

Effects of fire on fish populations: landscape perspectives on persistence of native fishes
and nonnative fish invasions

J.B. Dunham¹, M.K. Young², R.E. Gresswell³, and B.E. Rieman¹

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¹U.S. Forest Service
Rocky Mountain Research Station
Boise Forestry Sciences Laboratory
316 East Myrtle
Boise, ID 83702

208-373-4380 (voice)
209-373-4391 (fax)
jbdunham@fs.fed.us (email)

²U.S. Forest Service
Rocky Mountain Research Station
Forestry Sciences Lab
800 Block East Beckwith
P.O. Box 8089
Missoula, Montana 59807

³U.S. Geological Survey - FRESC
3200 SW Jefferson Way
Corvallis, OR 97331

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Abstract

Our limited understanding of the short and long-term effects of fire on fish contributes to considerable uncertainty in assessments of the risks and benefits of fire management alternatives. A primary concern among the many potential effects of fire is the effects of fire and fire management on persistence of native fish populations. Limited evidence suggests vulnerability of fish to fire is contingent upon the quality of affected habitats, the amount and distribution of habitat (habitat fragmentation), and habitat specificity of the species in question. Species with narrow habitat requirements in highly degraded and fragmented systems are likely to be most vulnerable to fire and fire-related disturbance. In addition to effects of fire on native fish, there are growing concerns about the effects of fire on nonnative fish invasions. The role of fire in facilitating invasions by nonnative fishes is unknown, but experience with other species suggests some forms of disturbance associated with fire may facilitate invasion. Management efforts to promote persistence of fishes in fire-prone landscapes can take the form of four basic alternatives: 1) pre-fire management, 2) post-fire management, 3) managing fire itself (e.g., fire fighting), and 4) monitoring and adaptive management. Among these alternatives, pre-fire management is likely to be most effective. Effective pre-fire management activities will address factors that may render fish populations more vulnerable to the effects of fire (e.g., habitat degradation, fragmentation, and nonnative species). Post-fire management is also potentially important, but suffers from being a reactive approach that may not address threats in time to avert them. Managing fire itself can be important in some contexts, but negative consequences for fish populations are possible (e.g., toxicity of fire fighting chemicals to fish). Monitoring and adaptive management can provide important new

information for evaluating alternatives, but proper implementation is often hampered by inadequate study designs and inconsistent financial and institutional support. The challenge for providing better management guidelines will be to add solid empirical data and models to assess the relevance of emerging concepts and theories, and provide a sense of where and when fires pose significant risks and/or benefits to fishes.

