MIGRATION BEHAVIOR AND DISTRIBUTION OF ADULT WINTER AND SUMMER STEELHEAD RADIO-TAGGED AT WILLAMETTE FALLS AND OF 'RECYCLED' SUMMER STEELHEAD AT FOSTER AND DEXTER DAMS IN 2012-2014

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Our objectives in this three-year (2012-2014) study were to describe the pre- and post-spawn migration behaviors and spawning distributions of winter and summer steelhead collected and radio-tagged at Willamette Falls Dam or radio-tagged after collection at upstream sites and 'recycled' downstream for angler opportunity.

Winter Steelhead

We collected and radio-tagged 184, 170, and 212 winter steelhead (i.e., intact adipose fin) at Willamette Falls during the 2012, 2013, and 2014 run years, respectively. The samples were 2.4-4.0% of the winter steelhead counted at the project from 1 November through 31 May. We inferred spawning distribution from the maximum upstream detections for each adult if the detections occurred during plausible spawning periods. Annual escapement rates to tributaries ranged from 82-84%. Across years, the tributaries with the highest mean percentages of tagged winter steelhead were the North and South Santiam rivers (~20% each), the Molalla River (15%) and the Middle Fork of the Willamette River (10%). Another 3-4% migrated to the Clackamas, Tualatin, Yamhill, and Calapooia rivers, on average. Means of ≤ 2%migrated to the McKenzie River, Fall Creek, Rickreall Creek, the Coast Fork, and the lower Santiam River. A mean of 11% of the tagged annual samples migrated no further upstream than Willamette Falls Dam and 6% had maximum river kilometers in the main stem indicating potential mortalities. We observed substantial downstream movements by tagged winter steelhead in late winter and spring, likely representing post-spawning outmigration events (i.e., kelting). Annual kelting rates ranged from 47-51% based on all tagged fish and from 57-61% based on only those steelhead that were detected inside tributaries. Annual kelting rates varied widely among populations and across years within population.

Summer steelhead

We radio-tagged 195, 250, and 196 summer steelhead (i.e., clipped adipose fin) in 2012, 2013, and 2014, respectively, which ranged from 0.8-2.4% of the annual summer steelhead counts at Willamette Falls. Annual escapement rates to tributaries were 75% in 2012 (fish were restrained, not anesthetized), 80% in 2013 (anesthetized), and 90% in 2014 (anesthetized). Across years, the tributaries with the highest mean percentages of tagged summer steelhead were

the South Santiam River (31%), Middle Fork Willamette River (18%), McKenzie River (16%), and North Santiam River (10%). On average, <2% migrated to the Clackamas River, the Molalla River, the lower Santiam River, the Coast Fork, and Fall Creek. A mean of 9% was last detected in the upper main stem Willamette and 5% was last detected in the lower main stem above Willamette Falls; 4% was last detected downstream from Willamette Falls Dam. Based on the criteria of: 1) tributary entry in summer/fall and 2) substantial downstream movements on or after 1 March the ensuing year, 2.5% (2012) and 1.2% (2013) of the summer steelhead exhibited kelt behavior.

There was evidence that some tributary spawning habitats were used by both winter and summer steelhead. Last detection locations of summer steelhead tagged in 2012 and 2013 spatially overlapped the maximum river kilometers for winter steelhead tagged in 2013 and 2014 in the South and North Santiam rivers and in the Middle Fork Willamette River.

Recycled summer steelhead at Foster and Dexter dams

At Foster Dam, we radio-tagged 95 (2012), 100 (2013), and 100 (2014) summer steelhead and released most at Waterloo County Park (~23 rkm downstream from Foster Dam) or at the Pleasant Valley Boat ramp (~6.2 rkm downstream from Foster Dam). In addition, some fish were released near the mouth of Wiley Creek (<1 rkm downstream from Foster Dam) in 2013 and directly into the Foster Dam tailrace in 2014.

At Dexter Dam, we radio-tagged 49-50 summer steelhead in all the three years and released them directly into the Dexter Dam tailrace. Tagging dates were on 25 July and 8 August in 2012; on four days from17 July through 13 August in 2013; and on four days from 18 June through 16 July in 2014.

Fates of recycled summer steelhead varied by year and release location. In all years, at least a third of the radio-tagged fish released downstream from Foster Dam were last detected on a fixed-site receiver or mobile tracked in the South Santiam River. Another 23-42% returned to Foster Dam, where they were either ponded for broodstock or surplussed by ODFW each year. Annual reported recreational angler harvest of the Foster-tagged fish released downstream ranged from 4-14%. Additionally, reported angler harvest was higher for fish released closer to Foster Dam in 2013 and 2014. The portion of fish that left the South Santiam River was small each year, with a maximum of 15 (16%) fish in 2012 detected outside the South Santiam. During all years, most fish that left the South Santiam were last detected in either the main stem Santiam or in the lower Willamette River. However, two fish released downstream from Foster Dam were last detected in the Mary's River and in Wiley Creek.

In all years, at least 39% of summer steelhead released downstream from Dexter Dam were last detected on a fixed-site receiver or mobile tracked in the Middle Fork Willamette River. Only one fish, in 2012, was re-collected by ODFW personnel at Dexter Dam. Reported angler harvest of Dexter-tagged steelhead was 16 in 2012, 14% in 2013, and 24% in 2014. Proportionately more steelhead left the Middle Fork than the South Santiam: last detections were outside the Middle Fork for 16 (33%) fish in 2012, 15 (30%) fish in 2013, and 8 (16%) fish in 2014. The majority in all years moved to the Willamette River main stem.