Prescribed Fire Use and Important Management Considerations for Amphibians and Reptiles within the Midwest[1]

1. Questions or comments contact:
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It is well known that fire has historically played an important role in creating and maintaining ecosystems in the Midwest. In landscapes where fire has been suppressed or where invasive and exotic plant species have taken hold, prescribed fire is a useful tool for restoring native plant communities. This management technique can be valuable for increasing suitable habitat for some herpetofauna. However, there is a growing body of evidence that it may also be damaging to resident populations of reptiles and amphibians. When planning prescribed fires, habitat managers should consider the needs of all parts of existing floral and faunal communities. Maintenance of native animal populations, particularly vulnerable, rare or threatened species, deserve as much attention as the manipulation of plant communities toward a pre-determined goal. To assist land managers concerned about the impacts of fire on herpetofauna, the Midwest Partners in Amphibian and Reptile Conservation (PARC) provide the following recommendations to promote effective use of prescribed fire in ecosystem restoration.

It is important to know the suite of amphibian and reptile species that occur within your region and to conduct baseline inventories to determine the presence of species within areas proposed for management with prescribed fire. Although seasonal activity varies greatly depending on location and species, herpetofauna within the Midwest are generally inactive in the winter and underground or underwater, and so are less vulnerable to the impacts of fire. This offers a window of opportunity for burning. However, care must be taken to consider species assemblages that are present in a particular habitat prior to conducting burns. Burns around wetlands may interfere with salamander breeding migrations by removing the detritus upon which they rely for cover. Winter fires can also expose hibernating frogs and terrestrial salamanders using the detritus and duff for cover, insulation, and moisture retention. Early spring burns in forests may harm Eastern Box Turtles emerging from hibernation, while burns later in spring and early summer in meadows and old fields during nesting may impact turtles laying eggs. Turtle and some snake populations can be particularly sensitive to burns because the length of time for individuals to become sexually mature means that the loss of only a few adults can dramatically affect population viability. Prior to burning (or the use of other high-impact management methods such as mowing) in known turtle habitats, managers should carefully consider whether the end result will benefit their population viability and whether the actions themselves can be modified or timed seasonally to eliminate mortality. Any management plan that threatens the local or large-scale destruction of native turtles or any other vulnerable native animal populations should be considered inadequate and be reassessed.

Management Recommendations

The following recommendations have been compiled based on review of scientific literature, ongoing field research, and discussion amongst experts in the field of herpetology and prescribed fire management. These recommendations are not arranged in any particular order of importance.

1. **Identify the herpetofaunal diversity of your site prior to large scale management.** Identify species diversity, population size and geographic extant, and evaluate potential impacts of several alternatives, including the "no action" alternative regarding habitat change due to invasive species or succession. This information can be obtained by reviewing Natural Heritage database for records of rare or sensitive species in the vicinity of the burn, contacting researchers or local agencies charged with conservation and management of herps in your area, or contracting qualified biologists with a strong background in amphibians and reptiles to conduct comprehensive inventories.

2. **Burning should be conducted during winter months when most herps are inactive.** Most Midwest herpetofauna are in winter refugia during this period. In most areas this would be from November 1 to March 1, but will vary based on location and latitude as well as fluctuations in annual precipitation and temperature conditions. Soil temperature inversions (i.e., when soil surface temperatures exceed deeper soil temperatures) may be used as an indicator of the onset of activity for many reptiles. However, because some salamander species emerge from hibernation very early, February burns may impact salamander migration. It is necessary to understand where populations of these species occur and plan accordingly.

3. **Burning after April 1 is discouraged.** However, harm may be minimized for many species if unusually cool (overcast, $\leq$10° C (50°F) conditions have persisted for many days. Management plans should allow for flexibility to respond to each year's conditions-planning should be more conservative during unusually warm years. Box turtles will emerge after soil temperatures (10 cm down, detritus excluded) exceed 5C for several days. They will be exposed thereafter, even if temperatures are subsequently cold.

4. **Spring burns in close proximity to snake hibernacula should be conducted well before the active season or not at all.** Snakes are concentrated early in the active season before they disperse from hibernacula and are vulnerable at that time. If these areas can be avoided and other management techniques used this would be preferable. Fire breaks constructed around known hibernacula may protect the animals during the burn.

