Tributary-specific Snake River Adult Steelhead Escapement Estimation using instream PIT arrays

Presented to the Lower Snake River Compensation Plan Steelhead Review - June 20-21, 2012



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QCInc.

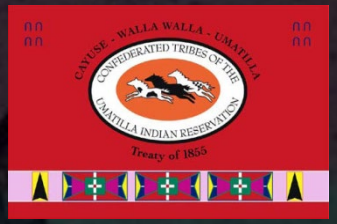
NEZ PERCE FISHERIES

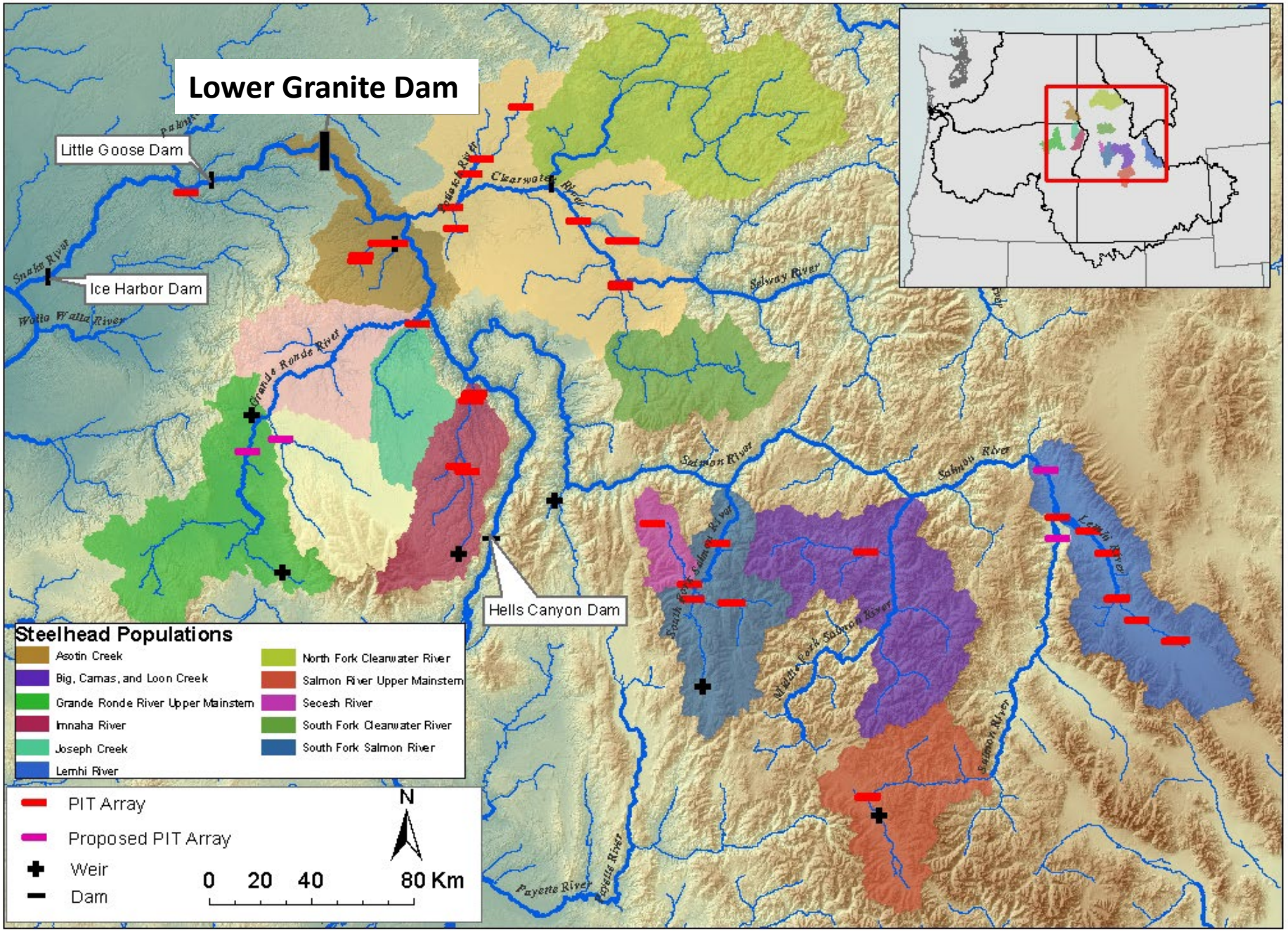
ISEMP

LOWER SNAKE RIVER COMPENSATION PLAN
Hatchery Program

BONNEVILLE POWER ADMINISTRATION

Collaboration




Lower Granite Dam
Little Goose Dam
Ice Harbor Dam
Hells Canyon Dam
Snake River
Walla Walla River
Grande Ronde River
Clearwater River
Selway River
Salmon River
Lemhi River
Payette River
Steelhead Populations
Asotin Creek
Big, Camas, and Loon Creek
Grande Ronde River Upper Mainstem
Imnaha River
Joseph Creek
Lemhi River
North Fork Clearwater River
Salmon River Upper Mainstem
Secesh River
South Fork Clearwater River
South Fork Salmon River
PIT Array
Proposed PIT Array
Weir
Dam
N
0 20 40 80 Km

Redd Count Expansions

Weirs (Floating/Pickett)

Weirs have Limitations

PIT Tag Arrays

PIT Arrays Have Limitations

Why Instream PIT Arrays?

- Adult Steelhead difficult to sample using weirs
  - Migration/Spawning occurs during high water
  - PIT Arrays allow for detection of adults in most conditions
- Can be used in Big Rivers, allowing for Tributary/DPS estimates
