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MANAGEMENT BRIEF

Effectiveness of a Fishway for Restoring Passage of Colorado River Cutthroat Trout

Brian W. Hodge*
Trout Unlimited, Post Office Box 771233, Steamboat Springs, Colorado 80477, USA

Eric R. Fetherman
Colorado Parks and Wildlife, Aquatic Research Section, 317 West Prospect Road, Fort Collins, Colorado 80526, USA

Kevin B. Rogers
Colorado Parks and Wildlife, Aquatic Research Section, Post Office Box 77577, Steamboat Springs, Colorado 80477, USA

Richard Henderson
U.S. Forest Service, Medicine Bow–Routt National Forest, 925 Weiss Drive, Steamboat Springs, Colorado 80487, USA

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Abstract

Little is known about the effectiveness of fishways for restoring passage to inland (nonanadromous) salmonids. We used PIT telemetry to evaluate the biological effectiveness of a vertical-slot fishway constructed to restore passage of adult Colorado River Cutthroat Trout *Oncorhynchus clarkii pleuriticus* (CRCT) in a small Rocky Mountain stream. Our objectives were to assess (1) fishway efficacy (whether or not the fishway restored fish passage), (2) approach efficiency (the probability that a tagged fish encountered the fishway; an index of population use), (3) attraction efficiency (the probability that a fish near the fishway located its entrance), and (4) passage efficiency (the probability that a fish entering the fishway navigated successfully through it). To account for antenna detection probabilities and avoid biases that can result from simple, proportion-based calculations, we used a variation of the Cormack–Jolly–Seber model to derive efficiency estimates. The fishway restored passage of adult CRCT to long-vacant habitats. Approach efficiency was 4%; attraction and passage efficiencies were 100%. We conclude that fishways can effectively restore passage of inland salmonids, and we recommend that additional fishway monitoring studies be conducted to inform decision-making and elucidate which designs and conditions will best facilitate passage.

Stream fragmentation has been implicated in the decline and extirpation of native fishes in North America (Nehlsen et al. 1991; Slaney et al. 1996; Sheer and Steel 2006). Habitat-fragmenting barriers, such as dams, diversions, and poorly constructed road–stream crossings (Schmetterling 2003; Gibson et al. 2005; Archdeacon and Remshardt 2012), can prevent fishes from accessing critical habitats (Sheer and Steel 2006), disrupt life histories (Beamish and Northcote 1989; Morita et al. 2000), and result in deleterious population-level effects (Beamish and Northcote 1989; Morita and Yamamoto 2002; Alò and Turner 2005). Removing fish passage obstacles from streams is one of the most effective ways to restore fish populations (Roni et al. 2008). However, because many instream barriers (e.g., dams and diversions) provide important societal benefits (Lehner et al. 2011; Januchowski-Hartley et al. 2013), structure removal may not always be feasible (but see East et al. 2015).

Fishways can facilitate fish passage around permanent instream obstacles (Clancy and Reichmuth 1990; Archdeacon and Remshardt 2012; Steffensen et al. 2013), but the reliability of fishways remains questionable for a number of reasons. First, relatively few fishways have been evaluated for their biological effectiveness (Schmutz et al. 1998; Roscoe and Hinch 2010; Bunt

*Corresponding author: bhodge@tu.org
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