(3.5) Wildlife

(3.5a) Existing Condition and Resource-Specific Information

Wildlife Species Habitat Associations

Early-Successional Vegetative Types

Openings, prairies, savannas, and barrens have declined within the Huron-Manistee National Forests (HMNF) over the past century due to extensive reforestation, increased fire control efforts, and the processes of natural succession. Remnant openings, prairies, savannas, and barrens are filling in with fire intolerant woody and shade tolerant herbaceous species. As a result, suitable habitat for the Karner blue butterfly (KBB), a federally-listed Endangered species and Terrestrial Management Indicator Species associated with oak/pine savanna and pine barren communities, is becoming scarcer. The decline in KBB habitat quality and quantity within the HMNF has led to a reduction in occupied subpopulations.

Early successional forest types (such as aspen) are also gradually being lost due to succession. Forest maturation of aspen forest communities may be reducing habitat quantity and quality for ruffed grouse, a Terrestrial Management Indicator Species associated with early successional forests dominated by aspens and poplars (*Populus* spp.). The Forests' monitoring information for grouse indicates that the population is stable with oscillations in year to year estimates likely resulting from the well known "ten-year cycle" in ruffed grouse numbers (HMNF 2008). Population trends for the State of Michigan indicate that the most recent low in grouse abundance occurred during 2004-2005, the most recent high in grouse abundance occurred between 1998 and 2000, and the next grouse population peak might occur between 2010 or 2011 (Frawley and Stewart 2009).

Other game and non-game wildlife species that may be associated with early successional vegetative types within the Project Area include, but are not limited to: eastern box turtle, hill-prairie spittlebug, dusted skipper, frosted elfin, red-headed woodpecker, whip-poor-will, American woodcock, cottontail rabbit, snowshoe hare, fox and gray squirrel, red and gray fox, coyote, wild turkey, and white-tailed deer. Early successional wildlife species are declining across their range in Michigan due to habitat loss and degradation and direct mortality resulting from fire suppression, vegetative succession, vegetative management, transportation management, water level manipulation, wildfires, human persecution and illegal collection, and vehicle collisions (USDA Forest Service 2005).

The Forest Plan emphasizes management for oak barrens/savanna ecosystems, particularly for KBB conservation, and directs the restoration and maintenance of 20,300 acres of savanna/barrens within designated KBB population management areas and essential KBB habitat within the HMNF (USDA Forest Service 2006b). The Forest Plan also recognizes the importance of early successional aspen communities, identifying a goal of approximately 2,400 acres of aspen regeneration harvests annually to create early successional habitat for a variety of species (USDA Forest Service 2006b). Currently, none of the approximately 859 acres of aspen stands or 1,056 acres of aspen/oak stands within the Project Area are in an early successional stage (<10 years of age). Over the next decade, the Forest Plan calls for 16% (24,100 out of

149,909 acres) of aspen stands within the HMNF to be in an early successional stage (USDA Forest Service 2006b).

Mid- to Late-Successional Forest Types

Mid- to late-successional forest types within the HMNF provide habitat for a variety of wildlife species including the Indiana bat, a federally-listed Endangered species known to hibernate in small numbers at Tippy Dam, which is within the administrative boundary of the Manistee National Forest on the Manistee River (USDA Forest Service 2006a). Except for records in the Tippy Dam area, no occurrences are documented for Indiana bat on the HMNF (USDA Forest Service 2006a). Major threats to Indiana bats in Michigan are disturbance to hibernating bats and destruction/degradation of non-hibernating bat habitat (USDA Forest Service 2006a).