- Fish Accessible at Lower Granite Dam (Weir)
  - Fish only handled fish
    - age/sex/genetics

Utilizing PIT Tags – Across Different Spatial Scales

- Population - Tributary
- Major Population Group
- DPS – Largest Scale

Answering Questions Across Different Spatial Scales

- Region-wide monitoring program to assess:
  - Key Questions addressed
    - Status Monitoring
    - **Adult abundance**
    - Juvenile abundance
    - Population productivity
    - Freshwater productivity

Program Goal

- Estimate adult steelhead returns to Snake River tributaries above Lower Granite Dam (LGD) by age and sex

Snake River Basin Adult Monitoring History (Instream PIT Arrays)

2008 – LSRCP Funded first Array in South Fork Salmon

2009 – ISEMP developed methods to estimate adult escapement in S. F. Salmon and Lemhi rivers, Idaho using PIT detection sites

- Tag at Lower Granite Dam
- Recover Tag at Instream PIT Sites (10 sites)
- Method was verified("proof of concept")

2010 – Columbia Basin Coordinated Anadromous Workgroup recommended:

- Collect high precision (<15% C.V.) adult escapement estimates for at least one population per MPG
- Of which PIT Tags were recommended for evaluation ("Fast-Track" process, BPA)

2012 – 32 Instream PIT arrays

Regional Strategy
(Andromous Salmonid Monitoring Strategy)

