

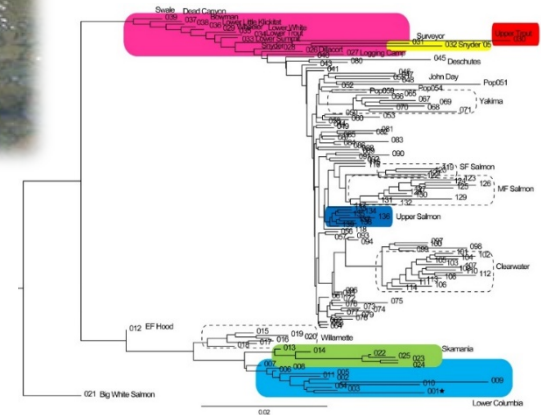
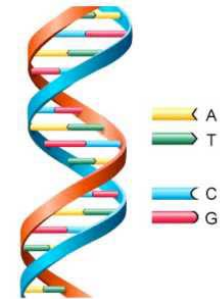
Acknowledgements



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Bill Sharp



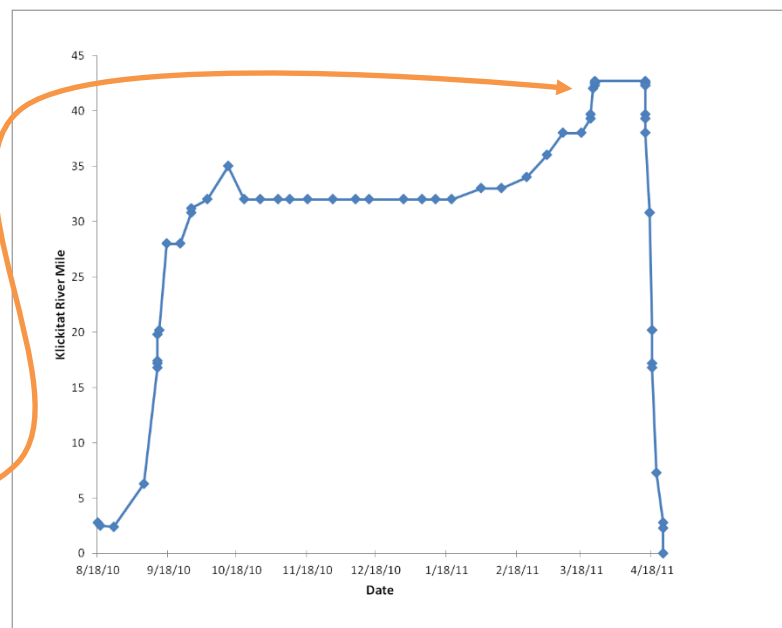
Jon Hess
Shawn Narum

Background

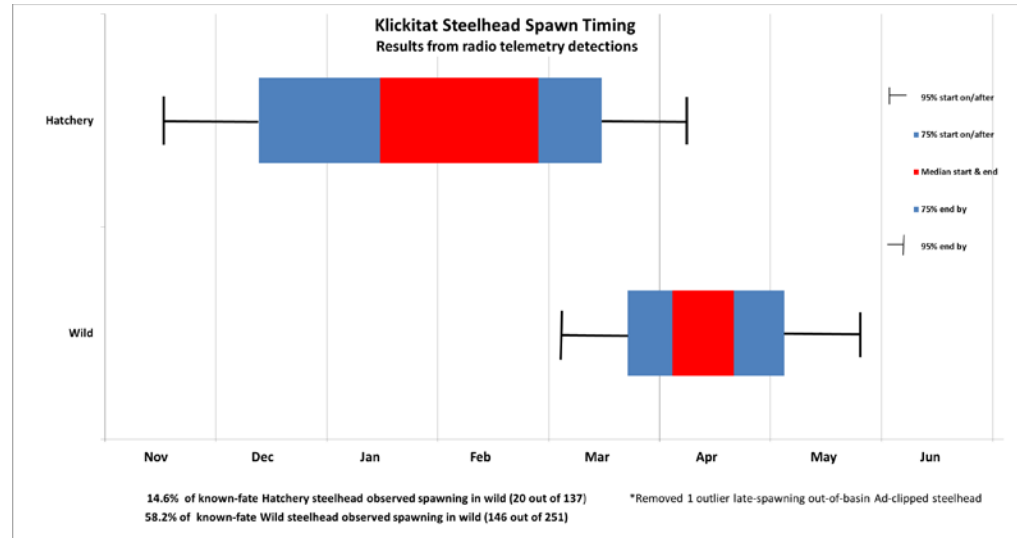
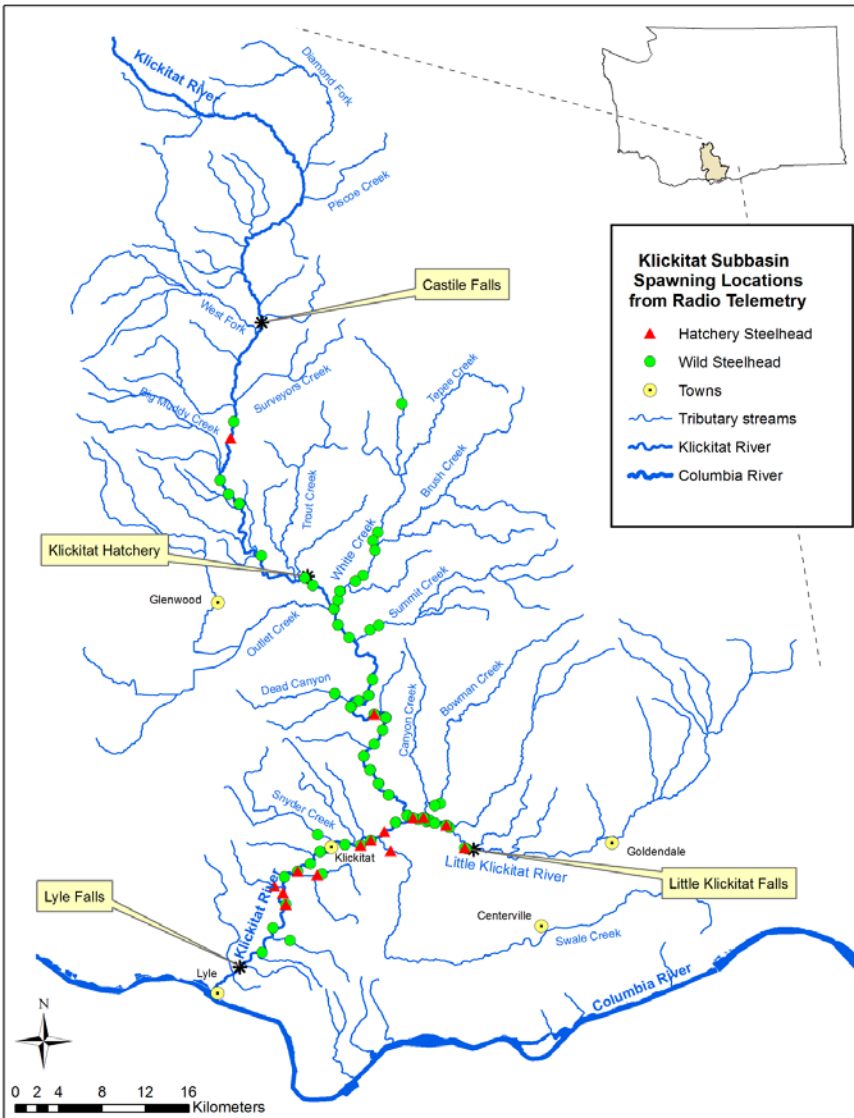
- ESA-listed native steelhead population in Klickitat
- Radio Telemetry study 2009-2014
- Objectives:
 - Patterns in Hatchery and Wild Spawner interactions
 - Passage issues
 - Harvest, Mortality rates
 - Spawning and Behavior of various Genetic groups
(Out-of-basin strays, etc.)
 - Spawning Patterns in Summer- and Winter-run steelhead