Other game and non-game wildlife species that may be associated with mid- to late-successional forest types within the Project Area include, but are not limited to: northern goshawk, red-shouldered hawk, bald eagle, cerulean warbler, Louisiana waterthrush, prothonotary warbler, eastern box turtle, pileated woodpecker, brilliant scarlet tanager, black bear, red and gray fox, coyote, black-throated green warbler, gray and fox squirrel, white-tailed deer, bobcat, and northern flying squirrel. Acreage of mid- to late-successional forest types has increased within the HMNF. However, forest fragmentation and disturbance/destruction of nesting, roosting, and foraging sites resulting from timber harvest and road construction threatens the viability of these species (USDA Forest Service 2005, USDA Forest Service 2006a). Management for early successional vegetative types under the Forest Plan would involve the conversion of mature forest stands. Currently, mid- to late-successional forests within the Project Area include approximately 4,469 acres of black oak, 2,737 acres of mixed oak, 1,915 acres of aspen and aspen/oak, 1,331 acres of lowland hardwoods, 1,282 acres of red pine/oak and white pine/oak, 1,092 acres of red pine, 428 acres of jack pine/oak, 356 aces of white pine/hemlock, 161 acres of lowland conifer, and 87 acres of jack pine/scots pine.

Streams, Creeks, Lakes, and Wetlands

In addition to the aforementioned vegetative types, there are several rivers, streams, creeks, lakes, and wetlands (i.e., White River, North Branch of the White River, South Branch of the White River, Mud Creek, Carlton Creek, Sand Creek, Knutson Creek, Bear Creek, Newman Creek, Rockdale Pond, Knapp Lake) within the Project Area. These waters and their associated uplands may provide habitat for waterfowl and shorebirds, such as great blue heron, wood duck, mallard, black duck, Canada goose, and other water-oriented species such as beaver, Blanding's turtle, and wood turtle. In Michigan, the viability of these species is being threatened by habitat loss and degradation, disturbance of foraging and nesting animals, and increased mortality resulting from human activities such as draining wetlands for agriculture, development adjacent to water bodies and along shorelines, road construction, increases in recreational use and traffic, pollution, and illegal collection (USDA Forest Service 2005).

Occurrence of Sensitive Wildlife Species

The Huron-Manistee National Forests provide habitat for 382 species of breeding vertebrate animals. These include 168 species of birds, 54 species of mammals, 24 species of reptiles, 18 species of amphibians, and 118 species of fish. The Forests also provide habitat for 28 migratory species and a large number of invertebrates, primarily insects.

Federally-listed Threatened and Endangered (T&E) species, Terrestrial Management Indicator Species (MIS), and Regional Forester's Sensitive Species (RFSS) that may be present or have habitat within the Project Area include: Karner blue butterfly, Indiana bat, dusted skipper, frosted elfin, hill-prairie spittlebug, red-headed woodpecker, whip-poor-will, ruffed grouse, bald eagle, cerulean warbler, Louisiana waterthrush, prothonotary warbler, northern goshawk, red-shouldered hawk, eastern box turtle, wood turtle, and Blanding's turtle. The habitat ecology and distribution (within Michigan, and if available, within the MNF) of these species are briefly summarized in Table 3.15. Citations are noted where more detailed information can be found concerning ecology, life history, and status. Trends for Terrestrial Management Indicator Species on the HMNF are discussed in the Monitoring and Evaluation Report for Fiscal Year 2008 (HMNF 2008).

A Biological Assessment and Biological Evaluation (see Project File) determined the potential effects of proposed actions on all of the wildlife species listed in Table 3.15. Ruffed grouse is not considered because it is a Terrestrial Management Indicator Species, not a federally-listed Endangered or Threatened Species or RFSS. To determine which species to include in the Biological Assessment and Biological Evaluation, the following process was used:

- We determined all federally-listed (and those proposed to be listed) Endangered and Threatened species that occur or have historically occurred in Michigan, based on U.S. Fish and Wildlife Service and Michigan Natural Features Inventory (USDI Fish and Wildlife Service 2006, MNFI 2010) records.
- We determined RFSS that can potentially occur on the Baldwin/White Cloud Ranger District of the HMNF.
- From these determinations, we selected species that have occurrence records on the MNF and/or have the potential to occur on or near the project site based on habitats present, species habitat requirements and historical occurrences. The Michigan Natural Features Inventory database (MNFI 2010), Huron-Manistee National Forests Endangered, Threatened and Sensitive species database (USDA Forest Service 2007a), and Forest Service Fauna database (USDA Forest Service 2007b) are three important occurrence record sources. Other sources include the annual surveys conducted for Karner blue butterfly, and bat echolocation surveys.
- We further refined the list by evaluating field survey data collected specifically for this project.