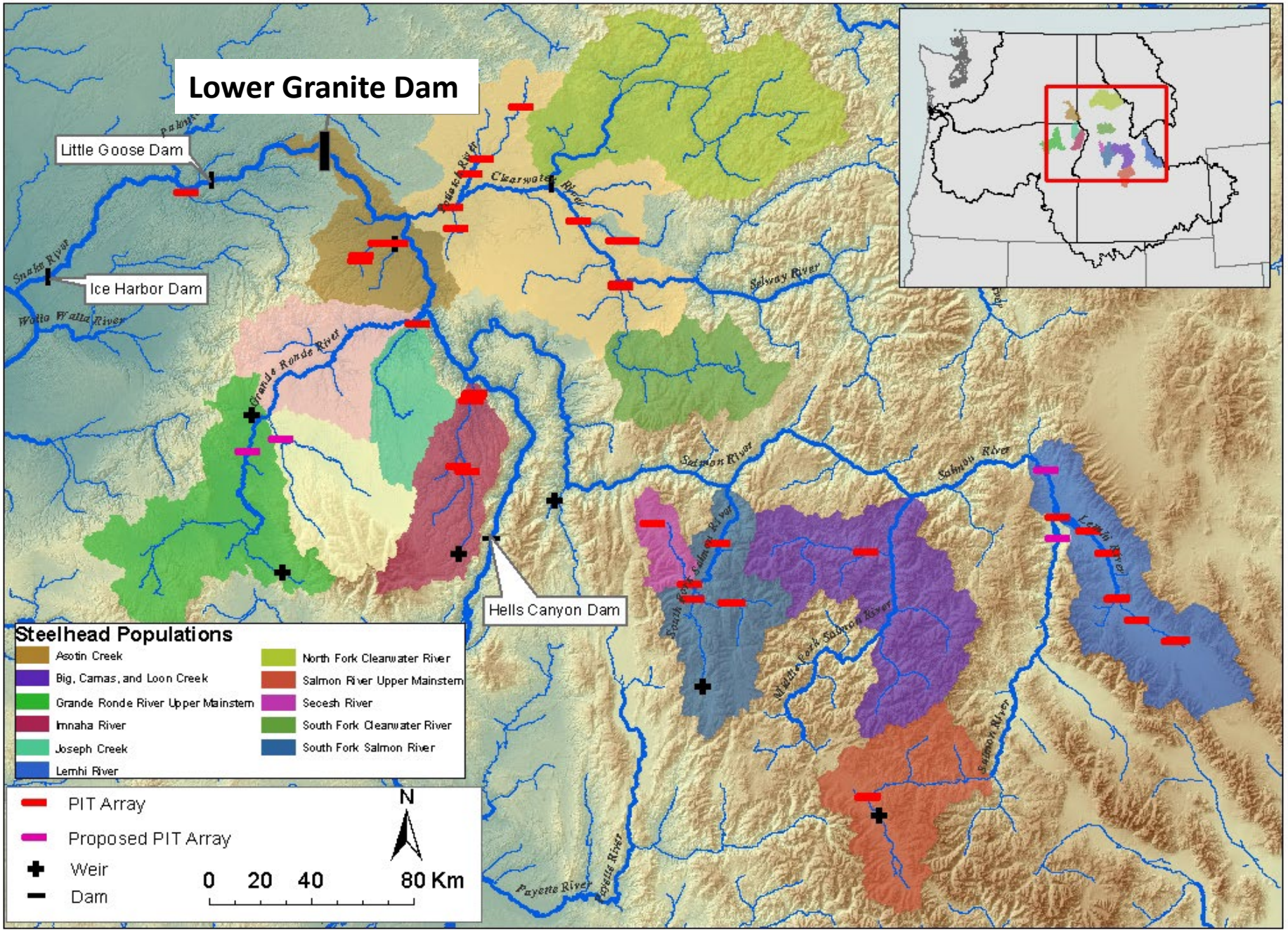
1) High precision status and trend data in at least one population per life history type per MPG.

- CVs of 5% or less.

  - Big Creek
  - South Fork Salmon River
  - Lemhi River
  - Secesh River
  - Imnaha River
  - Lolo Creek
  - South Fork Clearwater
  - Joseph Creek

2) Validate GSI results with radio and/or PIT tag arrays where we can

  - Compare with Campbell's Results - Forthcoming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PIT Array
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Methods

LGD sampling

Number / Estimate

- Consistent sample rate

Population

PIT tags

Ratio (Expansion Factor)

Methods

Population estimate using arrays

PIT Detection Site = “Recapture”

