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SURVIVAL OF HATCHERY STEELHEAD  
RELEASED IN MITIGATION FOR THE  
WYNOOCHEE LAKE PROJECT

by

Joseph M. Hiss  
Fishery Management Biologist

John H. Meyer  
Senior Staff Biologist

Ralph S. Boomer  
Project Leader

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The Wynoochee Dam was built at river mile (RM) 50 of the Wynoochee River in Grays Harbor County and closed in October, 1972. Some steelhead and sea-run cutthroat spawning grounds were permanently flooded by the reservoir, so Washington Department of Game (WDG) agreed with the Corps of Engineers to mitigate for the loss of a run of 1,700 anadromous trout presumed to use that area. Expected total survival was 1.0%, for a release of 170,000 smolts. The agreement (WDG 1967) was based on the assumption that the dam would pass juvenile salmonids and only required replacement of the potential fish production lost due to creation of Wynoochee Lake. This agreement addressed only steelhead and cutthroat since virtually no salmon were thought to spawn in the area to be inundated (Findlay 1967). In 1981, the Corps requested the U.S. Fish and Wildlife Service (FWS) evaluate the survival of hatchery steelhead planted under the existing mitigation program.

Survival was evaluated by means of hatchery-wild determination, mark recoveries at the dam, and expanded catch records that account for prior interception in the sport and commercial fisheries. Throughout this analysis it was necessary to assume that all returns of hatchery fish to the dam represent releases made in the immediate vicinity of the dam and not in the lower river, and that no smolts released near the dam spawned in the lower river.

The original Wynoochee mitigation agreement called for the expansion of the WDG Aberdeen Hatchery to rear 170,000 steelhead smolts to assure a return of 1,700 to the adult run. However, WDG has for various reasons not been able to rear this many smolts. Hatchery releases of Wynoochee native-brood fish were made from 1979 to 1983 in partial response to the existing mitigation agreement. The largest and most recent release was 54,680 smolts (Table 1). However, not all releases were made near the dam. On two occasions fish had to be released at Black Creek because of the mechanical problems with the hatchery truck (Bob Paulson, WDG Aberdeen Hatchery, personal communication). On three occasions fish were released into VanWinkle Creek to build up a hatchery brood run. Only those releases made at the dam were evaluated because the success of the lower river releases cannot be quantified and because VanWinkle releases are managed for a low fishery contribution rate not typical of the Wynoochee River releases. Only two of the five releases at the dam, 1980 and 1981, can be evaluated. This is because the 1979 release group was not examined for dorsal stubbing at the dam in 1980-81, and because the last two releases have not returned. Thus:

Survival for the 1980 release group was calculated as

$$S80 = [(Nm81)(E81)/N81 + (Nm82)(E82)/N82](1 + C/E)/P80$$

where:

S80 = survival of hatchery fish

Nm81 = number of marked steelhead recovered in 1981-82 sample

E81 = escapement to the upper river in 1981-82

Table 1. Hatchery steelhead releases of native stock in Wynoochee River and vicinity

Year	Location					
	Dam		Black Creek <sup>a/</sup>		VanWinkle Creek <sup>b/</sup>	
	No.	Mark	No.	Mark	No.	Mark
79	20,330	none				
80	7,500	LV			240	none
81	20,750	none	12,000	none	3,021	yes
82	39,135	CWT			3,025	yes
83	12,600	CWT	12,600	CWT		
	29,480	none				

a. Enters Wynoochee at RM 15.

b. Outlet stream from Lake Aberdeen, which draws its water from Wynoochee River at RM 8. VanWinkle Creek enters the Chehalis River about 8 mi. below the mouth of the Wynoochee.

N81 = number sampled in 1981-82 at dam  
 Nm82 = number of marked steelhead recovered in 1982-83  
 E82 = escapement to the upper river in 1982-83  
 N82 = number sampled in 1982-83 at dam  
 C/E = catch-to-escapement ratio  
 P80 = plant of smolts in upper river, 1980.

Thus:

$$\begin{aligned}
 S80 &= [(21)(288)/98 + (5)(545)/216](1 + 0.6)/7,500 \\
 &= (74)(1 + 0.6)/7,500 \\
 &= 1.59\%
 \end{aligned}$$

The reliability of this estimate is somewhat questionable due to the relatively low numbers of fish released and recovered. An estimate based on 21 and 5 recoveries in 1981 and 1982, respectively, should be viewed with caution.

Survival for the 1981 release group was calculated as:

$$S81 = [(Nj81)(E81)/N81 + (Ns82)(E82)/N82](1 + C/E)/P81$$

where:

Nj81 = number of jacks recovered in 1981-82 sample  
 Ns82 = number of stubbed-dorsal adults recovered in 1982-83 sample  
 P81 = plant of smolts in upper river in 1981.

Thus:

$$\begin{aligned}
 S81 &= [(17)(282)/98 + (163)(545)/216](1 + 0.6)/20,750 \\
 &= (461)(1.6)/20,750 \\
 &= 3.56\%
 \end{aligned}$$

This percentage is probably an overestimate of survival of the 1981 releases at the dam, due to the possibility of some of the Black Creek releases straying to the dam. Additionally, estimated returns of hatchery-reared fish based solely on incidence of dorsal stubbing are subject to positive bias due to the possible occurrence of dorsal stubbing in some of the adults of wild origin collected at the dam, and also due to the possible straying of hatchery-origin steelhead released in river systems outside the Wynoochee. The estimated survival of both release groups may be higher than that which might be expected if the mitigation program as originally planned were carried out, because relatively small releases have usually had higher survival than larger releases (G. Fenton, WDG, personal communication). The actual releases of 7,500 and 20,750 smolts, respectively, were well below the projected release of 170,000 smolts under the original proposal.

The Aberdeen Hatchery's production cannot significantly exceed the present level because of the cost of the necessary additional water. Therefore, it will probably not be possible the existing facility to carry out the additional steelhead mitigation recommended in our report, on the impact of the dam on the wild steelhead run produced above the reservoir (Hiss et al. 1983).

## LITERATURE CITED

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