5. **The intensity and speed of the flames should be adjusted and controlled to accommodate the herpetofaunal species present in the habitat.** Backfires and headfires may vary in mortality due to the slow and more complete burn of a backfire, compared to quick-moving headfires that tend to leave patches of refugia. It is important

to know the species you are potentially impacting and their response to fire survival prior to utilizing a particular burn method. Few amphibian and reptile species can "outrun" fires. A rate such as 10ft. per minute may allow those species which evade fire to have time to flee. However, faster fires will leave unharmed areas under logs and other cover objects, allowing species that tend to hide to remain safe. Some species, such as Box Turtles, will remain in place during a fire. They do not attempt to run or to take cover. Instead they will close themselves into their shells to wait out the flames. Often, burned individuals who are not killed outright become vulnerable to potentially life-threatening infections. Alternatives to fire should be considered in habitats where Box Turtles are present.

6. **Consider burn patch size in fragmented habitats.** As ecosystems become increasingly fragmented it is important to consider the life history traits of many amphibians and reptiles when adopting fire as a management tool. If it is desirable to burn an area that is isolated from nearby habitats, it will benefit herpetofaunal populations if the area is divided into smaller segments and each segment burned on a different day or in different years.

7. **Consider summer burn costs and benefits.** Mid- to late-summer burns can be an effective tool for land managers targeting exotic vegetation. Due to the presence of green vegetation (i.e. brome, Kentucky blue-grass), late-season burns are often patchier, slower, and cooler than early spring burns. It is important to note, however, that summer burns in uplands can be very intense. When possible, only small units should be burned and extra measures should be taken to provide buffers around known herp concentrations (such as nesting areas).

8. **Avoid burns that completely expose soil over extensive areas.** If burning during the active season, weather or site conditions that result in spotty burns will be preferred. Some of these conditions include high humidity, green vegetation, and low temperatures. This approach also provides refugia for herpetofauna. Alternatively, fires breaks should be created around select snags, standing dead trees, and downed logs to provide places for animals to escape the heat and flames. In addition to providing cover, this practice can dramatically reduce mop-up time.

9. **Alternate burn periods among years**. This action may also provide some relief to vulnerable herp populations. In general, diversifying the burn units and burn periods may be beneficial to a variety of grassland species and come closer to mimicking the natural burn regime that historically occurred on the land.

10. **Wetland shorelines should only be burned when a management objective specifically requires it.** Detritus provides cover for salamanders and frogs (and their

prey) as they migrate to and from wetlands to breed. Create burn perimeters around these areas of at least 50ft when possible.

11. **Do not use fire retardant chemicals around wetlands as these chemicals may harm amphibians and other wetland species.** Fire retardant chemicals have been used to create burn breaks including around wetlands. Because of the sensitivity of amphibian skin, these compounds could cause harm to these animals. Instead, use a leaf blowers or rakes to create the desired barrier.

12. **Consider structural needs of the species present.** Although some habitats are not botanically rich, many such places support rich and viable populations of herpetofauna and other animals. These species often associate with structure and functions (e.g., existing prey base) rather than botanical assemblages and can flourish in areas that are of low botanic quality. Consult local experts (see recommendation 1 for types of contact) prior to initiating intensive restoration efforts in such areas as these actions might have a greater deleterious affect on animal communities than no action at all.

13. **Fall burns should follow an approach that takes the above guidelines into consideration.** The month of October is analogous to late March early April, and therefore many herpetofaunal species may still periodically be on the ground surface and active. Thus, burning prior to November 1 is discouraged. If possible burn oak forests while cool, but prior to leaf fall. This will help provide cover and insulation for wildlife using the forest floor over winter.

14. **Avoid constructing brush piles, and when they are necessary, burn them immediately.** Snakes and other wildlife will take advantage of the presence of new habitat like brush piles, creating traps during burns. If piles are left out for more than a few weeks, they should be disassembled prior to the burn. Alternatively, allowing some of the older brush piles to remain with burn breaks around them will not only add additional habitat for wildlife, but will provide refugia during a fire.

15. **Repeated burns will have cumulative effects on population viability.** Populations of turtles and several species of snakes are sensitive to even small increases in mortality, especially if losses occur regularly. While only a few individuals may be lost during a single burn, recurring losses of a few individuals can quickly deplete populations of long-lived, slowly maturing animals such as turtles and many snakes.

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