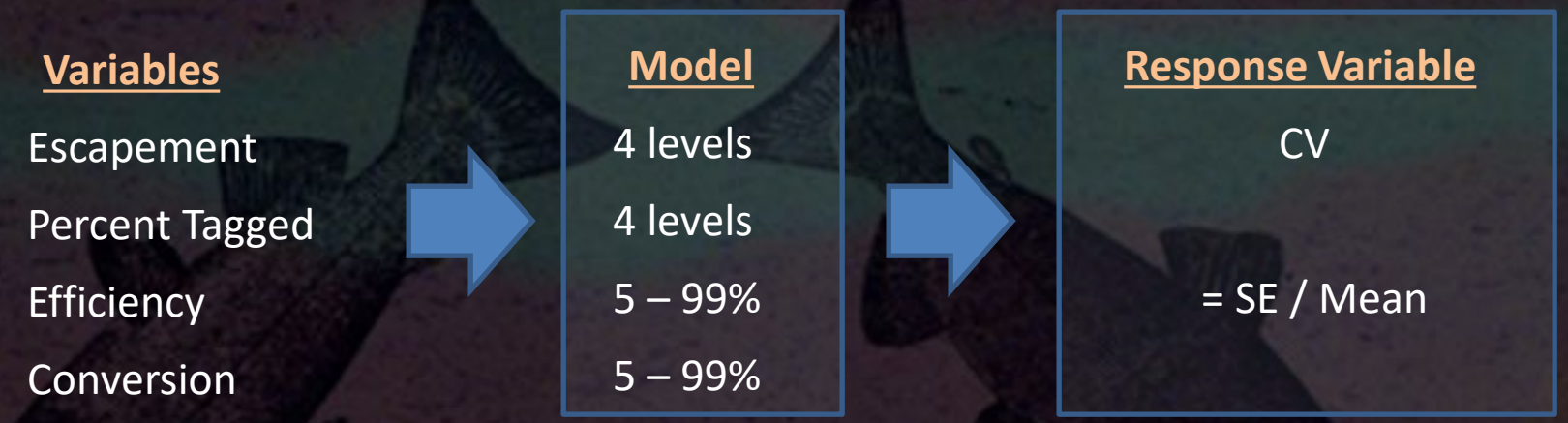
Upper Imnaha River

Precision

Starting Population Estimate, (complex)

Sample rate and adjustment, SbyC fish, night passage, August & December passages, fall back and re-ascension --- adapt fall Chinook run reconstruction methodology

Estimated Number of PIT Tags



RESULTS
Steelhead Tag Rates @ Lower Granite Dam - 2009-2011

Run Year	Escapement	Tagging Rate	95% CI	No. PIT Tagged
2009-2010	45,889	8.7%	8.4% - 8.9%	3,773
2010-2011	48,639	9.9%	9.7% - 10.2%	4,638

2010 -2011 Steelhead

Array	Estimated Tags	Array Efficiency	PIT Escapement Estimate
Joseph Ck. (JOC)	161 (± 1)	0.99 (± 0.00)	1,627 (± 45)
Cow Ck. (COC)	15 (± 0)	0.93 (± 0.00)	147 (± 4)
Lower Imnaha (IR1)	326 (± 3)	0.93 (± 0.01)	3,298 (± 97)
Lower Imnaha (IR2)	307 (± 3)	0.97 (± 0.01)	3,108 (± 97)
Upper Imnaha (IR3)	133 (± 11)	0.81 (± 0.07)	1,328 (± 45)
Big Sheep Ck. (BSC)	76 (± 2)	0.92 (± 0.02)	765 (± 33)
South Fk Salmon (SFG)	290 (± 5)	0.84 (± 0.02)	2,937 (± 93)
Upper S. Fk Salmon (KRS)	149	-	1490*
East Fk S. Fk Salmon (ESS)	66 (± 1)	0.92 (± 0.01)	667 (± 23)
Secesh R. (ZEN)	39 (± 1)	0.97 (± 0.03)	397 (± 24)
Big Creek (TAY)	68 (± 11)	0.71 (± 0.12)	687 (± 22)
Valley Ck (VC)	23 (± 0)	0.91 (± 0.00)	232 (± 7)
Lemhi R (LLR)	42 (± 11)	0.71 (± 0.21)	428 (± 14)

* Minimum Estimate – efficiency not calculated

How well Does it Work?

Steelhead 2010-2011 Run Year

Weir/Array	Weir Estimate	PIT Tag Estimate
Asotin Creek	1,128 (1,095 – 1,182)	890 (720 – 1070)
Joseph Creek	1,698 (± 744)	1663 (1448 – 1917)
Lake Creek*	203 (± 42)	198 fish
Horse Creek	239 (188-290)H	171 fish

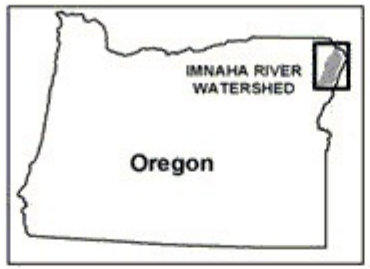
Weir	Fish Handled	ISEMP Tags Observed	Observed Tag Proportion
Horse Creek	141	10	0.071
Lostine River	240	18	0.075
Rapid River	133	9	0.068
Joseph Creek	304	29	0.095

