

Spring-run Chinook salmon technical memorandum
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Sentinel/surrogate annotated bibliography

Papers:

Beeman, J.W., S.D. Evans, P.V. Haner, H.C. Hansel, A.C. Hansen, C.D. Smith, and J.M. Sprando. 2014. Passage and survival probabilities of juvenile Chinook salmon at Cougar Dam, Oregon, 2012. U.S. Geological Survey Open-File Report 2014-1038, 64 p.

<http://pubs.usgs.gov/of/2014/1038/pdf/ofr2014-1038.pdf>

Subyearling hatchery Chinook salmon were tagged with radio transmitters and PIT tags to evaluate passage and survival probabilities of fish passing Cougar Dam (McKenzie River, Oregon). The hatchery Chinook salmon used for this experiment were from the Wild Fish Surrogate project (Oregon State University) and were the progeny of hatchery spring-run Chinook salmon from the North Santiam River. Dam passage and apparent survival were evaluated at two different dam operation scenarios in November and December. Dam passage and apparent survival probabilities were estimated using a model (Route-Specific-Survival-Model) with data from surface-acclimated fish released near the water surface just upstream of the temperature control tower (treatment group) and just downstream of the dam (control group). The vast majority (>93%) of dam passage of volitionally migrating fish occurred at night. The passage percent of fish released in the reservoir was about 70%.

Beeman, J.W., H.C. Hansel, A.C. Hansen, P.V. Haner, J.M. Sprando, C.D. Smith, S.D. Evans, and T.W. Hatton. 2013. Behavior and dam passage of juvenile Chinook salmon at Cougar Reservoir and Dam, Oregon, March 2011 – February 2012. U.S. Geological Survey Open-File Report 2013-1079, 48 p.

<http://pubs.usgs.gov/of/2013/1079/pdf/ofr20131079.pdf>

Yearling and subyearling juvenile spring-run Chinook salmon were tagged with acoustic transmitters and PIT tags in the spring and fall, respectively, to evaluate behavior and dam passage at Cougar Reservoir and Dam (McKenzie River, Oregon). The tagged fish were of hatchery and wild origins with hatchery fish from the McKenzie River Hatchery and wild fish captured in Cougar Reservoir. In the spring, a total of 411 hatchery fish and 26 wild fish were tagged and released while in the fall, 356 hatchery fish and 117 wild fish were tagged and released. Both tagging and releases occurred over 3 month periods. Passage past Cougar Dam was greatest in the fall and winter. Of the fish released in the spring, 10.5 % of the hatchery fish and 15.4 % of the wild fish passed the dam, whereas for fish released in the fall, 25.3 % of the hatchery fish and 16.9 % of the wild fish passed the dam. The rate of dam passage was affected by diel period, discharge, and reservoir elevation with diel period being the most influential (nighttime passage rates about 9 times greater than daytime rates). The results suggested that hatchery fish could be reasonable surrogates for wild fish based on their similar behavior (general movements in the

reservoir, timing of their dam passage, and the effects of diel period, discharge, and elevation on their passage rates).

Delaney, D., P. Bergman, B. Cavallo, and J. Melgo. Stipulation study: steelhead movement and survival in the south Delta with adaptive management of Old and Middle River flows. Report prepared by Cramer Fish Sciences for the California Department of Water Resources, Sacramento, California.

http://baydeltaoffice.water.ca.gov/announcement/Final_Stipulation_Study_Report_7Feb2014.pdf

A mark-recapture experiment was performed using acoustically tagged juvenile steelhead to examine survival and movement through the central and southern Delta at different Old and Middle river (OMR) hydraulic conditions. Hatchery juvenile steelhead from the Mokelumne River Hatchery were used as surrogates for wild juvenile steelhead emigrating through the Delta from the San Joaquin River. Acoustically tagged juvenile steelhead were released into the lower San Joaquin River at Buckley Cove in three different release groups that were separated by two week periods (April 15-16 [166 released], May 1-2 [167 released], and May 15-16 [168 released]). The releases were intended to target three different OMR reverse flow levels (-1250, -3500, and -5000 cfs) but the actual flow levels were -2466, -2933, and -5038 cfs before detection of steelhead tags at Railroad Cut triggered OMR flow modification (when 5% of acoustically tagged steelhead were detected moving south of Railroad Cut then OMR flows would be reduced to the least negative flow within the adaptive range [-1250 cfs]).

Limited selective tidal-stream transport movement patterns (moving on ebbing tides, holding on flooding tides) was observed in tags deployed in study fish. There was also some evidence that steelhead tags were being transported more commonly during the night in the mainstem San Joaquin River and more commonly during the day in the interior Delta.

The travel model developed indicated that most steelhead tags stayed in the mainstem San Joaquin River (77.6%) and 22.4% used Turner Cut. Overall survival was 50.2%, with survival for the mainstem route being 56.7% and survival for the Turner Cut route being 27.0%. Steelhead tags that used the mainstem route reached Chipps Island significantly earlier than steelhead tags that used Turner Cut.