Radio telemetry methods

- Tagged at Lyle Falls adult trap at Rkm 3.8 (RM 2.4)
- Mobile and fixed-site detections
- Detection data reviewed to determine fates (wild spawn, mortality or regurgitated tag, harvest, etc.)
 - 3-biologist consensus
- Wild spawners: Location and start/end dates

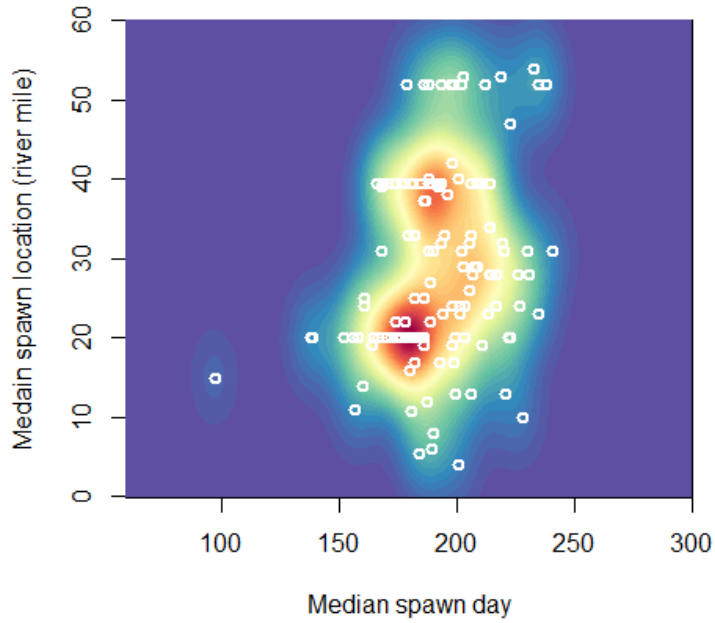


Previous Results – Hatchery/Wild Spawner Interactions

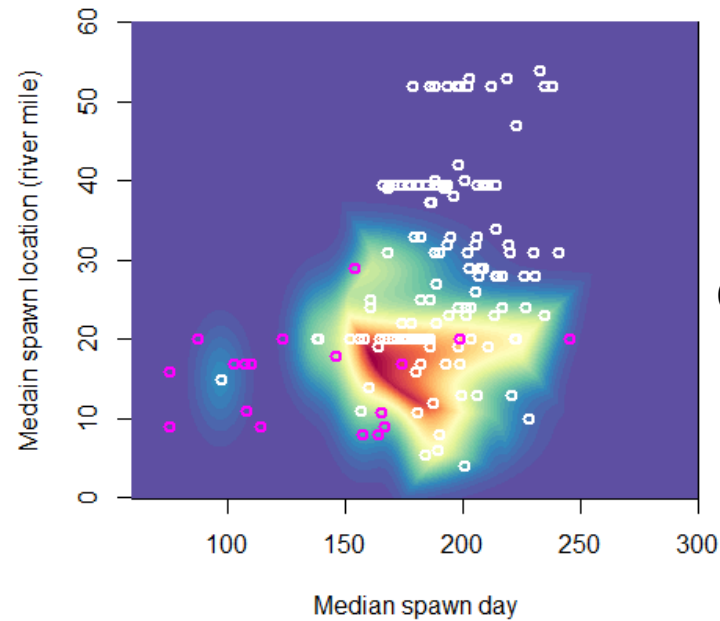
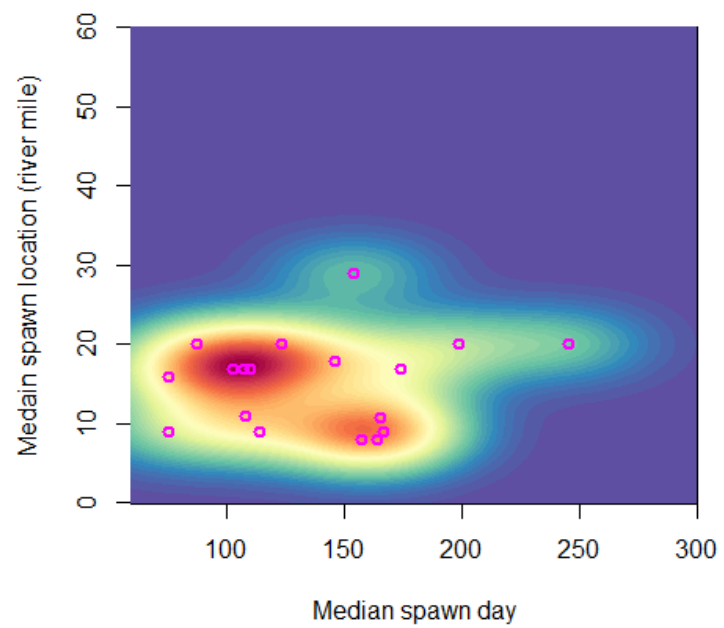


85% of Wild Steelhead started spawning after 75% of Hatchery steelhead had completed spawning.