2010-11 Natural Steelhead

ISEMP PIT-TAG ARRAY SITES

3,445 ±100
-3,120
325 fish unaccounted

Imnaha Basin
2011
Natural Steelhead



207

250

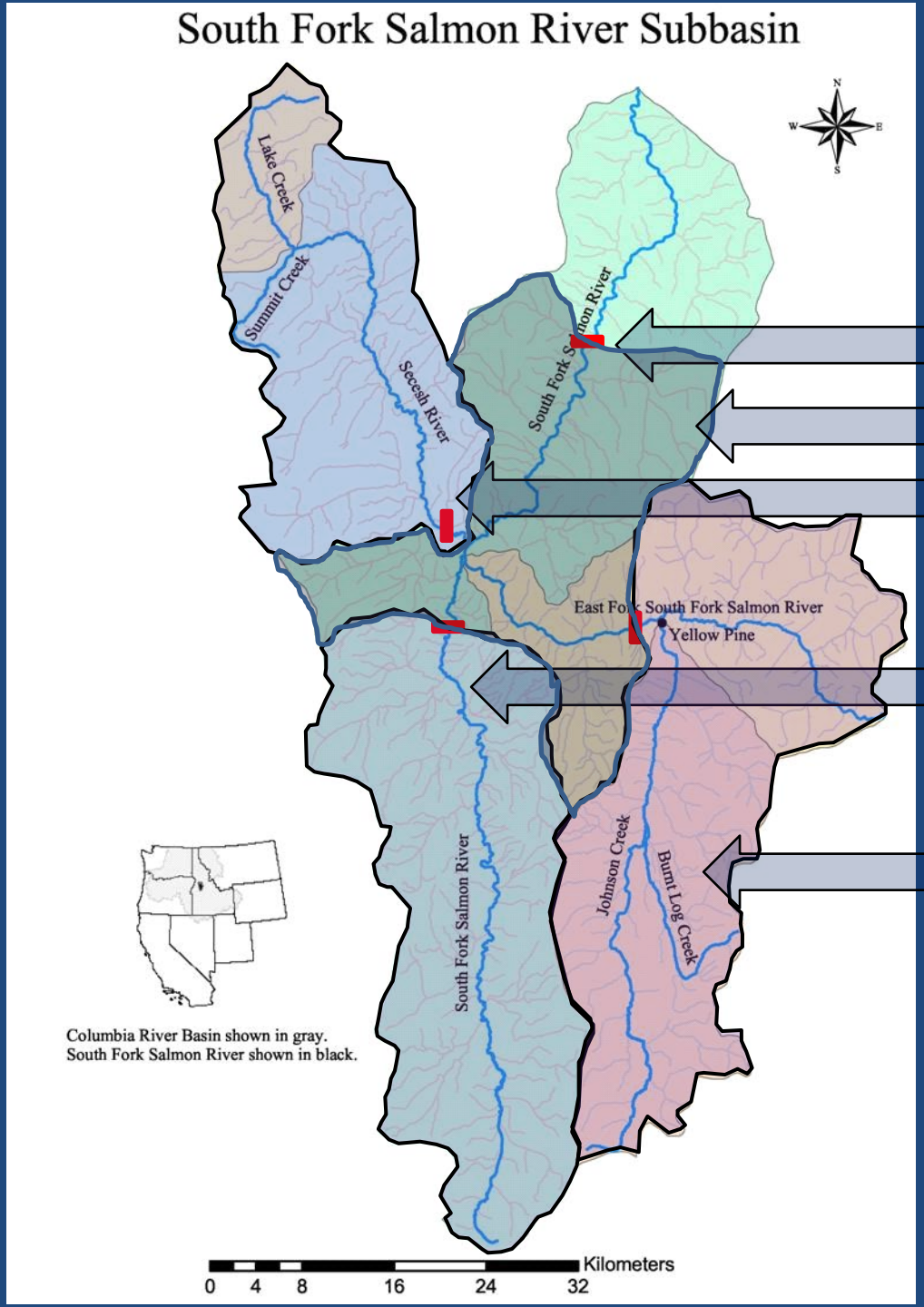
147±4

190

233

765±33

1,328±45



2011 Natural Steelhead

2,937 (± 93)

