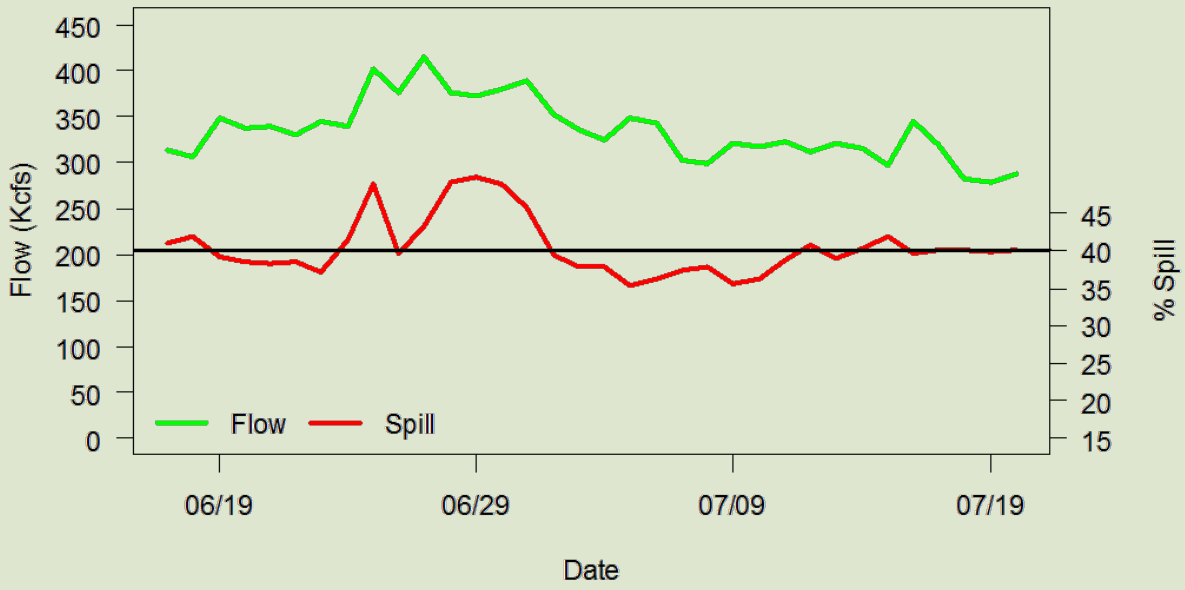
*Includes spill and spillway weir

CROSS-YEAR SUMMARY
DAM PASSAGE SURVIVAL – JOHN DAY

Fish Stock	Year of Study	
	2011	2012
Yearling Chinook salmon	0.9678 (0.0071)	0.9673 (0.0065)
Steelhead	0.9867 (0.0061)	0.9744 (0.0028)
Subyearling Chinook salmon		0.9414 (0.0031)

THE DALLES DAM – SEASONAL FLOWS AND SPILLS

- Summer



40% spill target

THE DALLES DAM – DAM PASSAGE SURVIVAL THIRD YEAR OF STUDY

- **Subyearling Chinook Salmon**

$$\hat{S}_{\text{Dam}} = \frac{0.9420}{\left(\frac{0.9886}{0.9937}\right)} = \frac{0.9420}{0.9949} = 0.9469\left(\widehat{\text{SE}} = 0.0059\right)$$

FISH ACCORDS: THE DALLES DAM 2012

Performance Measure	CH0
$\hat{S}_{\mathrm{BRZ-BRZ}}$	0.9462 (0.0059)
Forebay residence time (median)	1.08 h
Tailrace egress time (median)	0.24 h
SPE*	0.707 (0.005)
FPE	0.784 (0.005)