All other RFSS were not included because: 1) they have not been documented to occur on the MNF; 2) they are found in habitat(s) unlike those found in the Project Area; 3) they were not found during field surveys; and/or 4) habitat for the species exists within the Project Area; however, the species would not be present within the Project Area during project implementation. RFSS not included in this evaluation will have no effect from the Proposed Action.

Table 3.15: Habitat Ecology and Distribution for Wildlife Species Included in this Environmental Assessment

Common Name	Species Name	Habitat Ecology	Distribution
Karner Blue Butterfly	*Lycaeides melissa samuelis (Nabokov) [or Plebejus melissa (Edwards 1873)]*	Heterogeneous oak/pine savanna/barrens habitats with variable light conditions, abundant wild lupine (the sole food source for the caterpillar), abundant adult nectar sources, warm season grasses for basking and roosting, and ants to protect larvae from parasites and predators. Dispersal between subpopulations needs to be maintained by connecting subpopulations with corridors and maintaining an average nearest neighbor distance of 1 km between subpopulations (Rabe 2001, USDI Fish and Wildlife Service 2003).	Found in 11 counties in Michigan. Small, isolated populations occur in Lake, Mason, Mecosta, Montcalm, Muskegon, Newaygo, and Oceana counties in the MNF (Rabe 2001, USDI Fish and Wildlife Service 2003).
Indiana Bat	*Myotis sodalist*	Roost and form maternity colonies under loose, exfoliating bark of usually dead trees, in live shag-bark trees, or in hollows and cavities of mature trees in floodplain and bottomland forests, riparian zones, wooded wetlands, and upland forests. Roost trees are typically within canopy gaps that provide solar exposure. Eat terrestrial and aquatic insects while foraging in forested stream corridors, upland bottomland forests, and over impounded bodies of water at night (MNFI 2010, USDA Forest Service 2006a, USDI Fish and Wildlife Service 2006, USDI Fish and Wildlife Service 2007).	Summer (May 15 to August 15) distribution includes 16 counties in southern Michigan. Small number hibernates at Tippy Dam within the MNF on the Manistee River in Manistee County (MNFI 2010, USDA Forest Service 2006a).
Ruffed Grouse	*Bonasa umbellus*	Mixed deciduous and conifer forests (especially early seral stages dominated by aspen) and oak-savanna woodland. Forests 5-25 years old provide brood habitat and cover. Older forest age classes provide nesting habitat and winter food sources. Eats herbaceous plants, seeds, fruits, insects, and buds and leaves of trees/shrubs (NatureServe 2010).	Broadly distributed throughout Michigan and the MNF (NatureServe 2010).
Dusted Skipper	*Atrytonopsis hianna*	Typically found in localized colonies in bluestem grassland, barrens, prairie, or other openland habitats where little bluestem - its larval food plant - occurs [larvae may also feed on big blue stem (*Andropogon gerardii*)]. Adults nectar on a variety of plant species, including blackberry, cinquefoil, lupine, puccoons, vetches and yarrow (USDA Forest Service 2005).	Found in localized, patchy colonies scattered across 15 counties of the Lower Peninsula, from Cheboygan to Monroe counties. Occurs in Oceana, Muskegon, Mecosta, Newaygo, and Lake counties in the Manistee National Forest (USDA Forest Service 2005, NatureServe 2010).
Hill-Prairie Spittlebug	*Lepyronia gibbosa*	Prairie bowls in mesic dry sand prairie zones. Feeds on many families of forbs (NatureServe 2010).	Located typically in highly restricted disjunct populations (often in only a half-meter-wide mesic zone around prairie bowls) within 6 counties in southwest Michigan. Occurs in Oceana, Muskegon, Montcalm, Newaygo, and Lake counties in the Manistee National Forest (NatureServe 2010).

