

Bingham, D. M., A. J. Sepulveda, and S. Painter. 2021. A Small Proportion of Breeders Drive American Bullfrog Invasion of the Yellowstone River Floodplain, Montana. Northwest Science Vol 94, in press.

Abstract

The American Bullfrog (*Lithobates catesbeianus*) is a non-native invader of aquatic habitats across the northwestern United States. It recently invaded the Yellowstone River, Montana, and has spread to over 140 km of floodplain habitat. We analyzed seven microsatellites in 528 tadpoles sampled across nearly the entire Yellowstone River invasion (about 140 river km) to characterize invasion genetics, compare our results with those of a recent mtDNA study (Kamath et al. 2016), and to inform control efforts. Microsatellite variation supports the mtDNA-based hypothesis of at least two independent introductions to the floodplain from genetically divergent populations in the midwestern USA, followed by massive range expansion. One introduction is associated with the upstream extent of the invasion near Park City, Montana and the other more broadly with downstream populations. All sites were characterized by small effective numbers of breeders (N_b ; harmonic mean = 9.97), and therefore, a small proportion of highly successful adults may drive the invasion by producing large families. Microsatellites and mtDNA produced discordant estimates of genetic admixture between the upstream and downstream invasions, which may reflect small effective population size. Although we observed isolation by distance using both types of markers, microsatellites appear to reflect population structure resulting from secondary contact between the two introductions, as opposed to structure resulting from equilibrium between gene flow and genetic drift. Most sites showed evidence for genetic bottlenecks, which supports the recent history of invasion. Small N_b paired with known high localized extinction rates following colonization suggests focused removal of post metamorphic life stages at sites less likely to go extinct on their own could help limit invasion by bullfrogs.

Keywords: bullfrog, Yellowstone floodplain, microsatellite, effective number of breeders (N_b), genetic bottleneck

Note: This article has been accepted for publication in Northwest Science and has undergone full peer review, but has not been through the typesetting and proofreading process, which may lead to differences between this version and the final published version.