Wild (Adipose-present) Steelhead



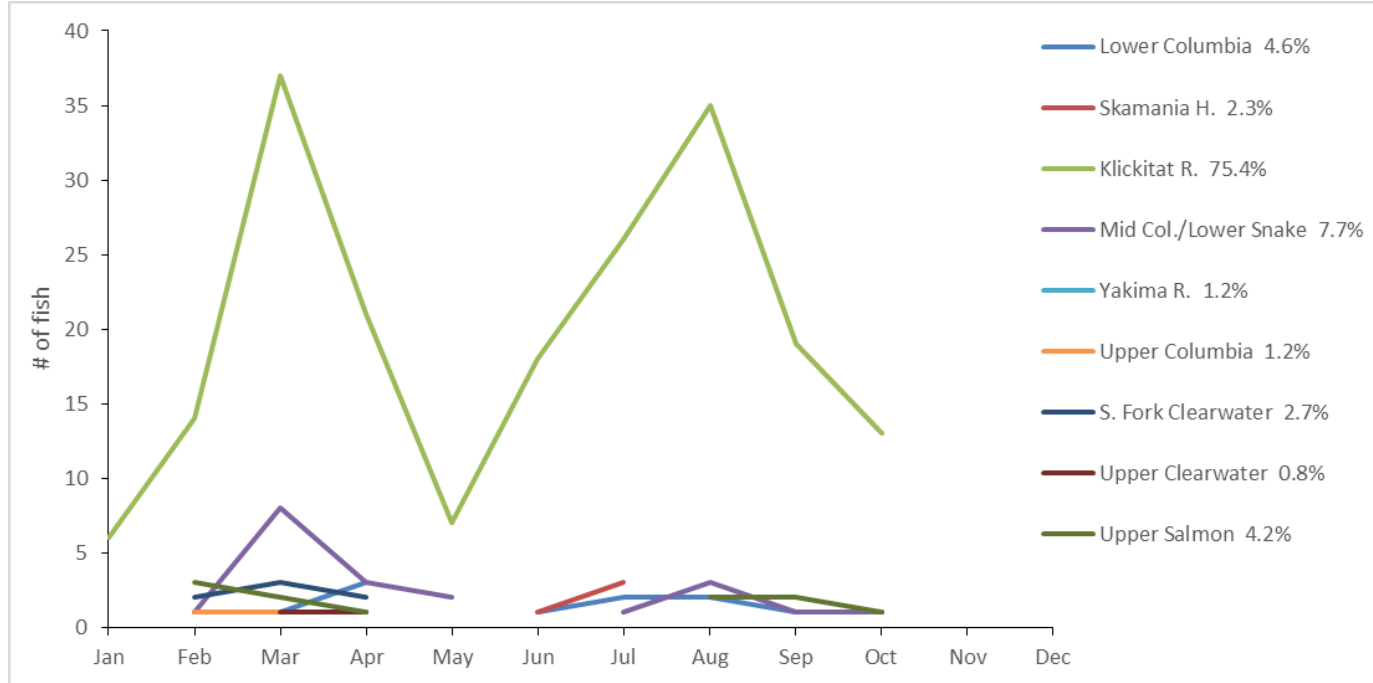
Hatchery (Adipose-clipped) Steelhead



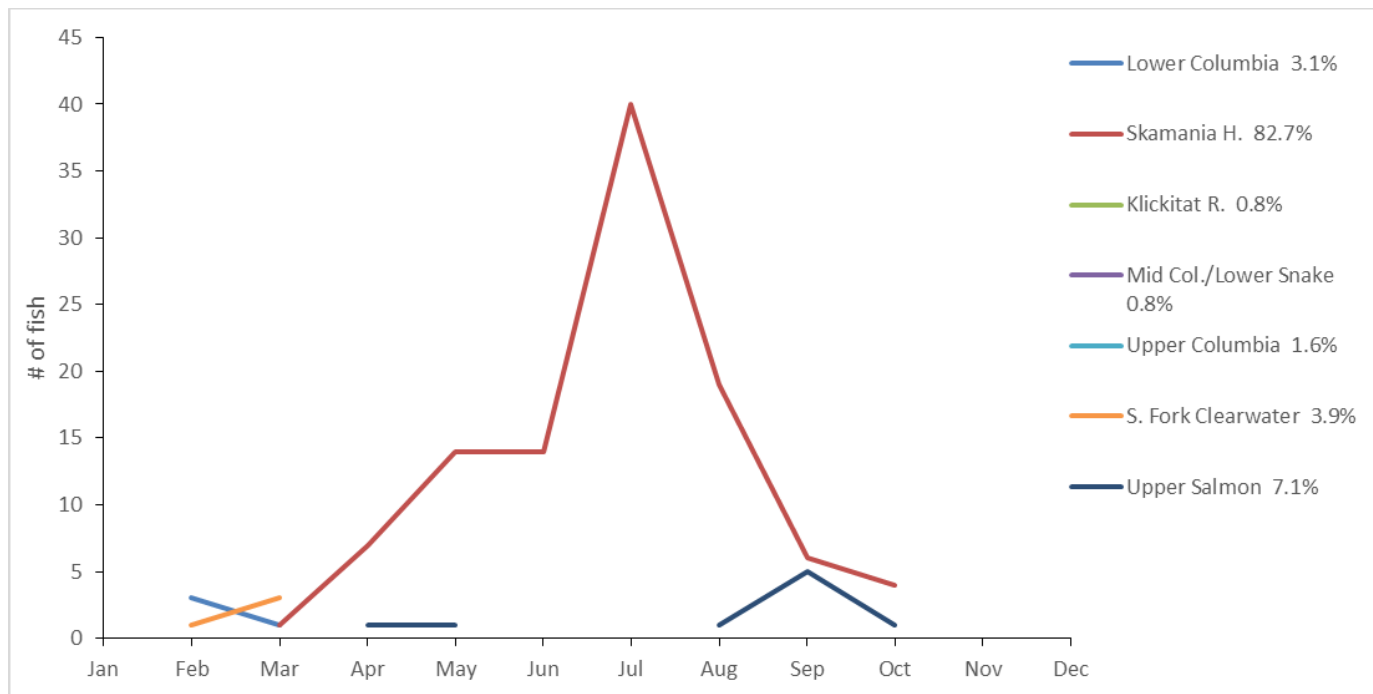
Overlap = 0.285

Radio Tagging and Genetic Stock Identification totals

Adipose-present steelhead
(N = 260)



Adipose-clipped steelhead
(N = 127)



Steelhead spawning by Genetic Stock

(known-fate fish only; use % as relative comparisons not absolute estimates)

Adipose-present steelhead:

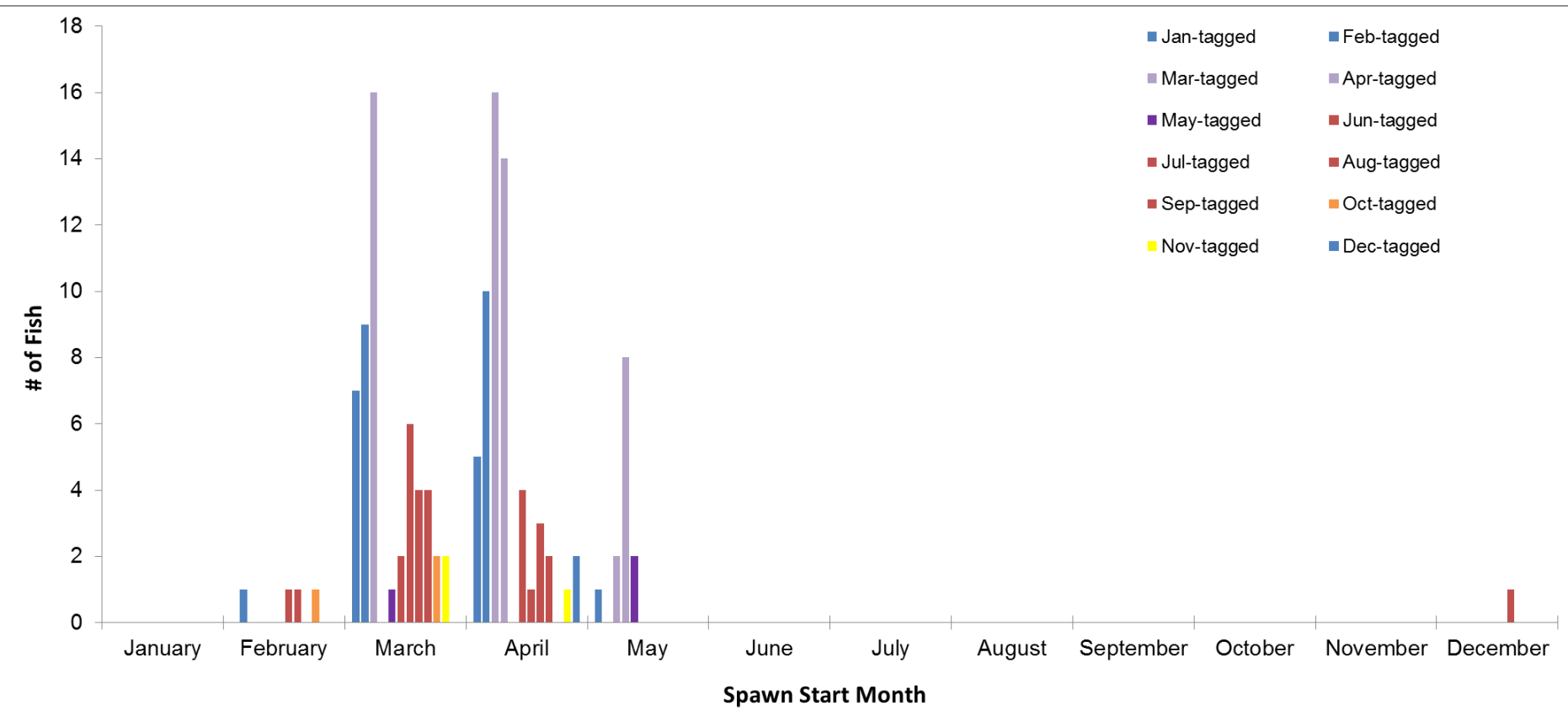
<u>GSI Reporting Group (Best Estimate)</u>	<u>Spawned in wild (Klickitat)</u>	<u>Total GSI Tagged</u>	<u>% of total</u>	<u>% of stock spawners</u>	<u>% of</u>
Lower Columbia	6	11	2.8%	54.5%	4.9%
Skamania Hatchery	2	4	0.9%	50.0%	1.6%
Klickitat River	92	155	43.2%	59.4%	75.4%