Common Name	Species Name	Habitat Ecology	Distribution
Frosted Elfin	*Incisalia lrus*	Grassy openings or burn scars in barrens and savannas with abundant wild lupine, false indigo, or wild indigo – its host plants - and other nectar sources (NatureServe 2010).	Located in scattered isolated populations in 11 counties in Michigan. Occurs in Oceana, Muskegon, Mecosta, Montcalm, Newaygo, and Lake counties in the Manistee National Forest (NatureServe 2010).
Eastern Box Turtle	*Terrapene carolina carolina*	Forested habitats (coniferous, deciduous and mixed) with sandy soils near a source of water. Also found in thickets, old fields, pastures, marshes, vegetated dunes, and at bog edges adjacent to water sources. Access to sandy, open areas for nesting sites is critical for successful reproduction. Eats plants, fruit, fungi, snails and other invertebrates, carrion, and rarely small vertebrates (Hyde 1999, USDA Forest Service 2005, NatureServe 2010).	Within the past 10 years, found in 20 counties in Michigan. Occurs in fragmentated populations in Mason, Manistee, Oceana, Muskegon, Newaygo, and Lake counties in the Manistee National Forest (Hyde 1999, USDA Forest Service 2005, NatureServe 2010).
Red-Headed Woodpecker	*Melanerpes erythrocephalus*	Open woodlands, especially with beech or oak, open situations with scattered trees, parks, cultivated areas, and gardens with mast crop abundance. Nests in excavated holes in live trees, dead stubs, snags, utility poles, or fence posts. Eats insects, invertebrates, berries and nuts, sap, and young and eggs of birds (USDA Forest Service 2005, NatureServe 2010).	Species is widespread across the Huron-Manistee National Forest, but is uncommon, and populations occur in smaller more isolated habitat patches (USDA Forest Service 2005, NatureServe 2010).
Whip-Poor-Will	*Caprimulgus vociferous*	Insectivore that occurs in open coniferous, deciduous, and mixed woodlands with well spaced trees and a low canopy, abundant shade, nearby open areas, and sparse ground cover. Prefers stands of even-aged young to medium aged second-growth, including early successional aspen/birch (USDA Forest Service 2005, NatureServe 2010).	Broadly distributed throughout Michigan and the Manistee National Forest, occurring in all the counties located in the Forest, and in all but 10 counties in the central, southern, and southeastern parts of Michigan (USDA Forest Service 2005, NatureServe 2010).
Bald Eagle	*Hallaeetus leucocephalus*	Nests in tall, dominant deciduous or coniferous trees, and sometimes cliffs, along or close to (within 4 km) major rivers, large lakes, deep marshes, or clusters of small lakes and streams where adequate prey is available and human disturbance is minimal to none. Preys primarily on fish, but frequently feeds on carrion, waterfowl, and other birds and mammals (NatureServe 2010, USDA Forest Service 2006a, USDI Fish and Wildlife Service 1983, USDI Fish and Wildlife Service 2006).	Breeding records are documented within 46 counties in the Lower Peninsula. Occurs within all counties within the Manistee National Forest. The number of active territories on or near the HMNF exceeds 45, producing more than 50 fledglings per year (USDA Forest Service 2006a, USDI Fish and Wildlife Service 2006, NatureServe 2010).

