Estimating Summer Steelhead Escapement using Redd Surveys: What have we learned and where do we go?

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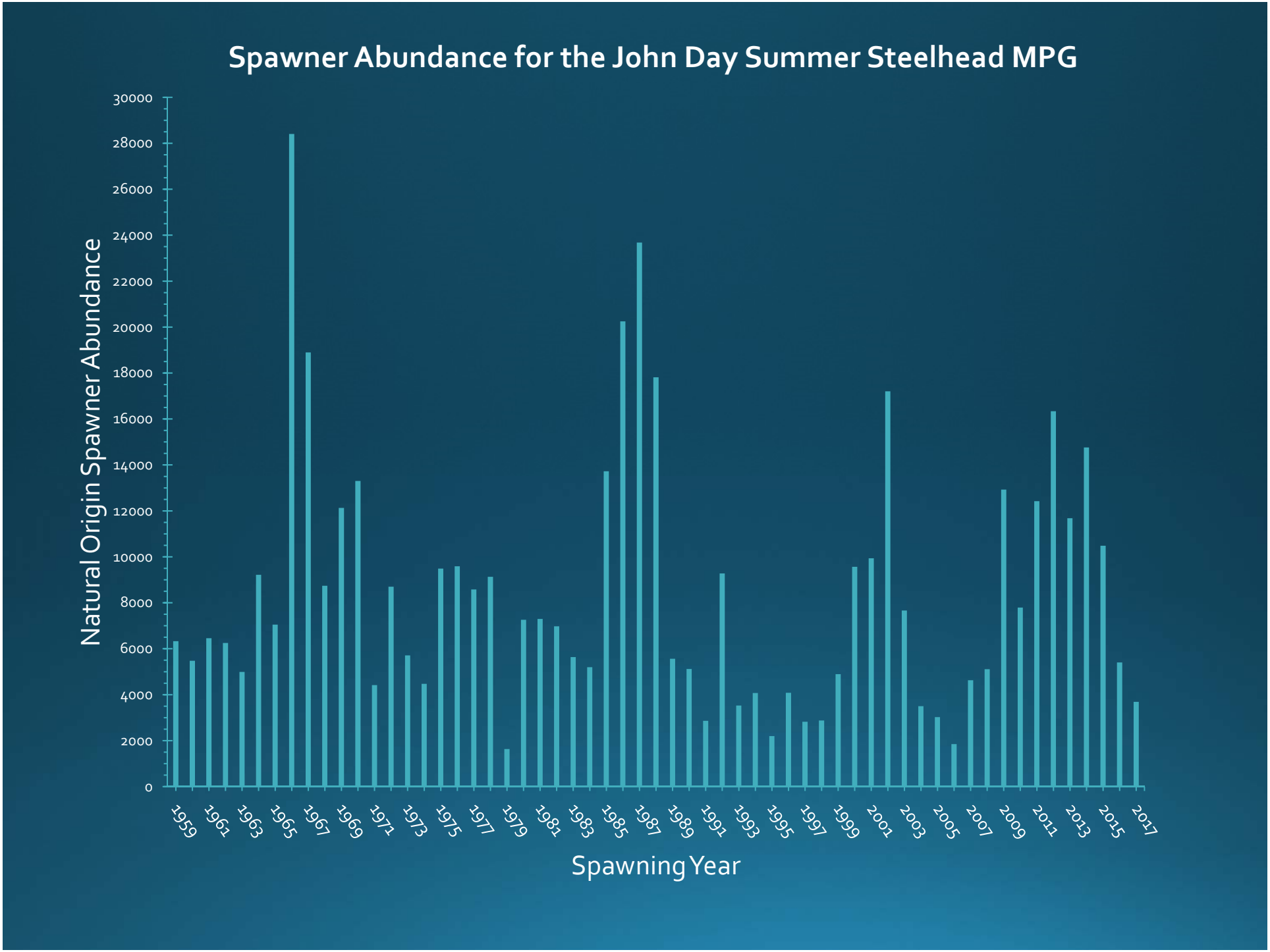
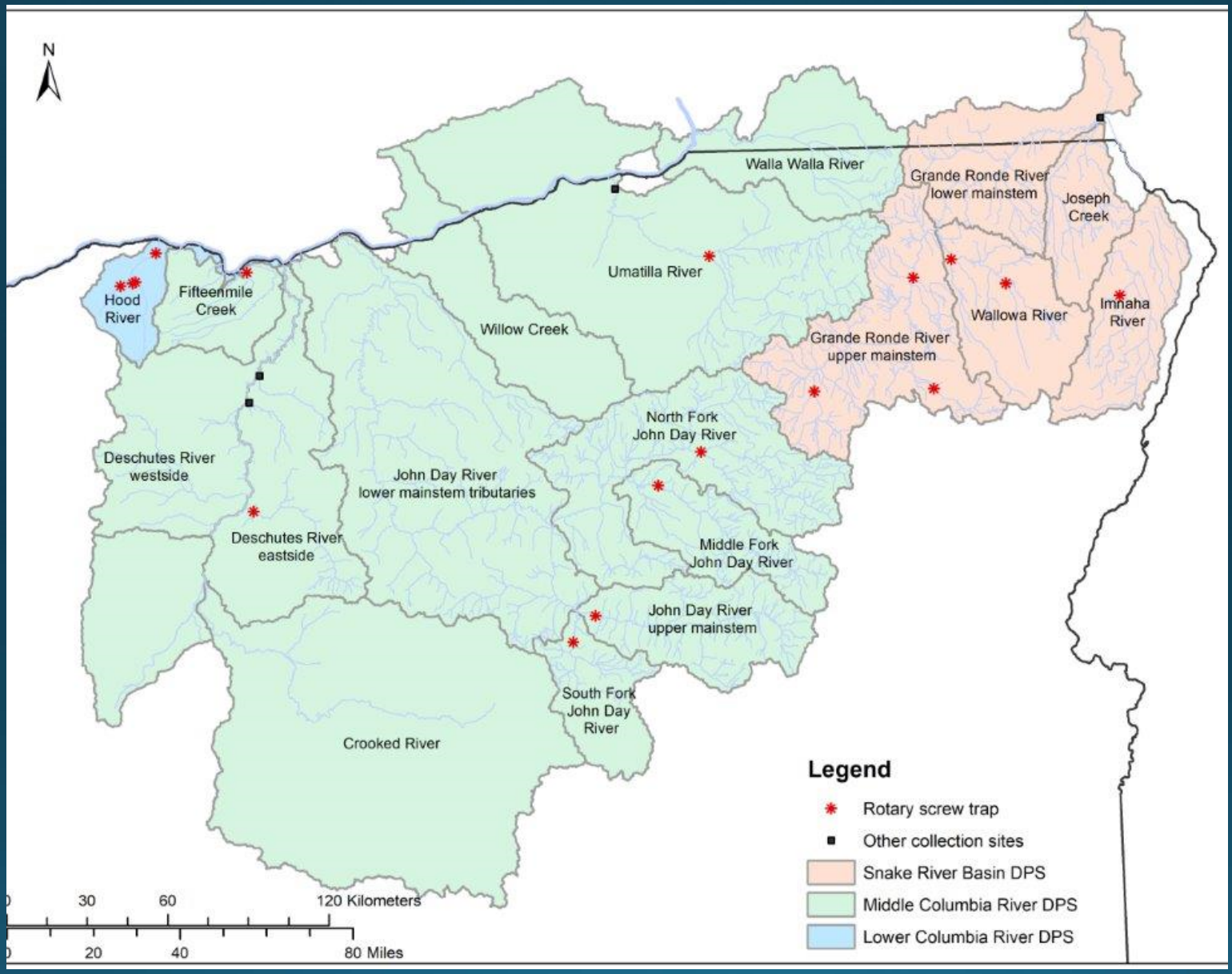
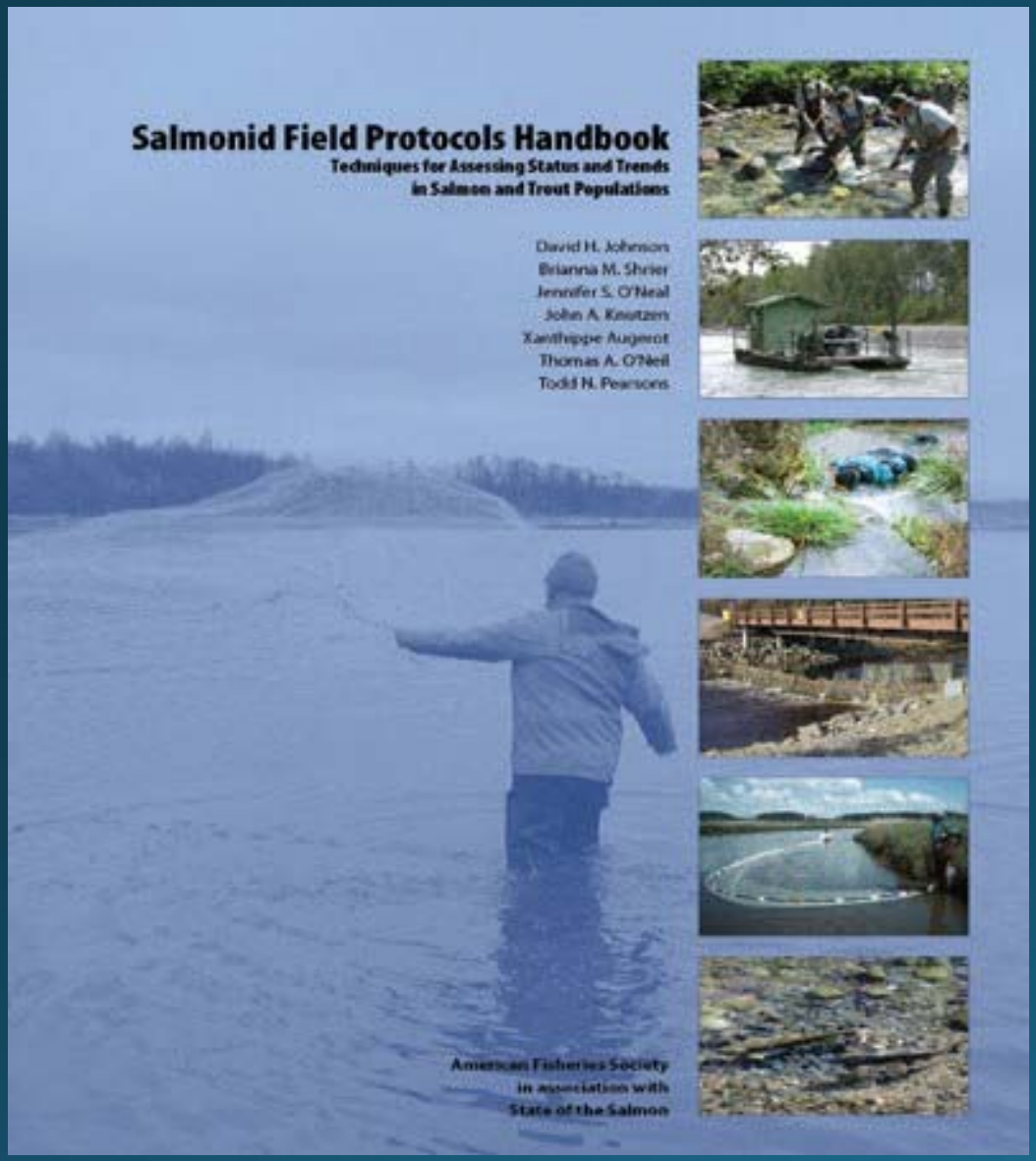