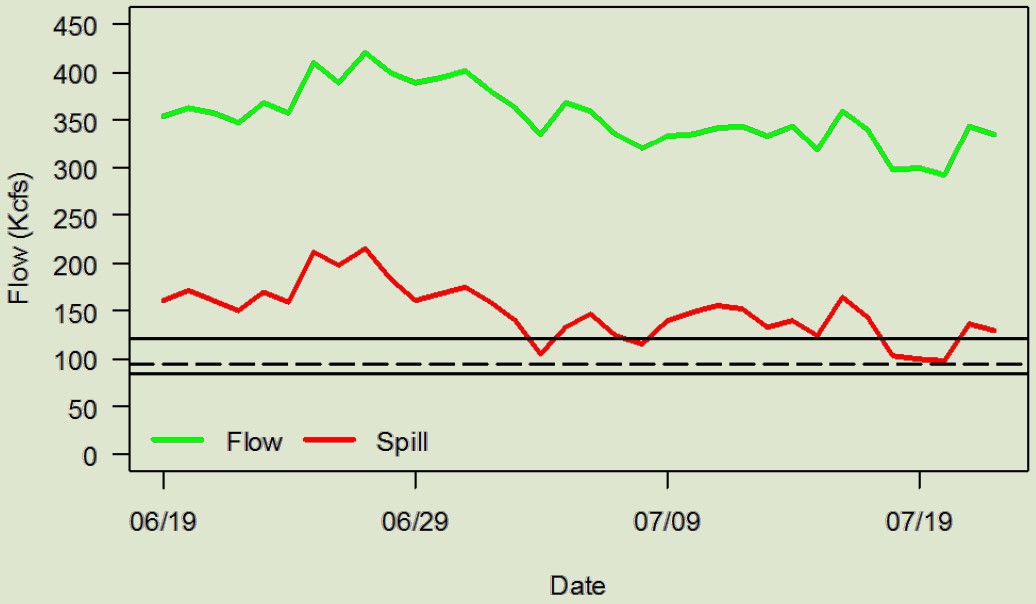
*Includes spill only

CROSS-YEAR SUMMARY
DAM PASSAGE SURVIVAL – TDA

Fish Stock	Year of Study		
	2010	2011	2012
Yearling Chinook salmon	0.9641 (0.0096)	0.9600 (0.0072)	
Steelhead	0.9534 (0.0097)	0.9952 (0.0083)	
Subyearling Chinook salmon	0.9404 (0.0091)		0.9469 (0.0059)

BONNEVILLE DAM – SEASONAL FLOWS AND SPILLS

- Summer



Two Spill Treatments

- 85 kcfs day/120 kcfs night
- 95 kcfs day/night

BONNEVILLE DAM – DAM PASSAGE SURVIVAL SECOND YEAR OF STUDY

- **Subyearling Chinook Salmon**

$$\hat{S}_{\text{Dam}} = \frac{0.9693}{\left(\frac{0.9953}{1.0037}\right)} \overset{\text{set}}{=} \frac{0.9693}{0.9953} = 0.9739 \left(\widehat{\text{SE}} = 0.0069\right)$$

FISH ACCORDS: BONNEVILLE DAM 2012

Performance Measure	CH0
$\hat{S}_{\mathrm{BRZ-BRZ}}$	0.9735 (0.0053)
Forebay residence time (median)	0.48 h
Tailrace egress time (median)	0.36 h
SPE*	0.543 (0.006)
FPE	0.697 (0.005)

*Includes spill only

CROSS-YEAR SUMMARY
DAM PASSAGE SURVIVAL – BONNEVILLE

Fish Stock	Year of Study		
	2010*	2011	2012
Yearling Chinook salmon	0.952 (0.0040)	0.9597 (0.0176)	
Steelhead	0.945 (0.0043)	0.9647 (0.0212)	
Subyearling Chinook salmon	0.958 (0.0055)		0.9739 (0.0069)

*Single-release estimates from dam face to rkm 153, including 78 km below Bonneville tailrace

CONCLUSIONS

- Eight survival studies performed
  - All achieved survival standard
  - 7/8 achieved precision level

Dam	CH1	STH	CH0
MCN	×	×	×
JDA	×	×	×
TDA			×
BON			×

- Assumptions satisfied in 2012
- High flow in 2012 made spill targets difficult to achieve
- TDA –First dam to test 3 stocks × 2 years