Common Name	Species Name	Habitat Ecology	Distribution
Cerulean Warbler	*Dendroica cerulea*	Insectivore that nests and perches in the canopy of large, tall, trees that occur in large tracts (≥ 3,000 hectares) of mature deciduous forest within one kilometer of rivers and the Lake Michigan shoreline. Prefer bottomlands, particularly floodplains and lowland hardwoods, over uplands. Most commonly found in forests with an open understory dominated by maple, ash, sycamore, beech, oak, black walnut, and black locust (USDA Forest Service 2005, Hyde et al. 2000, NatureServe 2010).	Documented occurrences are recorded within 16 Michigan counties. Habitat is broadly distributed across the Manistee National Forest and occurrences are documented within the Forest in Mason, Montcalm, Muskegon, and Oceana Counties, including in the Nordhouse Dunes Wilderness Area, and along the Manistee and White Rivers (USDA Forest Service 2005, Hyde et al. 2000, NatureServe 2010).
Louisiana Waterthrush	*Seiurus motacilla*	A riparian obligate species that nests along clear, fast-flowing streams and rivers in contiguous, deciduous, and often hilly forests containing moderate to sparse undergrowth. Nests on the ground along stream banks, hidden in the underbrush or among the roots of fallen, upturned trees, in crevices or raised sites in tree roots, or in rock walls of ravines over water. Preys primarily on aquatic insects, and also small mollusks, killifishes, minnows, and salamanders (Gibson 2007a, NatureServe 2010).	Documented occurrences are recorded within 12 Michigan counties, including Montcalm, Muskegon, and Oceana Counties within the Manistee National Forest (Gibson 2007a, NatureServe 2010).
Northern Goshawk	*Accipiter gentilis*	Nests in large tracts of mature pine, hardwood, or mixed forests with an intermediate amount of canopy closure, large deciduous trees for nesting, small forest openings for foraging, and an open understory. Preys on a wide variety of vertebrates and, occasionally, insects. (Cooper 1999a, USDA Forest Service 2005, NatureServe 2010).	Breeding records are documented within 24 counties in the Lower Peninsula. More than half of the total occurrences in Michigan are recorded from the Huron-Manistee National Forests. Generally widely distributed and abundant within the Manistee National Forest, occurring within all counties within the Forest, except for Mecosta County (Cooper 1999a, USDA Forest Service 2005, NatureServe 2010).
Prothonotary Warbler	*Protonotaria citrea*	Nests in tree cavities of dead snags and live trees within riparian corridors, wooded swamps, floodplain forests, and bottomland hardwood forests with dense underbrush near or over water along streams (often 20-40 meters wide), swamps, lakes, or ponds. Nest cavities usually are located somewhat low to the ground. Will nest in nest-boxes. Preys primarily on insects and spiders (Gibson 2007b, NatureServe 2010).	Documented occurrences are recorded within 16 counties in the Lower Peninsula, including Muskegon and Oceana Counties within the Manistee National Forest (Gibson 2007b, NatureServe 2010).