Spawner Abundance for the John Day Summer Steelhead MPG
Natural Origin Spawner Abundance
30000
28000
26000
24000
22000
20000
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
1959
1961
1963
1965
1967
1969
1971
1973
1975
1977
1979
1981
1983
1985
1987
1989
1991
1993
1995
1997
1999
2001
2003
2005
2007
2009
2011
2013
2015
2017
Spawning Year



- Eastern Oregon steelhead populations



- Standard protocol for redd surveys

Redd Counts

Sean P. Gallagher, Peter K. J. Hahn, and David H. Johnson

Summary

The purpose of this protocol is to describe field methods for the consistent collection of salmonid redd abundance and subsequent estimation of adult salmonid breeding population size. We recommend surveys be conducted on predetermined, 3–5-km long stream reaches, using a spatially balanced rotating panel design. We suggest an annual draw of 10% of all reaches in the sampling universe as the target goal for monitoring; furthermore, to account for access problems and other barriers to sampling, we recommend that the initial sample draw should over-select reaches (sampling rate of 25%) to provide flexibility in the field. One field survey should occur prior to fish entering the spawning areas, with surveys thereafter conducted 7–14 d apart until new fish and redds are no longer observed. Surveyors will need to recognize that stream flows and/or weather conditions will have some bearing on the temporal aspects of surveys. All redds will be identified to species, measured, and georeferenced. Redd longevity and observer efficiency in redd detection will be estimated for each watershed by tracking the condition of individual redds measured during previous surveys. To document sex ratios, the sex of all live fish will be visually identified on behaviors at redds or other visual cues (dead fish will be identified, sexed, inspected for tags, and measured, per the carcass count protocol, page 59). In situations where multiple salmonid species overlap on a given spawning area, redd sizes will help differentiate the species involved.

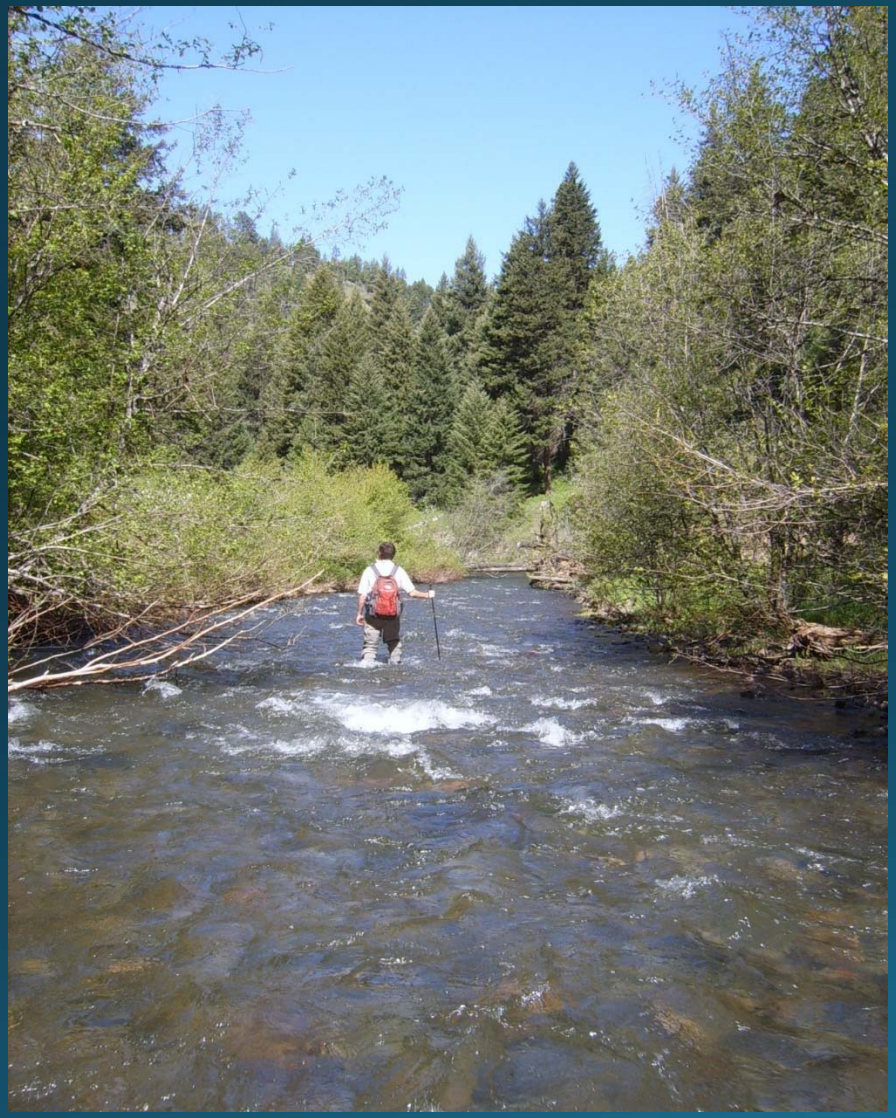
Background and Objectives

Background

The family Salmonidae is characterized in part by most members being gravel nest spawners (Eddy and Underhill 1978).

