

# Lake States Fire Science Consortium

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## FIRE EFFECTS ON AMPHIBIANS AND REPTILES

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Fire may have direct or indirect effects on herpetofauna. These effects can be variable depending on habitats used and characteristics of individual species. Direct negative effects from fire usually consist of mortality events. Amphibians may be at an increased risk for direct mortality because they often have limited dispersal capabilities. Amphibians may also be particularly vulnerable to heat and the drying of microhabitats. Seasonality of fire can also play an important role in mortality events. The majority of wildland fires in North America take place in the summer months when many amphibians are underground or in close proximity to water due to drier environmental conditions, whereas most prescribed burning is done when conditions are wetter in the spring or fall. These wetter conditions may coincide with an increase in surface activity for amphibians and a greater mortality rate when fire occurs. While there is potential for direct mortality, it is widely believed that these effects are not significant on a population level for many species of herpetofauna.

Indirect effects from fire occur as a result of habitat alteration. Possible effects on habitat include increased solar radiation to soils and streams from loss of shade, sedimentation or a change in substrate composition, nutrient pulses or loading in lakes and streams, alteration of prey resources, and changes in vegetative structure. Whether these changes to habitat have an ultimate positive or negative effect on herpetofauna depends upon individual needs of a species. For example, in Florida longleaf pine (*Pinus palustris*) ecosystems, some reptile species are found in open, early successional habitats historically maintained by fire. For species requiring more ground



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### MANAGEMENT IMPLICATIONS

- 1) Indirect effects of fire through habitat alterations have greater impacts on herpetofaunal assemblages than direct effects (mortality).
- 2) Fire effects on amphibians and reptiles can be variable and dependent on factors such as timing of the burn and individual species characteristics or habitat needs.
- 3) Prescribed fire is thought to increase overall diversity of herpetofauna at broad scales, although site-level impacts may cause local declines for some species.

#### Want to learn more?

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### Research Brief for Resource Managers

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cover, however, immediate post-fire effects can be detrimental. Fire suppression also changes vegetation structure in ways that have impacts on herpetofauna. Surveys in Michigan over a 30-year period have suggested that local extirpations of amphibians may have occurred as a result of succession to closed canopy conditions and the associated changes in hydrology. Additionally, succession and stand maturation can fragment open landscapes suitable for some herpetofaunal communities.

While there are some species within fire-adapted ecosystems that benefit from climax vegetation, restoring landscape heterogeneity in fire-dependent ecosystems using prescribed fire has been suggested as an appropriate management tool that can benefit amphibians and reptiles. Beneficial indirect effects, resulting in broader-scale diversity of species, likely outweigh any direct mortalities or decrease in diversity of a particular patch. To confirm this, however, more extensive research is needed with pre-fire baseline data. It is also important to take into account other impacts from prescribed or wildland fires such as the creation of fire roads and firebreaks. These features on the landscape, especially near wetlands, can prevent migration and dispersal of individuals. In wetlands, firebreaks are sometimes constructed with the perception of protecting the wetland, when in reality keeping fire out of these places may encourage hardwood succession. There is little known about the effects of mechanical treatments such as thinning understory brush or removing coarse woody debris on amphibian populations. More information is also needed concerning the effects of fire retardants, fire suppressants, and herbicides on herpetofauna. Sodium ferrocyanide (an ingredient of fire retardants and suppressants) has been shown to cause amphibian mortality, and these chemicals can also have detrimental impacts through bioaccumulation. Herbicide applications have been shown to have mixed effects on herpetofauna.

Amphibians and reptiles are known to have complex life histories. Particularly for amphibians, multiple life stages of a single species each may be impacted differently from fire. Impacts from changes in habitat are likely greatest on habitat specialists. Fire effects on a landscape can be varied, creating a mosaic of vegetation structures that can at once create or destroy amphibian and reptile microhabitats. While the nature of fire makes generalized recommendations difficult, it is thought that the increased heterogeneity in successional stages and habitat structures resulting from fire should increase overall diversity on a large scale. More research is needed to better understand the effects of wildland fire, prescribed fire, and other treatments on herpetofauna.

## References

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