Common Name	Species Name	Habitat Ecology	Distribution
Red-Shouldered Hawk	*Buteo lineatus*	Nests in large tracts of mature deciduous or mixed forests with closed canopies, large deciduous trees for nesting, nearby wetland and upland habitats interspersed for foraging, and variable amounts of understory vegetation. Preys on a wide variety of vertebrates and, occasionally, insects (Cooper 1999b, USDA Forest Service 2005, NatureServe 2010).	Breeding records are documented within 36 counties in the Lower Peninsula. Except for Muskegon and Mecosta counties, occurs within all counties within the Manistee National Forest. High concentrations of nesting red-shouldered hawks with good reproductive success have been documented in the Manistee County area of the Forest (Cooper 1999b, USDA Forest Service 2005, NatureServe 2010).
Blanding's turtle	*Emydoidea blandingii*	Occupies productive, clean, shallow waters (lake shallows, ponds, marshes, creeks) with abundant aquatic vegetation and soft organic substrate. In spring and summer, during mating and nesting seasons, occupies terrestrial habitats, preferring to nest in adjacent open, sunny, upland areas with moist but well-drained sandy or loamy soils. Hibernates underwater within organic substrate of ponds and creeks. Omnivorous, feeding primarily underwater predominantly on crayfish and aquatic insects (Lee 1999b, USDA Forest Service 2002b, USDA Forest Service 2005, NatureServe 2010).	Documented within 36 counties in Michigan's Lower Peninsula and within all the counties in the Manistee National Forest. Fairly common in parts of the Lower Peninsula (Lee 1999b, USDA Forest Service 2002b, USDA Forest Service 2005, NatureServe 2010).
Wood Turtle	*Glyptemys insculpta*	Occupies clear, medium-sized rivers with sand or sand-gravel substrates, and adjacent forested riparian and floodplain areas with numerous openings and a dense mixture of low herbs and shrubs, providing partially shaded, wet-mesic herbaceous vegetation such as raspberries, strawberries, grasses, willows, and alders along or near the river for foraging. In summer, occupies nearby terrestrial habitats, preferring to nest on steep, eroding, sandy, or sandy-gravelly slopes near the river that have little or no ground vegetation, are sunlit most of the day, and receive little human disturbance. Hibernates underwater under overhanging roots or logs, in pools or along the stream bottom under the ice, or in beaver lodges or muskrat burrows (Lee 1999a, USDA Forest Service 2004b, USDA Forest Service 2005, NatureServe 2010).	Documented within 45 Michigan counties and within all the counties in the Manistee National Forest. Within the Manistee National Forest, has been found on the Pine, Little Manistee, Big Sable, Pere Marquette, Baldwin, White, and Muskegon Rivers and their tributaries. Suitable habitat is widely distributed and of high abundance across the Manistee National Forest (Lee 1999a, USDA Forest Service 2004b, USDA Forest Service 2005, NatureServe 2010).

The Endangered Species Act of 1973 requires federal agencies to ensure that actions authorized, funded, or carried out by the agency are not likely to jeopardize the continued existence of federally-listed or proposed-to-be-listed Endangered or Threatened species or to adversely modify critical habitat. Five federally-listed species were considered for the Project Area: Indiana bat (potential habitat), piping plover, Kirtland's warbler, Karner blue butterfly, and Pitcher's thistle. The Project Area is outside the potential range for piping plover, Kirtland's

warbler, and Pitcher's thistle on the HMNF. As such, these species will not be analyzed further. Piping plover, Kirtland's warbler, and Pitcher's thistle have recently been addressed in a programmatic Biological Assessment (USDA Forest Service 2006a) and subsequent Biological Opinion (USDI Fish and Wildlife Service 2006). The Indiana bat and Karner blue butterfly could occur in the Project Area and were analyzed to determine the potential effects from implementation.

No proposed treatments are within the Tippy Management Zone (swarming habitat) for Indiana bat (*Myotis sodalist*) (Biological Opinion (BO) dated June 12, 2003). However, the Project Area is within the potential breeding range for Indiana bat. Breeding Indiana bats are unlikely to occur within the Project Area as no suitable breeding habitat was found during wildlife surveys conducted in 2006, 2007, and 2009, and no vocalizations of Indiana bat were recorded during bat echolocation surveys conducted in summer 2009, which can be used to distinguish this species in the field (personnel communication, Eric Britzke, U.S. Army Corps of Engineers, April 1, 2010). However, based on a review of GIS vegetative data layers and tree record data, potential breeding habitat for Indiana bat might occur within 5 stands proposed for treatment in the Project Area. These include: U.S. Forest Service Compartment 458 Stand 6, Compartment 438 Stand 22, Compartment 438 Stand 25, Compartment 418 Stand 130, and Compartment 416 Stand 32.

Sites that have had a documented occurrence of Karner blue butterfly within the past three years are considered to be "occupied" (personnel communication, Jessica Hogrefe, USDI Fish and Wildlife Service, February 21, 2007). There are currently 73 openings covering 519 acres that are considered to be occupied by the KBB within the Project Area. Based on the overlap of historical occurrences of savanna/barrens habitats and KBB, 2,542 acres within the Project Area have the potential to be restored to suitable KBB habitat. *No designated critical habitat* exists for federally-listed Endangered or Threatened species in any of the treatment areas.