SUMMER STEELHEAD SPAWNING SURVEY PROCEDURES MANUAL 2011

ODFW East Region Fish Research & Monitoring Program



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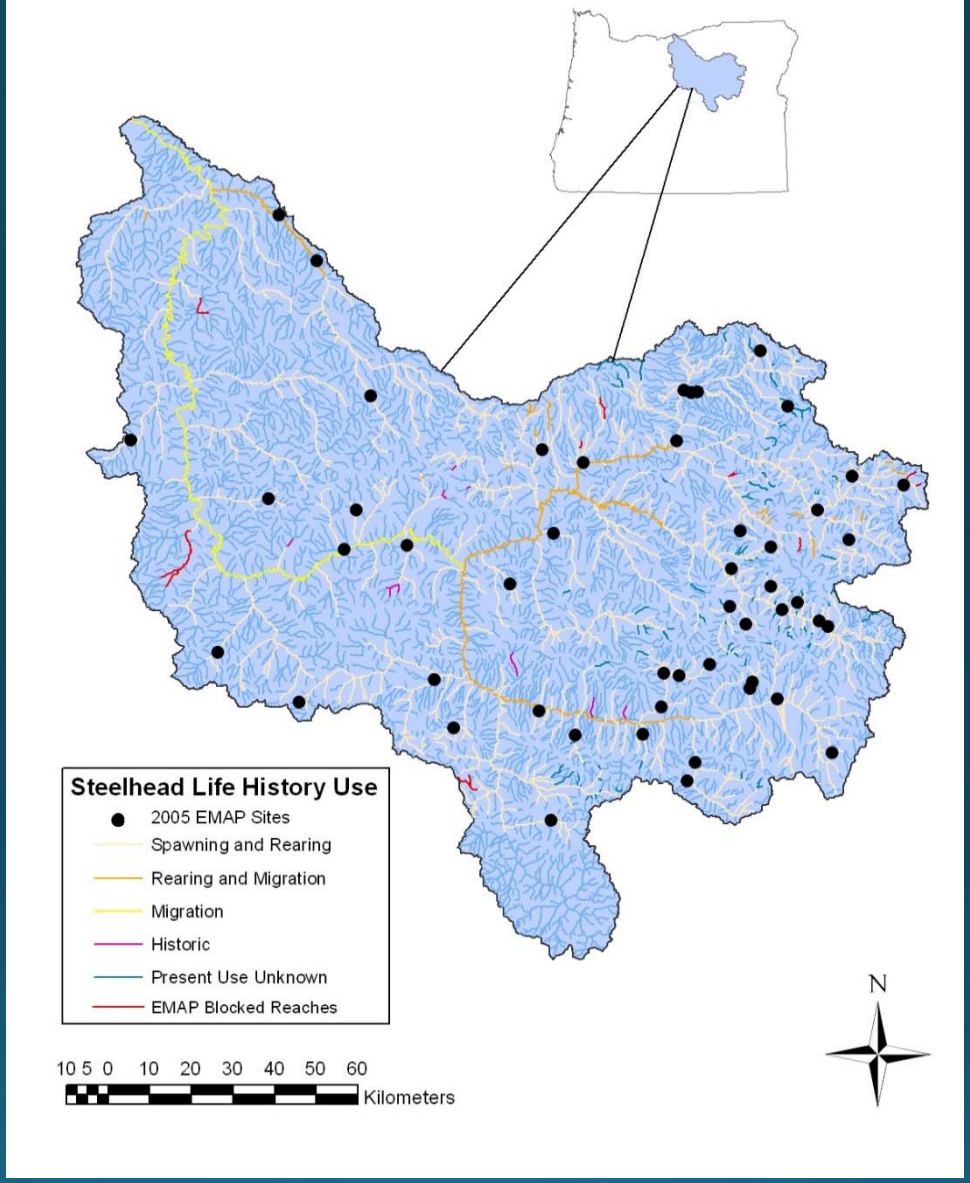
GRTS Spawning Survey Locations

