Estimates of Wenatchee Steelhead Redds in 2020

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Abstract

This report contains estimates of total steelhead spawners in the Wenatchee.

Contents

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Table 1: Data from the radio telemetry study, representing fish known to have escaped to the Wenatchee River.

Year	Origin	Initial Fish	Surviving Fish	Survival	SE
2015	Hatchery	20	16	0.80	0.09
2015	Natural	25	24	0.96	0.04
2016	Hatchery	4	3	0.75	0.22
2016	Natural	12	9	0.75	0.12
Total	**Hatchery**	**24**	**19**	**0.79**	**0.08**
Total	**Natural**	**37**	**33**	**0.89**	**0.05**

Table 2: Known number of fish removed at dams or due to harvest, by origin.

Source	Hatchery	Natural
Dryden	39	33
Harvest	0	0
Tumwater	24	33

1 Introduction

Redd counts are an established method to provide an index of adult spawners (Gallagher et al. 2007). However, all redd surveys were cancelled during the steelhead spawning season due to COVID-19. Therefore, for this year, we have devised another method to estimate the number of spawners In the Wenatchee subbasin, based on results from a PIT-tag based patch-occupancy model that estimates escapement, and a radio telemetry study that estimated overwinter survival in the mainstem of the Wenatchee.

2 Methods

2.1 Data

2.1.1 Escapement

Estimates of escapement to various tributaries in the Wenatchee were made using a branching patch-occupancy model (Waterhouse et al. 2020) based on PIT tag observations of fish tagged at Priest Rapids dam. All fish that escaped to the various tributaries were assumed to be spawners (i.e. prespawn mortality only occurs in the mainstem). The remaining fish may have survived the winter and spawned in the mainstem (where redd counts would normally be conducted).

2.1.2 Overwinter survival

Estimates of overwinter survival in the mainstem Wenatchee come from a radio telemetry study, conducted over two years (2015 and 2016) in the Wenatchee (Fuchs et al. n.d.). Steelhead in the study were both radio and PIT tagged, and zero mortality was observed in fish once they entered the tributaries of the Wenatchee. Tags were combined across both years of the study, since we are making the assumption that overwinter survival is consistent year to year.

2.1.3 Known removals

Before applying overwinter survivals, we must account for any fish removed at Tumwater or Dryden for brookstock or surplus, as well as any deaths due to harvest (Table 2).

2.2 Analysis

Due to a lack of redd counts in 2020, we instead start with estimates of escapement from the PIT-tag based patch-occupancy model. As we are assuming that all the fish that escaped to the tributaries were spawners, we only need to update the escapement estimates of the mainstem areas. The patch-occupancy model contains estimates for two mainstem areas: above and below Tumwater dam. First we subtract known removals from each of those areas, based on 2; Dryden removals are subtracted from below Tumwater, and Tumwater removals are substracted from above Tumwater. Then we apply the overwinter survival estimates from the radio telemetry study, by origin. We then assume that all the fish that survived the winter and remained in the mainstem were spawners.

Table 3: Inputs and estimates of mainstem spawners.

Location	Origin	PO Estimate	PO SE	Removed	Escapement	Overwinter Surv.	Overwinter SE	Spawners	Spawners SE
Below TUM	Hatchery	26	10.2	39	0	0.792	0.059	0	8.1
Below TUM	Natural	64	16.1	33	31	0.892	0.036	28	14.4
Above TUM	Hatchery	25	9.9	24	1	0.792	0.059	1	7.8
Above TUM	Natural	77	18.3	33	44	0.892	0.036	39	16.4

Table 4: Estimates (CV) of spawners by area and origin.

Area	Natural	Hatchery
Below TUM	28 (0.52)	0 (-)
Above TUM	39 (0.42)	1 (9.9)
Icicle	37 (0.34)	19 (0.43)
Peshastin	70 (0.25)	8 (0.69)
Mission	33 (0.36)	15 (0.53)
Chumstick	29 (0.37)	0 (-)
Chiwaukum	29 (0.38)	0 (-)
Chiwawa	44 (0.32)	23 (0.43)
Nason	32 (0.35)	24 (0.4)
Little Wenatchee	7 (0.74)	0 (-)
White River	0 (-)	0 (-)
Total	**348 (0.12)**	**90 (0.24)**

3 Results

3.1 Mainstem spawners

Estimates of mainstem spawners above and below Tumwater dam are shown in Table 3.

3.2 Total spawners

Table 4 displays estimates of spawners in all areas within the Wenatchee, as well as the total by origin.

4 Discussion

Despite the lack of redd count data this year, we were able to estimate the number of spawners, by origin through applying an empirical estimate of mainstem overwinter survival to escapement estimates to the mainstem areas. When accounting for known removals, the known number of fish removed sometimes exceeded the patch-occupancy estimate to that area, but the removals were within the 95% confidence interval of that estimate. Therefore, in any situation when removals exceeded patch-occupancy estimates, we set escapement equal to zero. This was only applicable to hatchery fish below Tumwater this year.

5 Acknowledgements

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6 References

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