Estimates of Wenatchee Steelhead Redds and Spawners

Spawn Year 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**

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 Wenatchee subbasin 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 focus on estimates of escapement from the PIT-tag based patch-occupancy model, by origin. We started with escapement to the entire Wenatchee subbasin (past

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

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

site LWE), and then subtracted known removals. After this, we applied an overwinter survival estimate to determine how many fish survived to spawn. We determined how many mainstem spawners by subtracting the total number of estimated tributary spawners from the total population level estimate of spawners.

Table 3: Inputs and estimates of mainstem spawners.

Location	Origin	PO Estimate	PO SE	Removed	Escapement	Overwinter Surv.	Overwinter SE	Trib Spawners	Trib SE	Spawners	Spawners SE
Mainstem	Hatchery	140	23.8	63	77	0.792	0.059	89	18.7	0	26.9
Mainstem	Natural	420	40.8	66	354	0.892	0.036	279	34.2	37	51.5

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

Area	Natural	Hatchery
Mainstem	37 (1.4)	0 (-)
Icicle	37 (0.34)	19 (0.43)
Peshastin	69 (0.24)	8 (0.68)
Mission	33 (0.36)	15 (0.53)
Chumstick	29 (0.37)	0 (-)
Chiwaukum	28 (0.4)	0 (-)
Chiwawa	44 (0.32)	23 (0.43)
Nason	32 (0.35)	24 (0.4)
Little Wenatchee	7 (0.73)	0 (-)
White River	0 (-)	0 (-)
Total	**316 (0.12)**	**61 (0.32)**

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 overwinter survival to total escapement estimates to the sub-basin. After accounting for known removals and tributary spawners, the estimates of mainstem spawners for hatchery origin fish did drop below zero. Therefore, we fixed the estimate of mainstem hatchery spawners to zero.

5 Acknowledgements

The data for this report was collected by Washington Department of Fish and Wildlife. Development of the observer error model was done in collaboration with Andrew Murdoch, WDFW.

6 References

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