- 50 annual sites
- Spatially balanced
- Rotating panel



- Initial GRTS draw for the John Day River MPG

Barriers

- Barrier identification has significantly reduced GRTS sample domain

8% Gradient

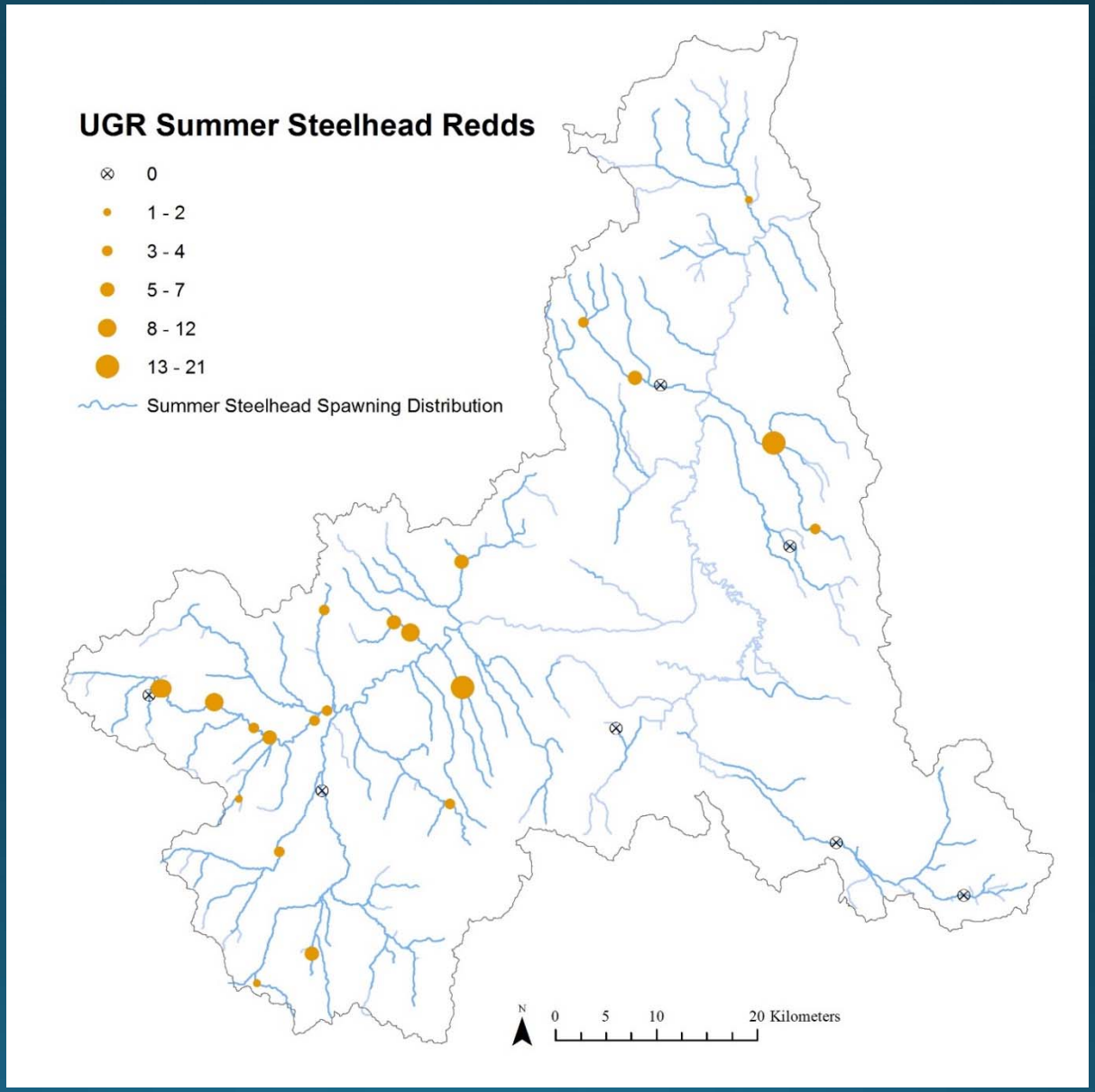
- No redds observed in gradients > 8%

Available Habitat: 892 km

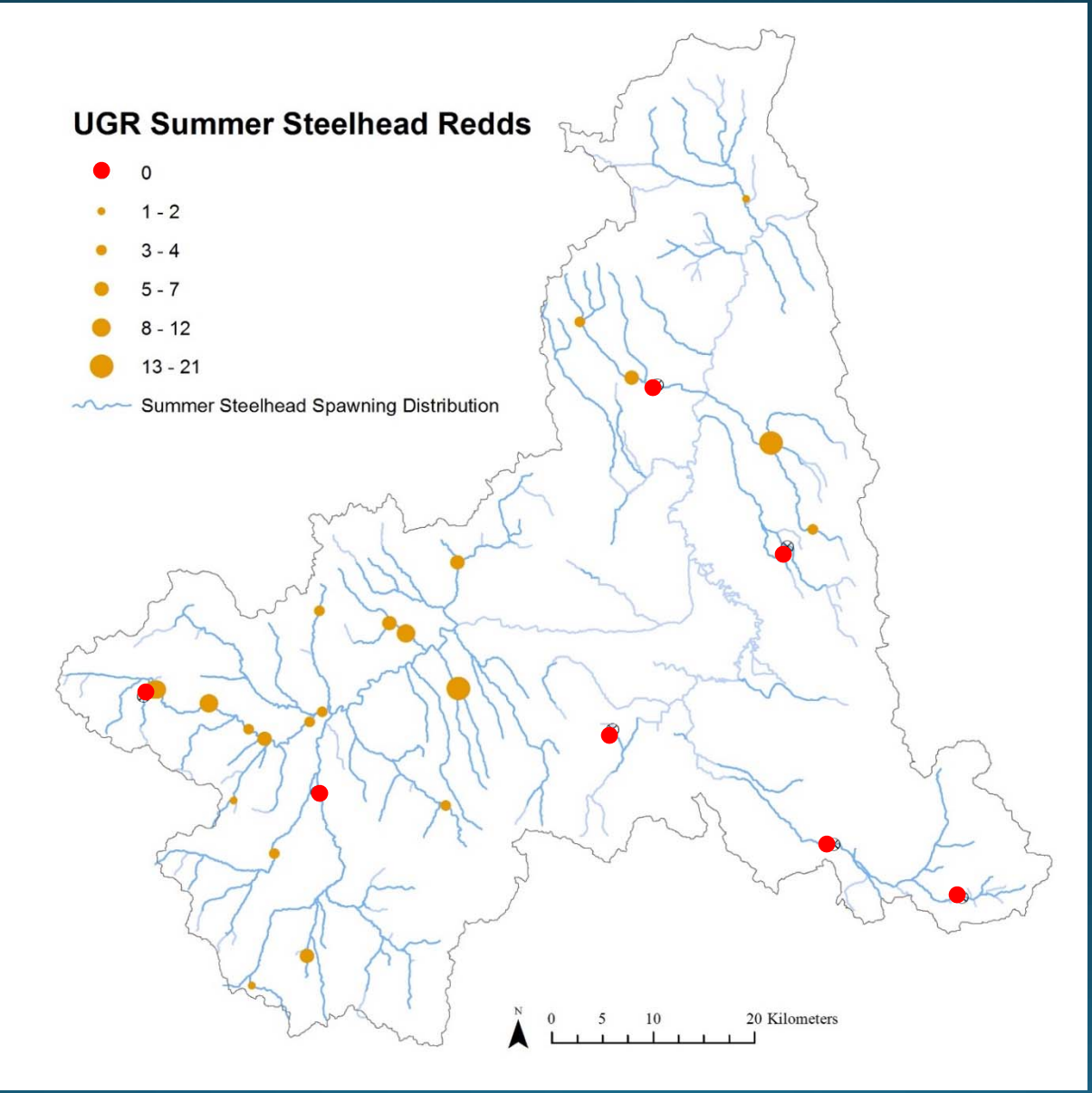
Surveyed: 31 sites, 64.6 km

Redds Observed: 36

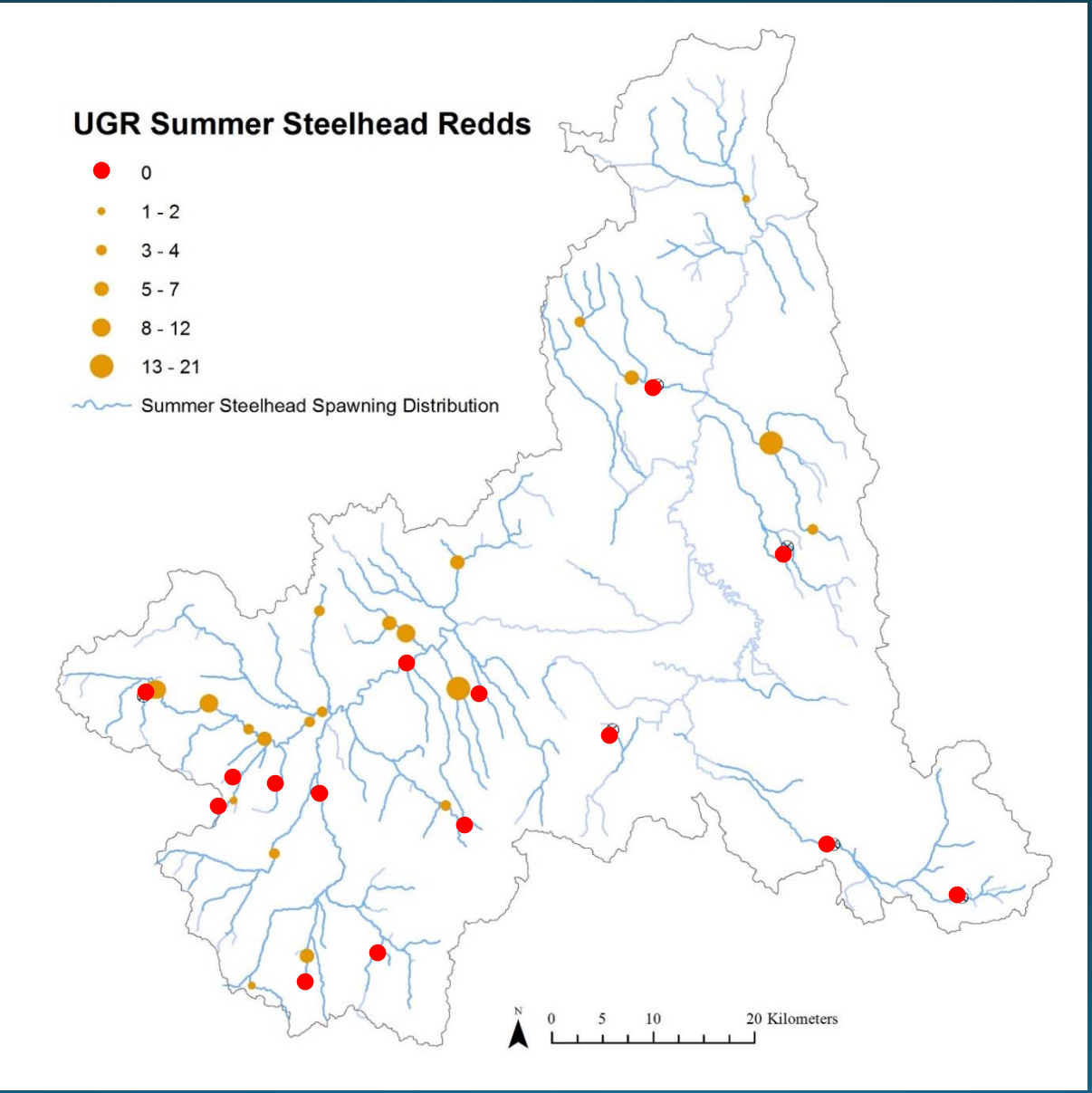
Spawners: 1,733 ± 39%



- Example of the current GRTS effort for the Upper Grande Ronde



- Spatial distribution of survey sites w/o redds



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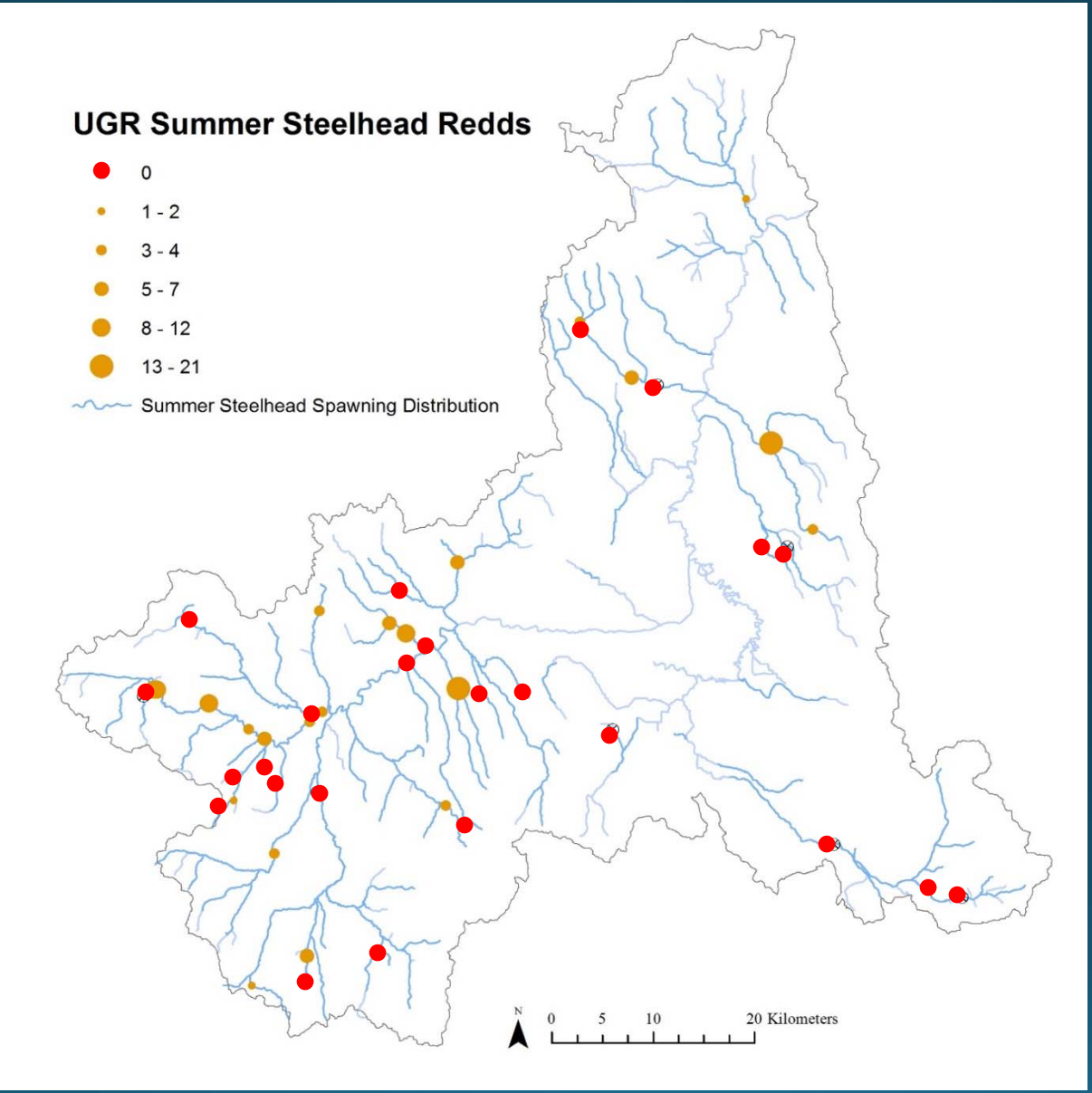