There was no evidence that OMR flows in this study affected the routing of steelhead tags at Columbia Cut, Middle River, and Turner Cut. There was limited evidence that OMR flows had an effect on steelhead tags routing to the south at Railroad Cut and the export facilities.

Delta operations for salmonids and sturgeon technical working group. 2012. Annual report of activities October 1, 2011 to September 30, 2012. Sacramento, CA.

Coleman National Fish Hatchery juvenile late fall-run Chinook salmon are used as surrogates for natural yearling spring-run Chinook salmon emigration from Deer, Mill, and Antelope creeks. The fish are marked with an adipose fin clip and a unique CWT code prior to release. The hatchery late fall-run salmon are considered appropriate surrogates for yearling spring-run Chinook salmon because they are released at a similar size and at a similar time (first storm / high flow event). In 2012 there were three surrogate hatchery releases, one in December and two in January. The following are the dates and

numbers released for the three 2012 surrogate spring-run releases into Battle Creek: 1) 62,400 on 12/23/11, 2) 80,800 on 1/13/12, and 3) an unknown number on 1/20/12 due to a release malfunction. Two surrogates from the December release were observed at the CVP and eight surrogates were observed at the pumps from the first January release (3 at SWP and 5 at CVP).

Presentations:

Friesen, T.A., M.A. Johnson, S.E. Savoie, R.K. Schroeder, and P.M. Oldmsted. 2013. Migration, survival, growth, and fate of hatchery juvenile Chinooks salmon released above and below dams in the Middle Fork Willamette River. Oregon Department of Fish and Wildlife, Corvallis Research Laboratory.

http://oregonstate.edu/dept/ODFW/willamettesalmonidrme/sites/default/files/paired_release_mfwr_friesen_2013_wrr2.pdf

The effect that passage through dams and reservoirs (Lookout Point, Dexter, and Hills Creek) in the Middle Fork Willamette River has on survival of juvenile Chinook salmon was investigated using tagged hatchery juveniles with a paired release study design. Hatchery juvenile spring-run Chinook salmon were used as surrogates for wild fish with the major assumption that hatchery fish are phenotypically similar (size, timing, behavior, condition) to wild fish entering the reservoir. In the spring of 2011, about 6000 PIT tagged fish were released at the head of Lookout Point Reservoir, about 6000 PIT tagged fish were released at the Dexter tailrace, and about 200,000 adipose clipped plus CWT fish were released in the reservoir. In the spring of 2012, about 50,000 PIT tagged fish were released at the head of Lookout Point, about 49,000 PIT tagged fish released at Dexter tailrace, about 49,000 PIT tagged fish released in Hills Creek Reservoir, about 46,000 genetic mark fish released at head of Lookout Point, and about 46,000 genetic mark fish released at Dexter tailrace. The PIT tagged and adipose clip plus CWT tagged fish had median fork lengths of 65 mm while the genetic mark fish had median fork lengths of 40 mm. In 2011, 8.5% of the tailrace release group were detected at Willamette Falls while only 3.4% of the reservoir release group was detected. In 2012, 5.9% of the tailrace release group was detected at Willamette Falls while only 1.3% of the reservoir release group was detected. None of the fish released into Hills Creek Reservoir were detected. Fish had consistent migration rates of 4.5 to 6.0 km/day however, the tailrace release group were significantly faster than the reservoir release group. Median growth rates for reservoir released fish were 0.96 mm/day which was greater than the median growth rate for tailrace released fish of 0.38 mm/day. There was anecdotal evidence of substantial predation in reservoirs by non-native fish.

Friesen, T.A., M.A. Johnson, S.E. Savoie, R.K. Schroeder, and P.M. Oldmsted. 2013. Migration, survival, growth, and fate of hatchery juvenile Chinooks salmon released above and below dams in the North Santiam River. Oregon Department of Fish and Wildlife, Corvallis Research Laboratory.

http://oregonstate.edu/dept/ODFW/willamettesalmonidrme/sites/default/files/paired_release_nsr_friesen_2013_wrr2_0.pdf

The effect that passage through dams and reservoirs in the North Santiam River (Oregon) has on relative survival of PIT tagged hatchery juvenile spring-run Chinook salmon was investigated using a paired

release study design. Hatchery juvenile spring-run Chinook salmon were used as surrogates for wild fish with the major assumption that hatchery fish are phenotypically similar (size, timing, behavior, condition) to wild fish entering the reservoir. In August 2012, about 50,000 tagged fish were released at the head of Detroit Reservoir (37,500 CWT plus adipose clip and 12,500 CWT plus adipose clip plus PIT tag) with median fork length of 90 mm while an equivalent group was released in the tailrace at Minto. A total of 7.1% of the tailrace release group was recovered at Willamette Falls while 5.7% of the reservoir release group was recovered. Median migration rate was around 5.5 km/day with the tailrace release group being significantly faster than the reservoir release group. Median growth rate of reservoir release group was 0.85 mm/day while no tailrace release fish were recaptured.