Use Of Pit Tag-Detecting Antennas To Assess Culvert Passage Of Yellowstone Cutthroat Trout And Rainbow Trout In Mulherin Creek, A Tributary Of The Yellowstone River

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Road crossing culverts create passage barriers during fish migration and, as a result, there are various tools for predicting passage success. Most tools have not been field-tested and give a "yes" or "no" answer to passage success. However, an estimate of the probability of passage could be more useful given that success is contingent on dynamic interactions of fish size, discharge, water temperature, and hydraulic conditions. We utilized half-duplex PIT (passive integrated transponder) tags to assess the probability of passage of Yellowstone cutthroat trout and rainbow trout in relation to biotic and abiotic factors among three different culvert types on a spawning tributary to the Yellowstone River. Velocities were significantly different between smooth box, baffled box and smooth circular culverts but did not differ significantly between a natural stream reach and one baffled box culvert. There was a positive linear relationship between number of attempts and velocity and a negative linear relationship between number of attempts and drop height, most likely due to culverts with lower velocity having larger drop heights. Time required for passage was inversely related to water velocity. Culverts where velocities were most similar to natural reaches allowed fish to pass multiple times in both directions and some remained in the culvert for up to 22 hr. These results show that culverts that simulate natural conditions are most efficient for allowing fish passage and that PIT tags are an efficient method for determining not only probability of passage success but also can provide measures of passage difficulty.