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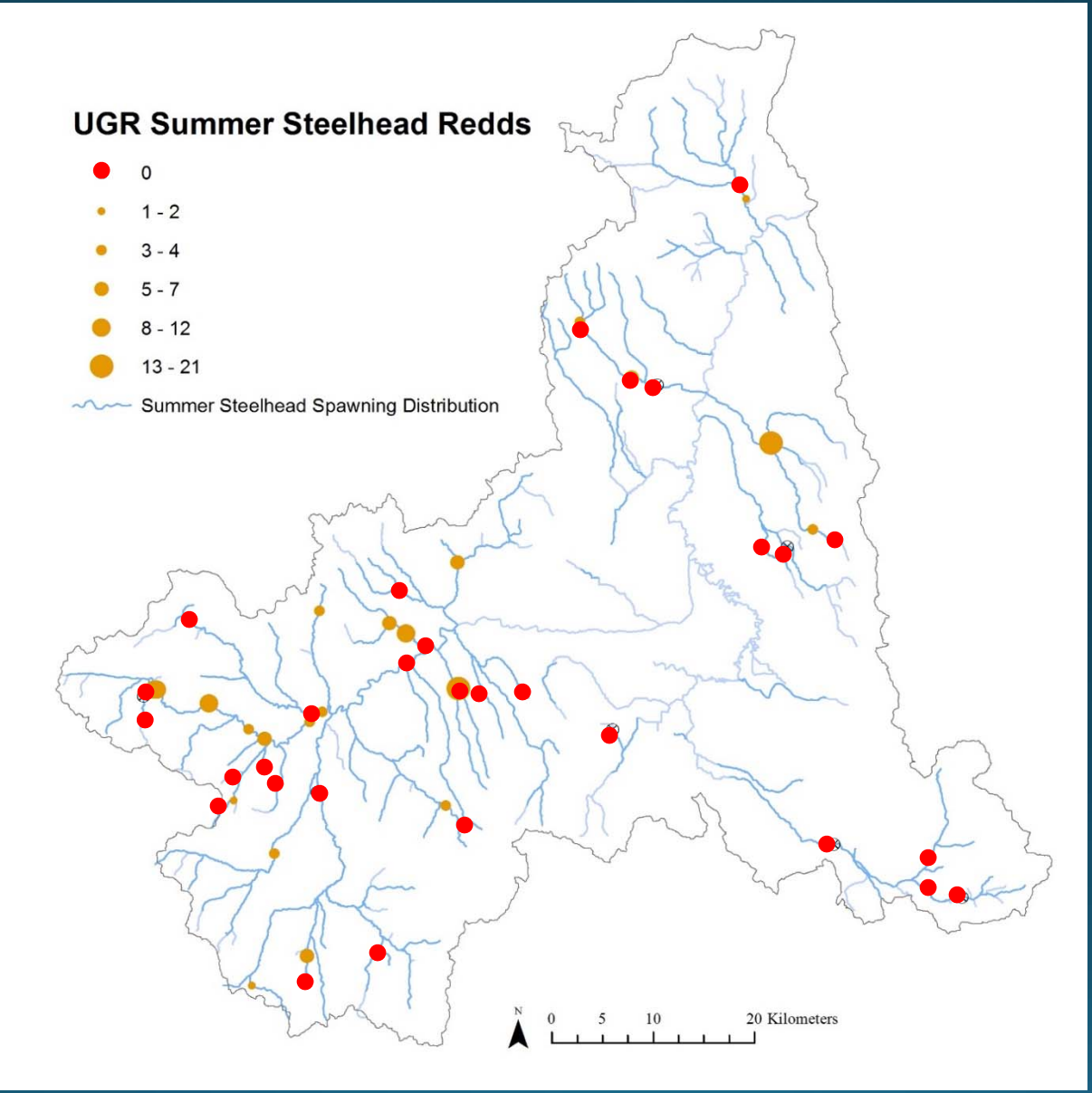

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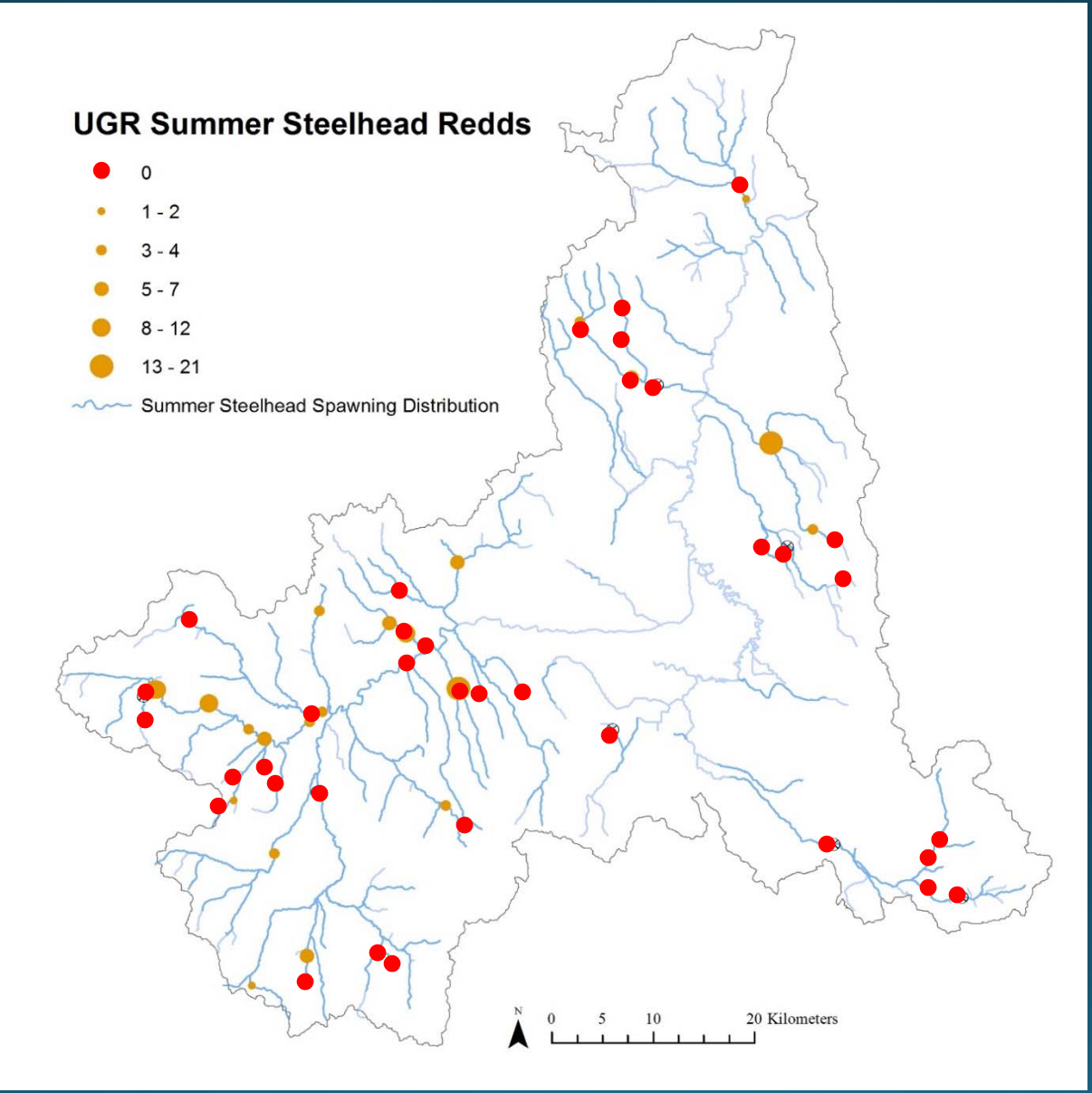


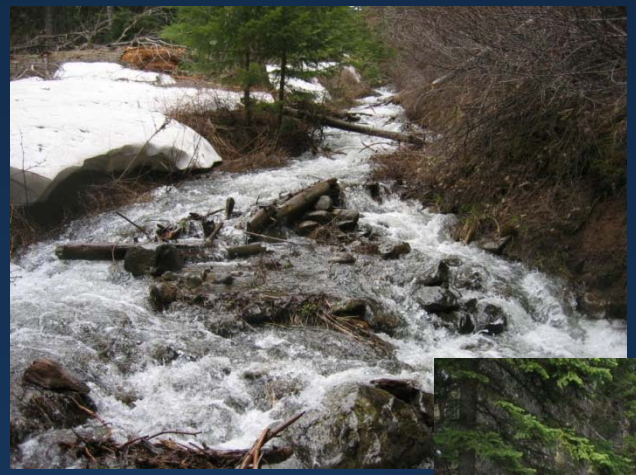
- Spatial distribution of survey sites w/o redds

Stratify by Valley Class

Source
- Gradient > 2 %
- Bankfull width < 8m

Transport
- Gradient < 2 %
- Bankfull width < 8m

Depositional
- Bankfull width > 8m



- Stratification by valley classification did not significantly improve precision

Redd Visibility

- Our ability to observe redds (bias) across varying conditions has a major influence on NOSA estimation.

