

### 3 Wildlife and Fire in the Upper Midwest

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*Abstract:* Fire plays an important role in the perpetuation of forests, prairies, and wetlands in the Upper Midwest. The effects of fire in these habitats have profound implications to wildlife because of the dynamic changes in plant species composition and habitat structure. At the same time, wildlife species may be instrumental in the regeneration of forests, prairies, and wetlands following fire, through enhancement of seed dispersal, seed viability, and the development of soils. Hence, the role that fire plays in altering plant and soil ecosystem structure is closely intertwined with the dynamic processes that take place in the animal communities. These interactions represent complex feedback loops that affect forests, prairies, and wetlands following fire. Many species of wildlife (e.g., Kirtland's warbler [*Dendroica kirtlandii*], sharptailed grouse [*Tympanuchus phasianellus*], yellow rail [*Coturnicops noveboracensis*], black-backed woodpecker [*Picoides tridactylus*], and moose [*Alces alces*], likely depend on fire conditions for their continued existence, and it is prudent to include fire as an active component in the dynamic management of wildlife in the Lake States area. However, the role that fire plays in the continued management of these areas should be scrutinized where humans and important natural resources are located.

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The forest fires that raged through Yellowstone National Park in 1988 created a renewed interest and concern about how we deal with fire in resource management. Although the destruction and loss of resources from fire seem immense, it is generally accepted that fires have long been a part of the natural ecology of forest and prairie ecosystems in the Lake States area (e.g., Daubenmire 1936, Curtis 1959, Ahlgren and Ahlgren 1960, Frisell 1973, Heinselman 1973, Wright and Heinselman 1973). Moreover, it is generally accepted that most wildlife species have lived with fire for thousands of years and may even be considered "adapted" to fire (e.g., Kelsall et al. 1977). The role of fire in wetland habitats is less clear because it has been little studied (Weller 1981), but recent studies on fire regimes and climate change indicate that fire must have been frequent in many habitats during dry years (Clark 1988). Hence, fire has become an integral part of many wildlife management practices (Lotan 1979).

Intense crown fires in forests will result in early successional stages of vegetation consisting of open grassy areas and shrublands. In prairies, fires

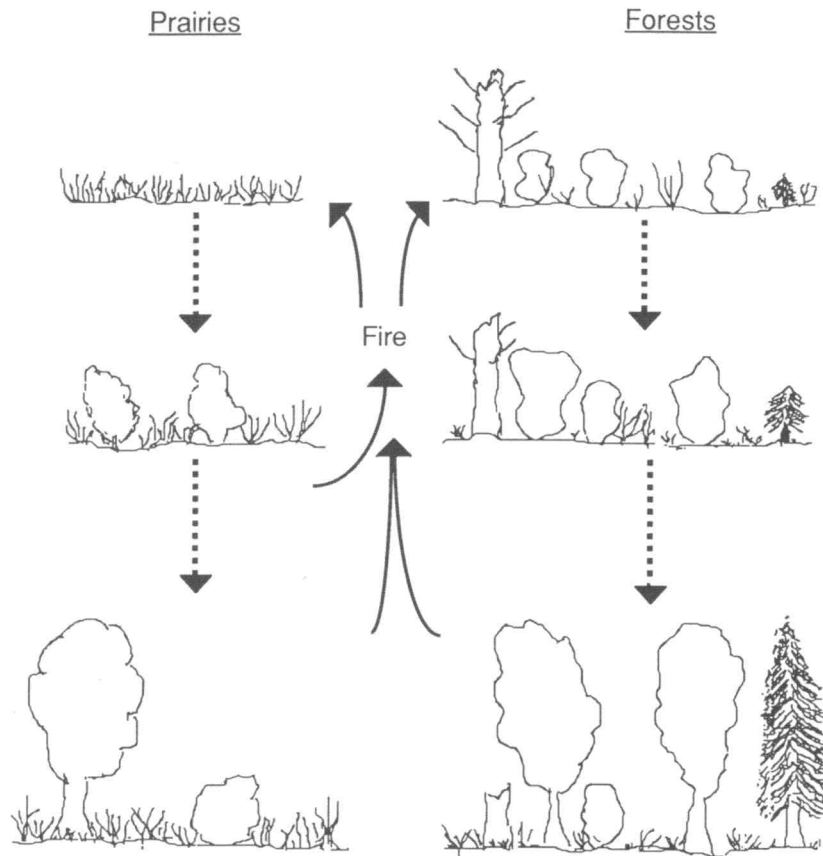


Fig. 1. Vegetation development after fire.

maintain open areas by eliminating woody vegetation such as shrubs and trees (Fig. 1). In wetlands, fires burn standing crops of cattails (*Typha* spp.), sedges (*Carex* spp.), and shrubs (Weller 1981) and, if intense enough, can burn well into the moss of peatland habitats (Anderson 1982).

There is sometimes direct mortality to wildlife from fire especially if suitable refugia are not available or if dispersal from the fire is impossible (Bendell 1974). The major effects on wildlife, however, are due to changes that occur in the habitats (Anderson 1982). Species that favor young forests will be positively affected, while those favoring old growth forests will be negatively impacted. Similarly in prairies or wetlands, those species requiring shrubs or trees within their habitats likely will be eliminated, while those favoring grass or sedge dominated habitats will be positively affected. Here

we provide an overview of fire and how it affects wildlife in the Upper Midwest area (see also Bendell 1974). By Upper Midwest we refer to the general area consisting of Michigan, Wisconsin, Minnesota, Iowa, Illinois, and Indiana. Rather than focusing entirely on a species-specific approach, we discuss potential feedback loops and interactions between vegetation, wildlife, and fire within these ecosystems. Moreover, given that "fire suppression" is generally the rule for most of the Upper Midwest, it is time to review the role of fire in relation to the species and communities that may need fire in a landscape context. For a more complete review the reader should see Kellsall et al. (1977), Viereck and Schandelmeier (1980), or Wein and MacLean (1983).

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## Fire Effects on Habitat

### Landscape Patterns

Fires create a complex mosaic of burned and unburned patches of habitat with the actual juxtaposition of these areas depending on such factors as the patchiness and intensity of the fire, topography, soil moisture patterns, and weather patterns during the burn. Hence, each species responds to the conditions left by the fire in a manner consistent with its needs and the spatial scale with which those needs are met. The size of the burn is less important to a species with a small home range (e.g., < 2 ha) such as a deer mouse (*Peromyscus* spp.) or chestnut-sided warbler (*Dendroica pensylvanica*). In contrast, size and orientation of a fire is more important for wide-ranging species such as moose or hawks that move over several square kilometers of area. In the latter case a small fire would likely have only a minor effect on the species. For instance, the frequency and spatial pattern of fires in coniferous forests can profoundly affect population dynamics of wildlife species that depend on early successional deciduous species for food. Geist (1974) hypothesized that moose populations find refuge in habitats of continuous but small disturbances, but expand into habitats with an abundance of food created by large disturbances such as fire. The ability of a moose to affect recovery of the forest also depends on the size of the burn. Pastor and Naiman (1988) show that browsing by moose in large disturbances does not alter species composition because of the abundance of food regenerated and the lack of seed dispersal to the center of the distur-