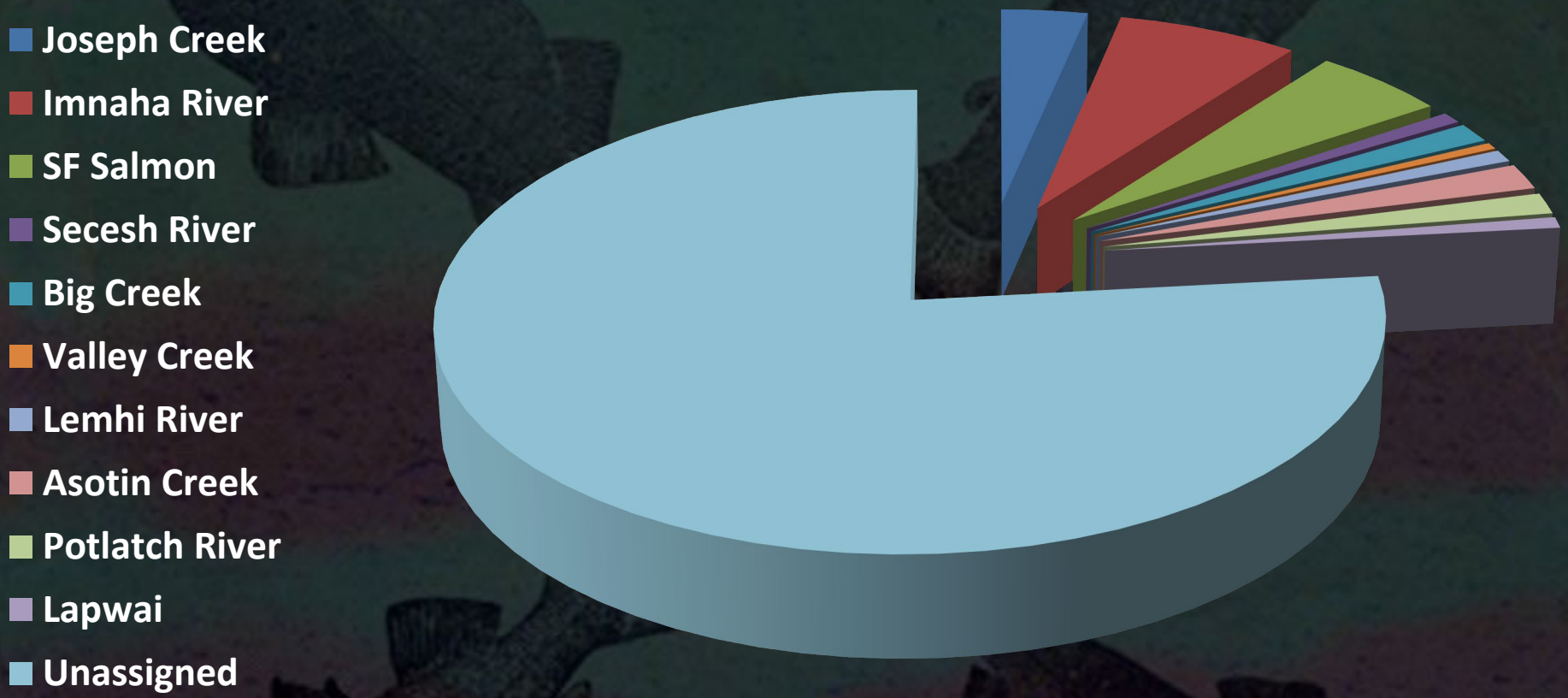
383 ± 46

397 (± 24)

1,490*

667 (± 23)

Run Reconstruction of Natural Steelhead above Lower Granite Dam



Wild Adult Steelhead Sex Ratio (similar to juveniles)

Basin	2011 Male	2011 Female	2010 Male	2010 Female
Middle Fk. Salmon	31%	69%	33%	67%
Grande Ronde R.	33%	67%	35%	65%
Imnaha R.	41%	59%	40%	60%
South Fork Salmon	25%	75%	24%	76%
Lemhi River	39%	61%	39%	61%
Valley Creek*	62%	38%	59%	41%

*Probably very large hatchery influence

Summary

- PIT Arrays gives precise natural adult steelhead abundance estimates
  - PIT Arrays allow for detection of adults in most conditions
  - Array efficiencies very high (>90% in most cases)
- Can be used in Big Rivers, allowing for Tributary/DPS estimates
- Used in combination with other methods can fill in large data gaps for steelhead

Future

- 4 PIT arrays to be installed in 2012
- Can use arrays to estimate hatchery abundance and straying
- Comparisons with GSI for validation
- Invaluable tool for the run reconstruction efforts of natural and hatchery fish above Lower Granite
- Juvenile detection benefits (forthcoming)

Acknowledgments

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Rick Orme, Chris Beasley, Jody White, Bill Young

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