Field methods

- Bi-weekly foot surveys
- Count redds
- **Categorize redd visibility**

Describe flagged **redd visibility** as:
0: New
1: Clearly visible
2: Moderately visible
3: Visible, but would not have found w/o flagging
4: Not visible due to poor water clarity
5: Not visible despite good water clarity
6: Determined to not be a redd on revisit (explain in comments)

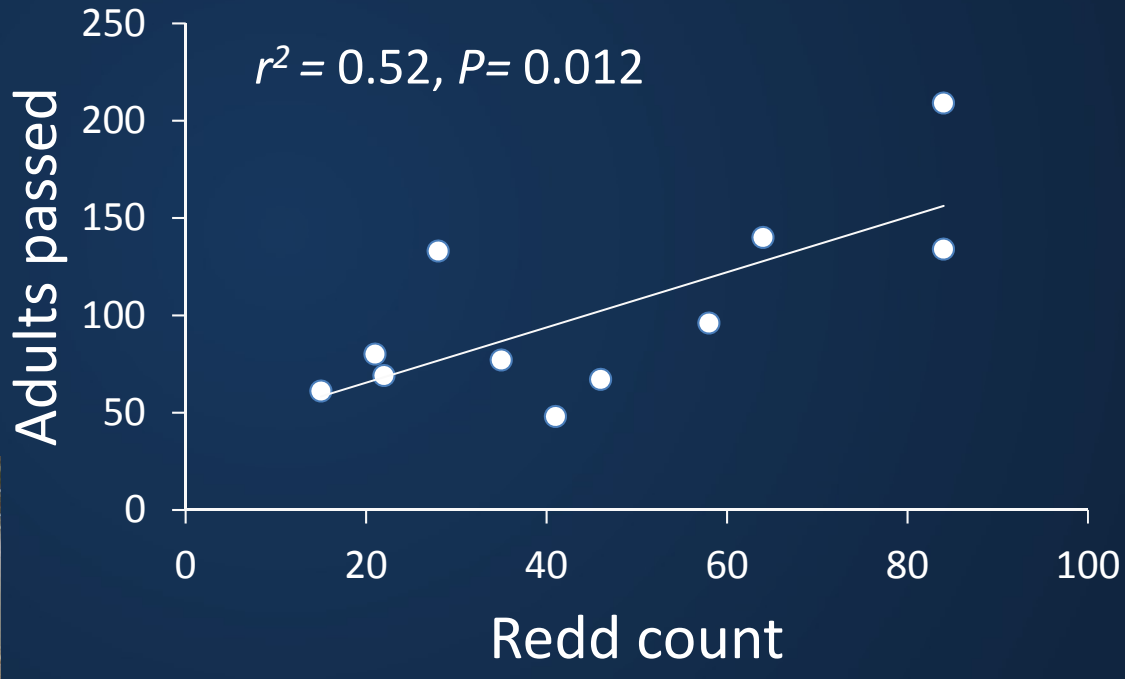
- We have focused much effort on reducing bias associated with visibility

- Permanent weir on Deer Creek allows annual spawner counts

Complementary redd surveys conducted above weir

Calculate fish per site ($fish_i$)