Middle Columbia/Lower Snake	11	19	5.2%	57.9%	9.0%
Yakima River	0	3	0.0%	0.0%	0.0%
Upper Columbia	0	2	0.0%	0.0%	0.0%
South Fork Clearwater River	6	7	2.8%	85.7%	4.9%
Upper Clearwater River	1	2	0.5%	50.0%	0.8%
Upper Salmon River	4	10	1.9%	40.0%	3.3%
	122	213	57.3%		100.0%

18%

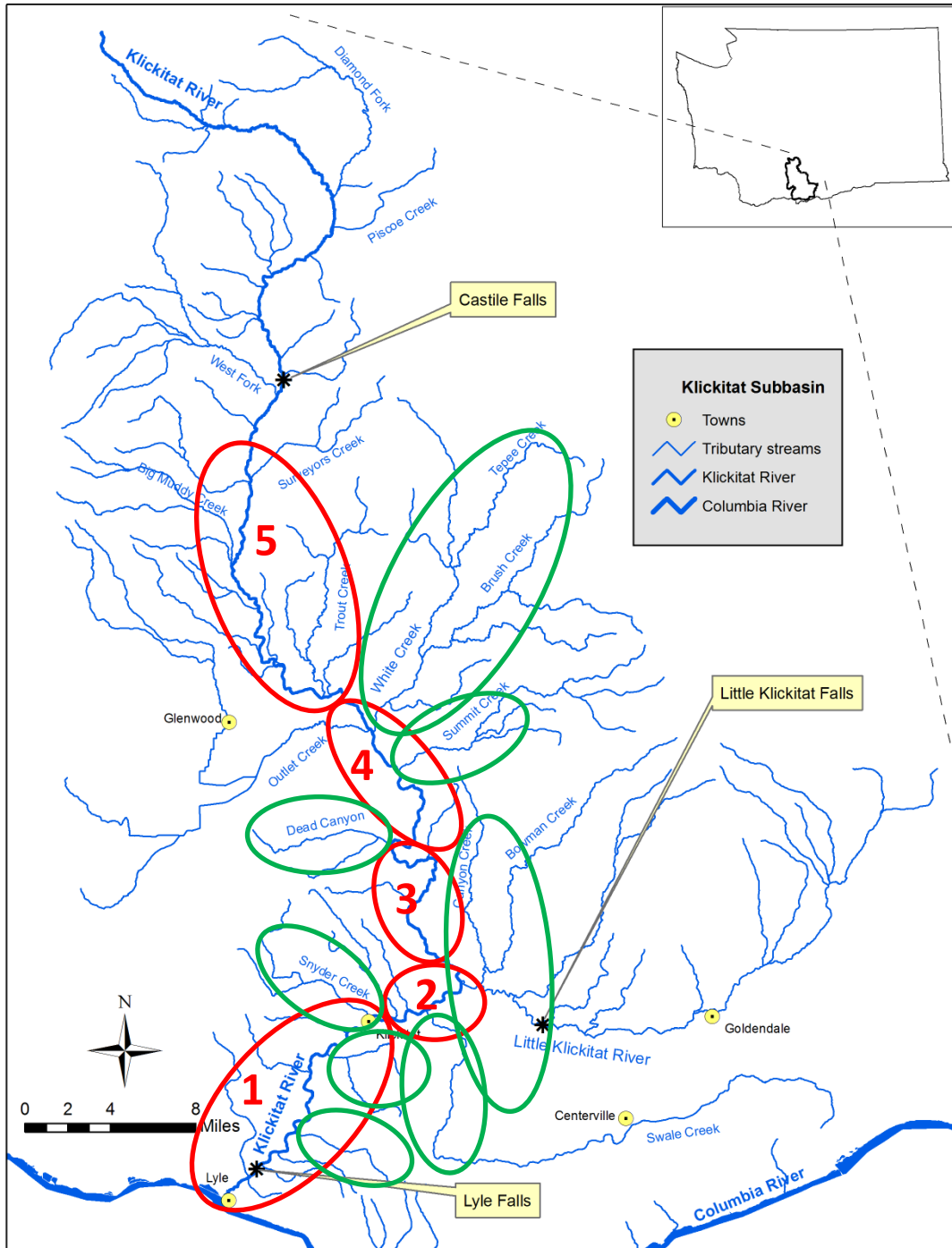
Adipose-clipped steelhead:

<u>GSI Reporting Group (Best Estimate)</u>	<u>Spawned in wild (Klickitat)</u>	<u>Total GSI Tagged</u>	<u>% of total</u>	<u>% of stock spawners</u>	<u>% of</u>
Lower Columbia	2	4	2.1%	50.0%	16.7%
Skamania Hatchery	7	72	7.4%	9.7%	58.3%
Klickitat River	0	1	0.0%	0.0%	0.0%
Middle Columbia/Lower Snake	0	1	0.0%	0.0%	0.0%
Upper Columbia	0	2	0.0%	0.0%	0.0%
South Fork Clearwater River	1	5	1.1%	20.0%	8.3%
Upper Salmon River	2	9	2.1%	22.2%	16.7%
	12	94	12.8%		100.0%

Adipose-present steelhead



86.0% of fish start spawning in Mar-Apr



Klickitat Reach 1: RM 0-15 (Rkm 0-24)
 Dillacort Creek
 Wheeler Creek
 Snyder Creek

Klickitat Reach 2: RM 16-20 (Rkm 25-32)
 Swale Creek
 Little Klickitat River (incl. Bowman Creek)

Klickitat Reach 3: RM 21-30 (Rkm 33-48)
 Dead Canyon Creek

Klickitat Reach 4: RM 31-40 (Rkm 49-64)
 Summit Creek
 White Creek

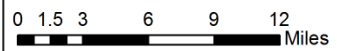
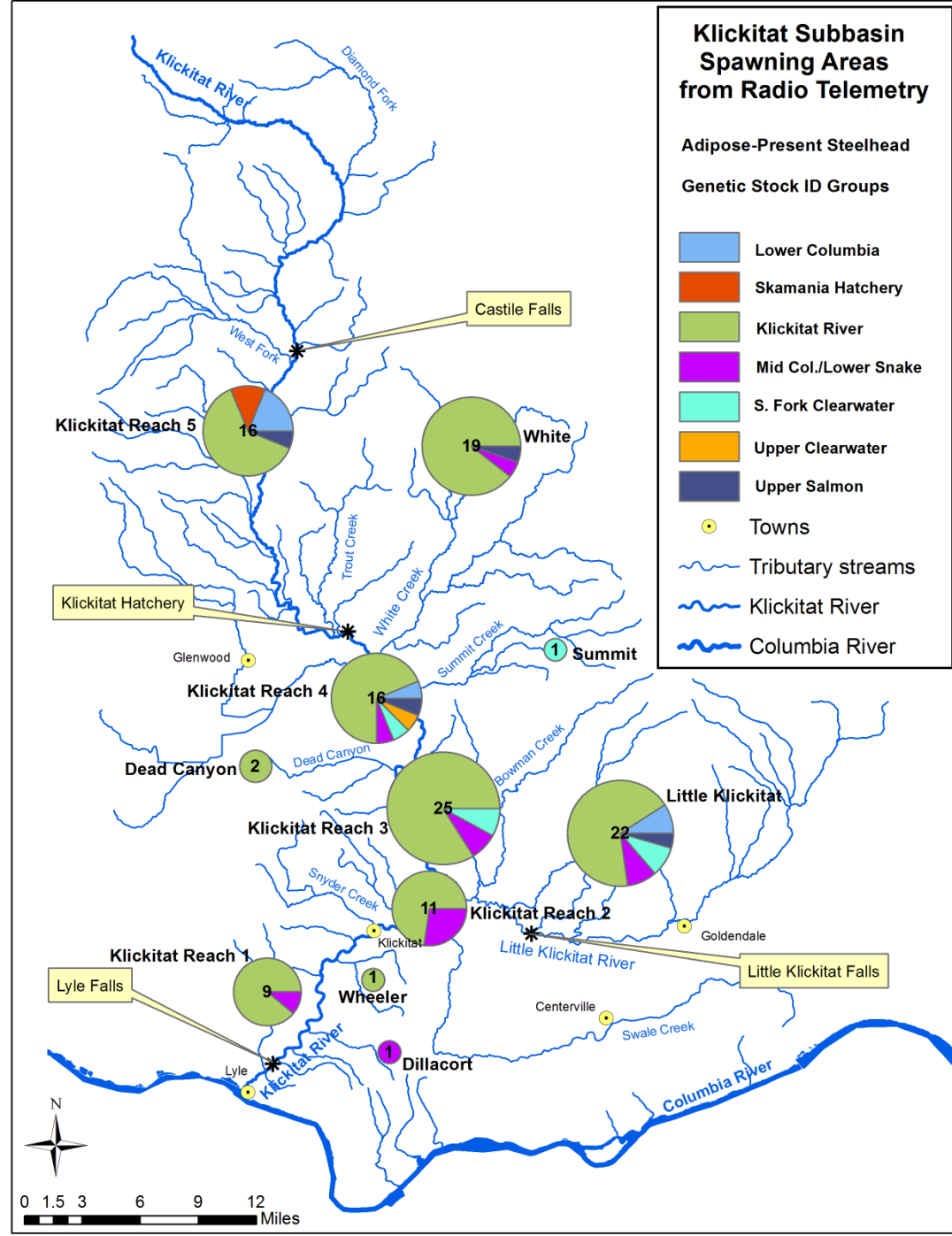
Klickitat Reach 5: RM 41-60 (Rkm 65-97)