- Expand total redd/site to fish/site using fish/redd constant from Deer Creek

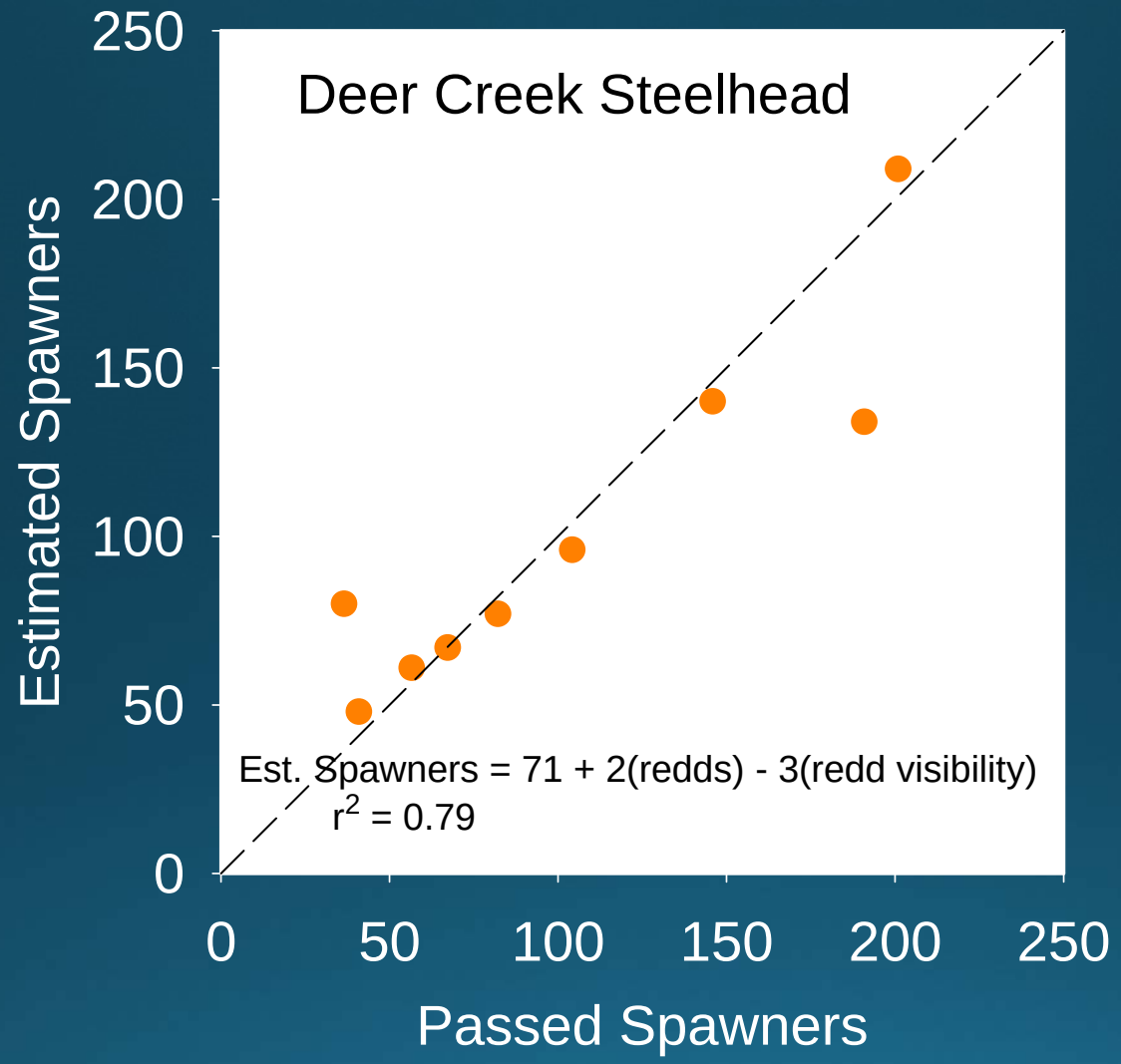


- Annual surveys conducted since 2002

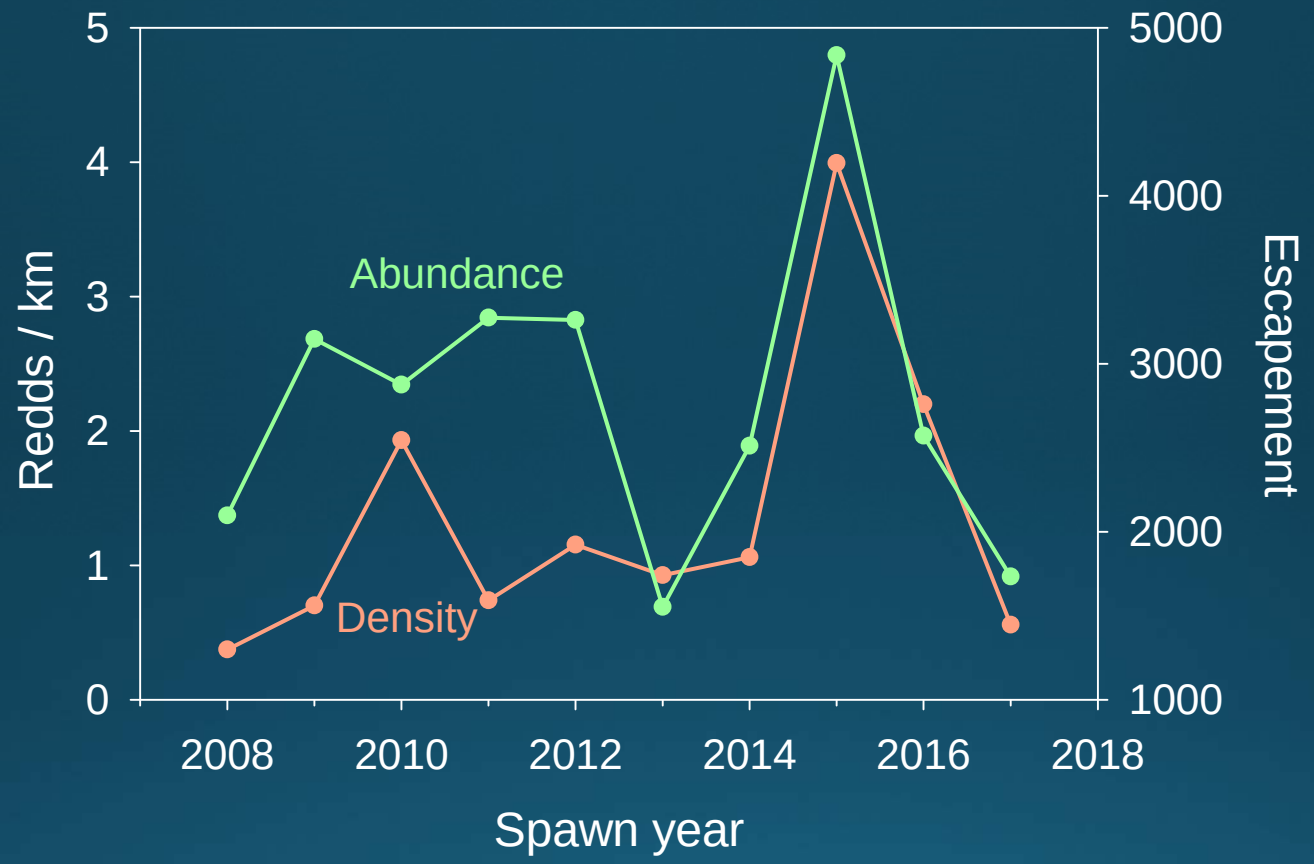
Deer Creek Surveys

Year	Females	Males	Total	Redds	Fish/redd	Females/redd	Redd visibility (days)
2002	120	89	209	**84**	2.49	1.43	**19.8**
2003	92	48	140	**64**	2.19	1.44	**20.5**
2004	47	20	67	**46**	1.46	1.02	**29.8**
2005	42	35	77	**35**	2.20	1.20	**16.7**
2006	55	41	96	**58**	1.66	0.95	**28.2**
2007	27	21	48	**41**	1.17	0.66	**35.3**
2008	23	38	61	**15**	4.07	1.53	**8.6**
2009	42	38	80	**21**	3.81	2.00	**19.3**
2010	85	49	134	**84**	1.60	1.01	**22.8**

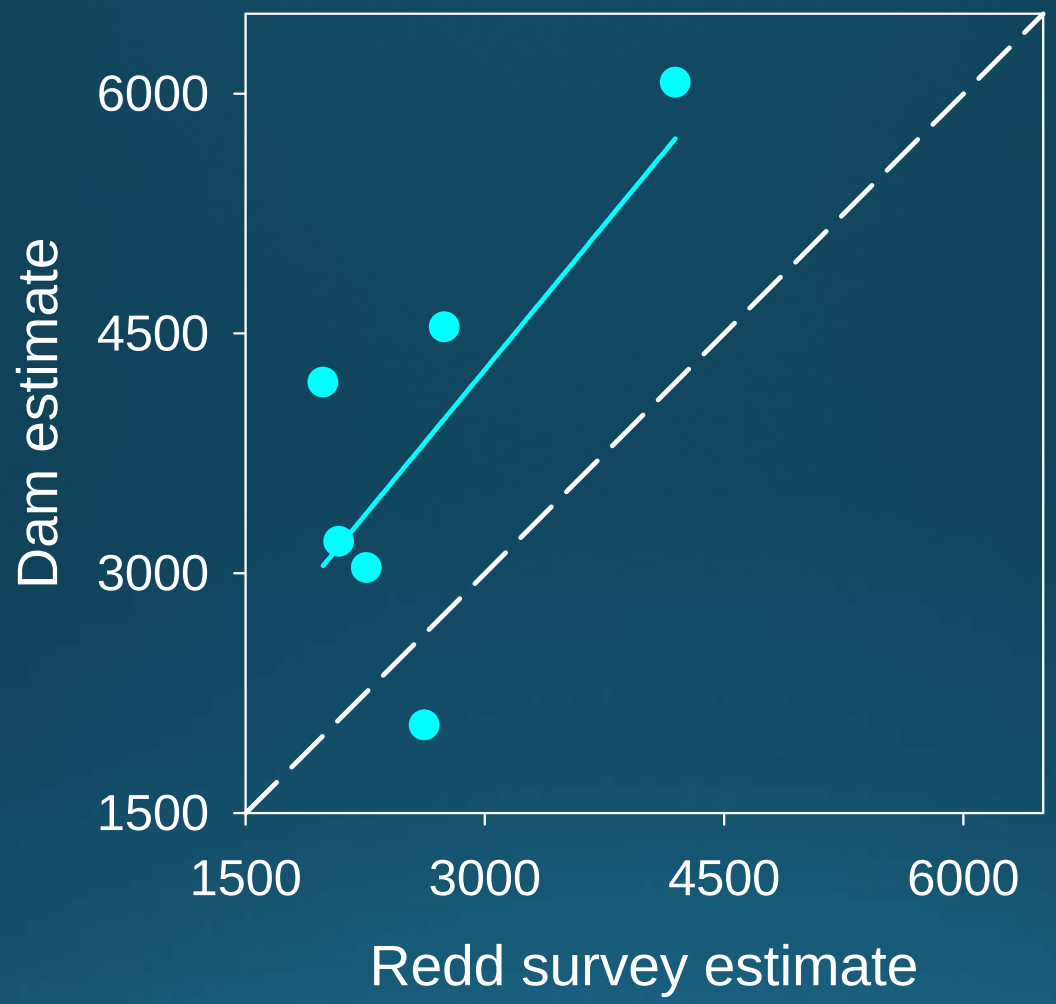
Estimated Spawners = 71 + 2(redds) – 3(redd visibility)



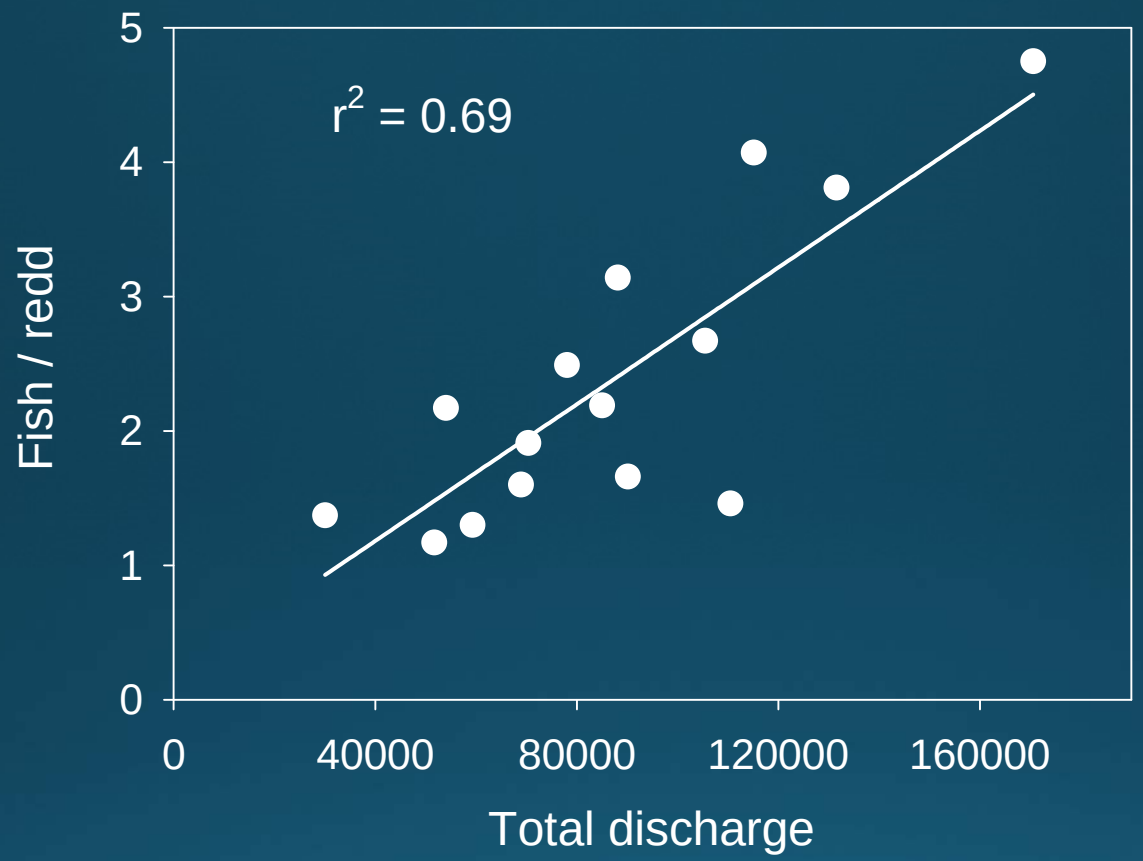
- Incorporating redd visibility has significantly improved prediction



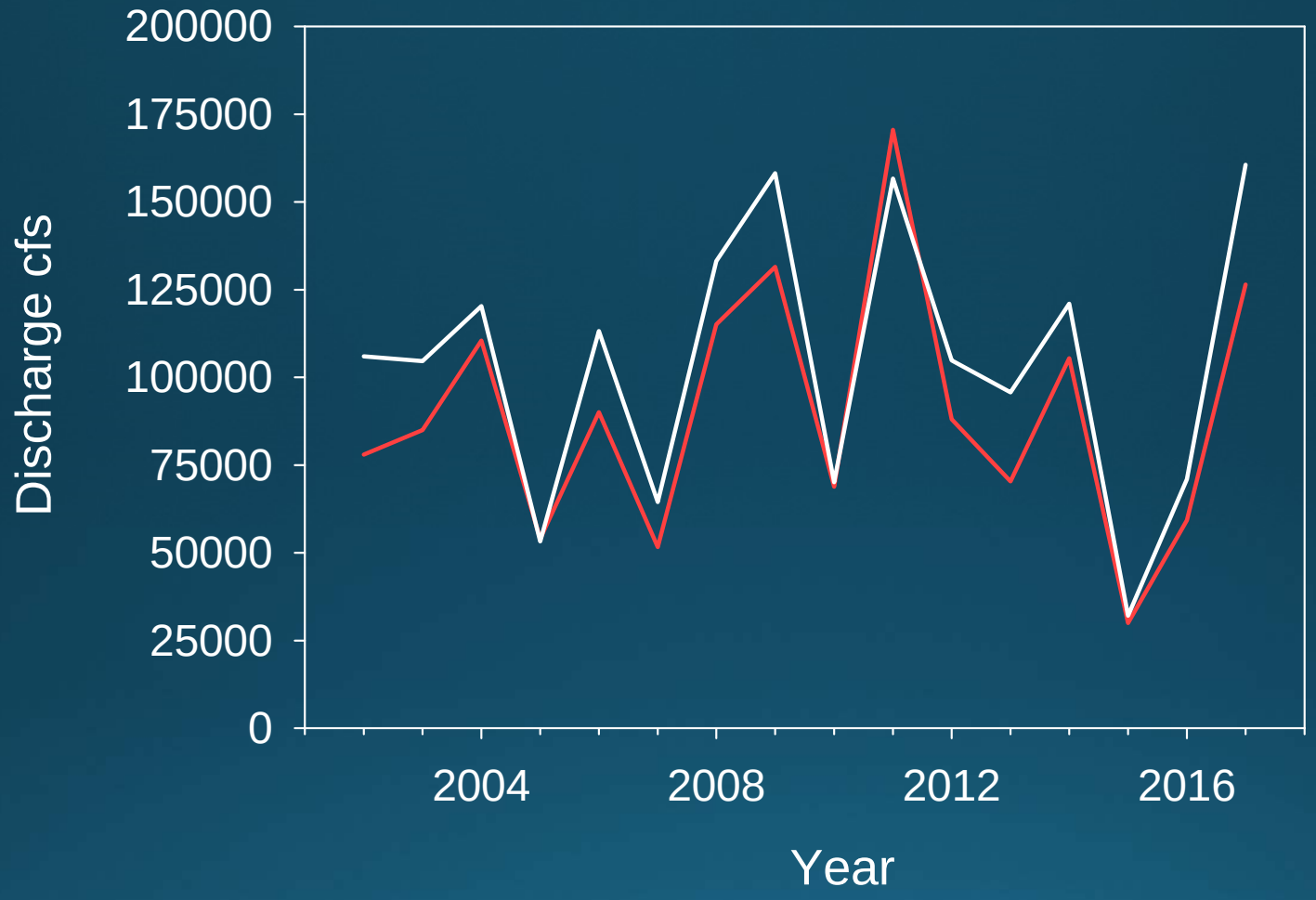
- Fish/redd ratios have an annual influence on NOSA estimates.



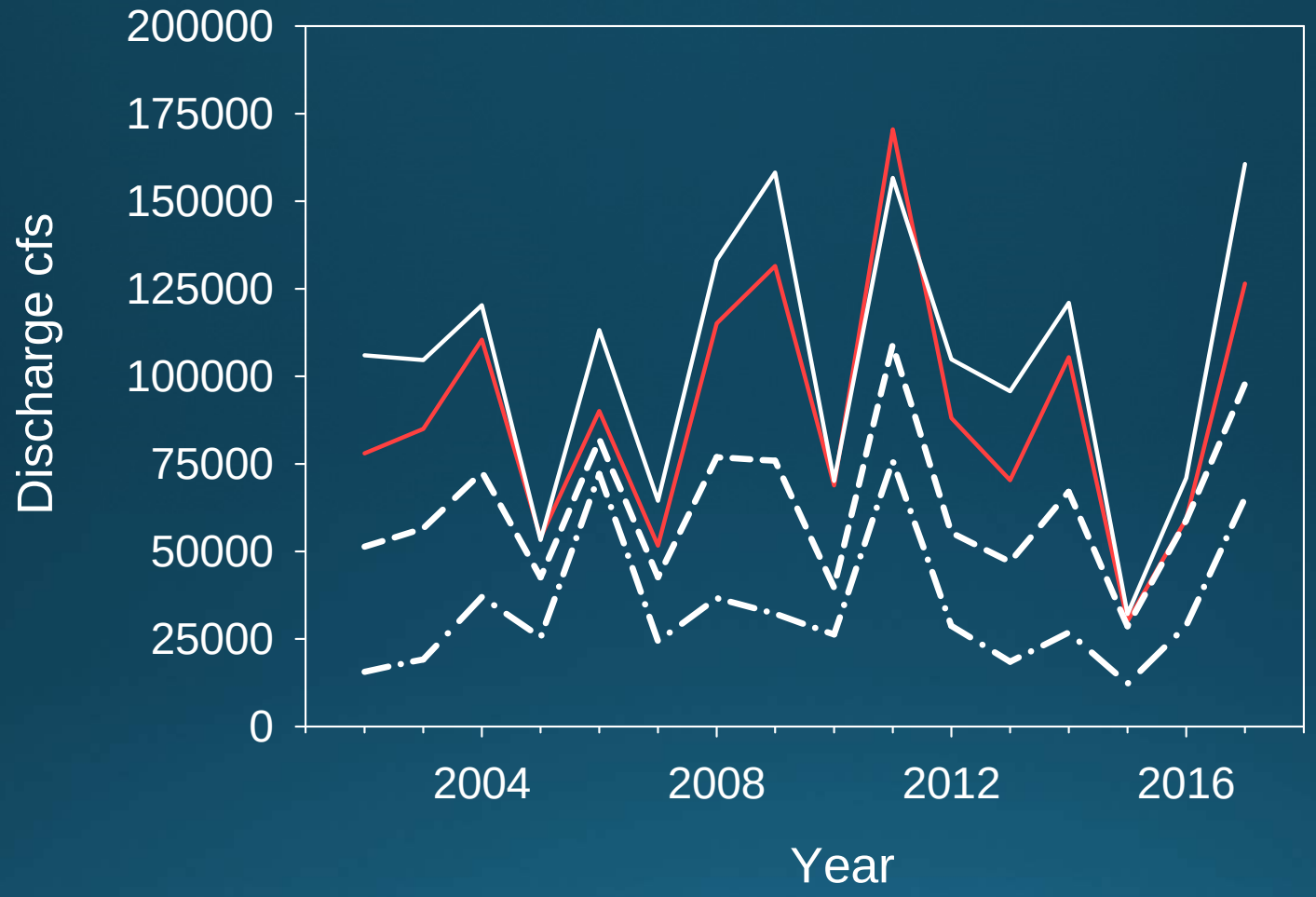
Redd surveys appear to track dam counts



- Discharge has a major influence on our fish/redd estimates
  - ability to observe a redd
  - redd longevity



- Discharge is similar but not equal across populations



- Discharge is similar but not equal across populations

Discussion & Conclusions

- The GRTS survey design has allowed us to estimate NOSA for populations w/o counting structures.

- By correcting for different survey conditions among years, we provide more accurate estimates of steelhead spawner abundance.

- The strength of the Deer Creek relationship gave us confidence in applying it to regional steelhead surveys.

- This relationship deteriorates with distance from Deer Creek.

- We plan to continue redd surveys where they work.

- We are exploring alternate methods of monitoring for these distant populations.

Acknowledgements

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Summer steelhead monitoring in NE Oregon