Klickitat Subbasin Spawning Areas from Radio Telemetry

Adipose-Present Steelhead

Genetic Stock ID Groups

- Lower Columbia
- Skamania Hatchery
- Klickitat River
- Mid Col./Lower Snake
- S. Fork Clearwater
- Upper Clearwater
- Upper Salmon
- Towns
- Tributary streams
- Klickitat River
- Columbia River



Klickitat Subbasin Spawning Areas from Radio Telemetry

Adipose-Present Steelhead
 - Summer run (May-Nov)
 - Winter run (Dec-April)

Summer

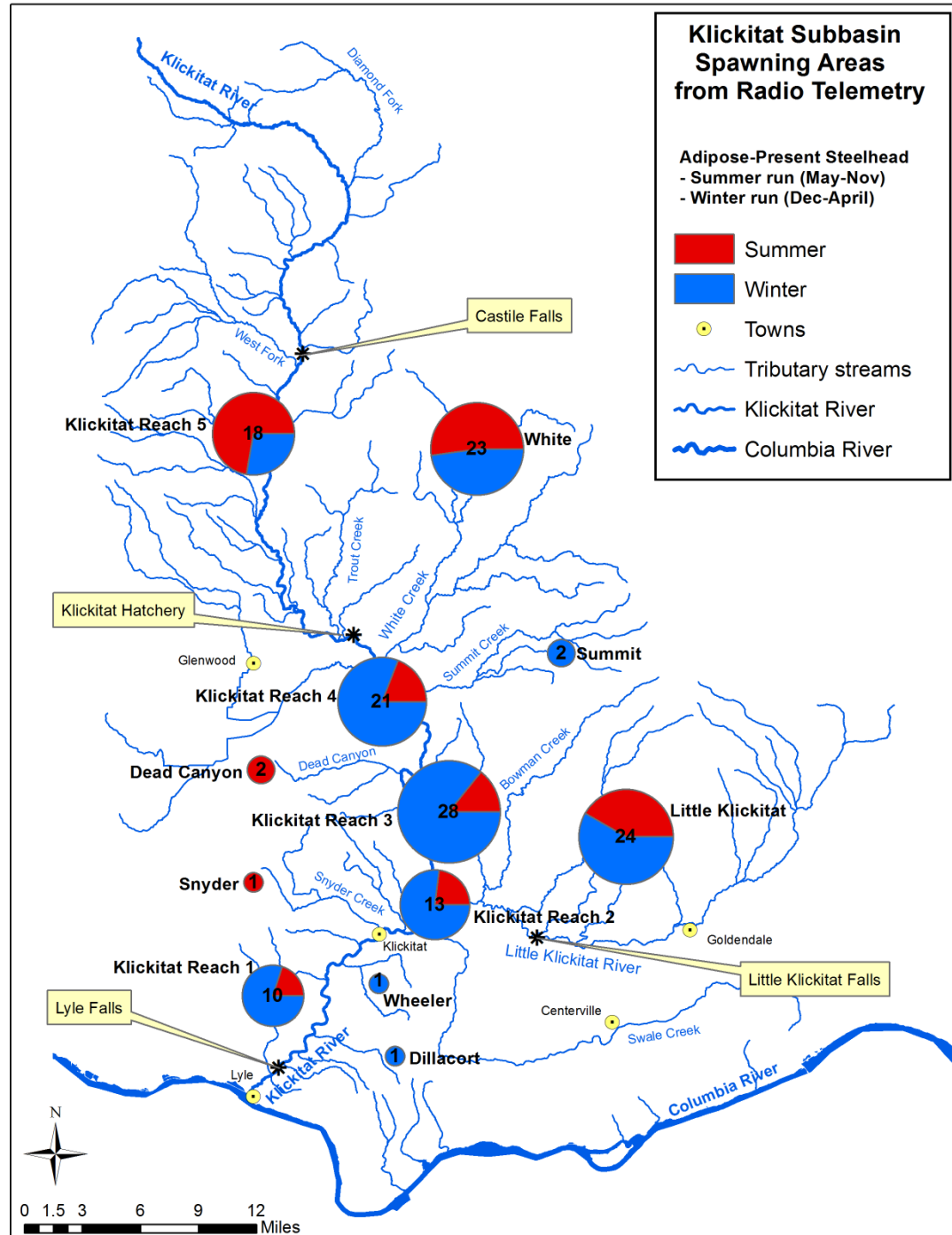
Winter

Towns

Tributary streams

Klickitat River

Columbia River



For known-fate fish:

- 41.8% of summer steelhead spawned in wild
- 72.2% of winter steelhead spawned in wild

Hess et al. 2016:

- Summer and winter steelhead in Klickitat maintain some distinct genetic markers but are largely interbreeding

Conclusions

- Hatchery Steelhead spawn earlier and lower in the Klickitat subbasin (and in lower numbers) than Wild Steelhead



Natural-origin Steelhead:

- Entering Klickitat:
 - 75.4% native Klickitat stocks; 2.3% Skamania; 22.4% other river basins
- Majorities (55-60%) of known-fate fish of Klickitat, Lower Columbia, Mid-Columbia/Lower Snake, and other Snake R. genetic groups spawned in the wild in Klickitat subbasin
 - Native Klickitat stocks comprised 75.4% of spawners
 - Out-of-basin spawners fairly widespread in geographic area, and comprise ~23% of spawners, but limited in White Creek
- Summer- and Winter-run spawners also fairly well mixed in time and space, with some evidence of summer fish spawning higher in subbasin, and winter fish spawning slightly later
 - Winter fish also appeared to spawn at a higher rate (72% vs. 41%)
- More Spawning in mainstem middle Klickitat than previously observed

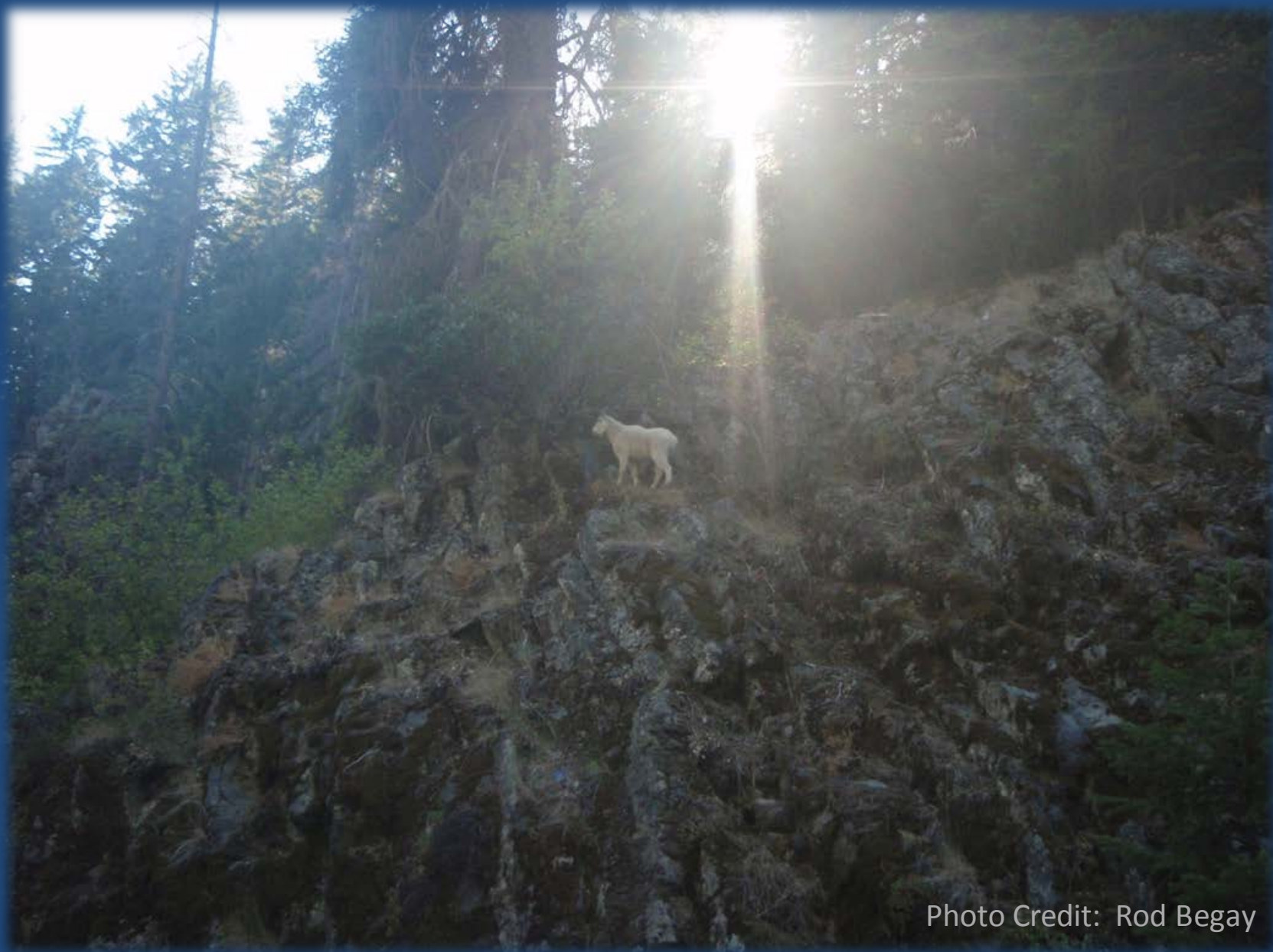


Photo Credit: Rod Begay