The following RFSS have documented occurrences within the Project Area: dusted skipper, hill-prairie spittlebug, frosted elfin, eastern box turtle, red-headed woodpecker, whip-poor-will, bald eagle, cerulean warbler, northern goshawk, Louisiana waterthrush, prothonotary warbler, Blanding's turtle and wood turtle (Tables 3.16, 3.17, and 3.18).

Table 3.16: Michigan Natural Features Inventory Results for Regional Forester's Sensitive Wildlife Species within the Savanna Ecosystem Restoration Project Area

RFSS Wildlife Species	Township, Range	Section(s)
Bald Eagle	T12N, R16W	4
Blanding's turtle	T13N, R15W	9
	T13N, R16W	10
Cerulean Warbler	T12N, R16W	4, 5
	T13N, R15W	9, 20, 29, 30
	T13N, R16W	25, 33, 34, 35, 36
Dusted Skipper	T12N, R16W	5
	T13N, R16W	32
Eastern Box Turtle	T12N, R16W	4, 5, 6, 7
	T12N, R17W	1, 12
	T13N, R15W	19
	T13N, R16W	2, 11, 23, 25, 26, 27, 29, 32, 34, 35

RFSS Wildlife Species	Township, Range	Section(s)
Frosted Elfin	T13N, R15W	15, 16, 17, 19
	T13N, R16W	27, 34
Hill-Prairie Spittlebug	T12N, R16W	5
	T13N, R15W	17
	T13N, R16W	27, 28, 29, 32, 33
Louisiana Waterthrush	T12N, R16W	4
	T13N, R16W	25, 34, 35
Northern Goshawk	T13N, R16W	4, 5
Prothonotary Warbler	T12N, R16W	4
	T13N, R15W	30
Wood Turtle	T12N, R16W	4, 5, 6, 7
	T12N, R17W	1, 12
	T13N, R15W	9, 10, 16
	T13N, R16W	1, 2, 3, 4, 9, 10, 11, 12, 14, 15, 31, 32, 33
	T13N, R17W	36

Table 3.17: Huron-Manistee National Forests Endangered, Threatened and Sensitive Species Database Results for Wildlife within the Savanna Ecosystem Restoration Project Area

RFSS Wildlife Species	Township, Range	Section(s)	Compartment	Stand(s)
Blanding's Turtle	T13N, R16W	10	421	Not Specified
Eastern Box Turtle	T13N, R15W	19	439	21, 24, 25, 37
	T13N, R15W	20	439	16
	T13N, R16W	25	438	22, 25, 43, 62, 63
	T13N, R16W	27	418	22
	T13N, R16W	32	414	36, 50
	T13N, R16W	34	418	65
Hill-Prairie Spittlebug	T13N, R15W	17	439	4, 10, 42
	T13N, R15W	19	439	Not Specified
	T13N, R15W	30	439	25, 26, 27
Northern Goshawk	T13N, R15W	30	439	25, 27
Wood Turtle	T12N, R16W	5	416	1, 2
	T12N, R16W	5	407	1
	T13N, R15W	2	457	33
	T13N, R15W	7	437	Not Specified
	T13N, R15W	9	440	66
	T13N, R16W	2	Not Specified	Not Specified
	T13N, R16W	3	421	2

Table 3.18: U.S. Forest Service Survey Results for Wildlife within the Savanna Ecosystem Restoration Project Area

RFSS Wildlife Species	Township, Range	Section	Compartment	Stand(s)
Blanding's Turtle	T13N, R16W	1	Private Land in Compartment 423	230 meters North of Compartment 422 Stands 2, 17, 18
Dusted Skipper	T13N, R16W	26	418	29, 32, 90, 120, 129
Eastern Box Turtle	T13N, R15W	30	439	25
	T13N, R15W	20	437	22
	T13N, R15W	17	439	4, 6, 9
	T13N, R16W	11	422	3
	T13N, R16W	25	438	63
	T13N, R16W	26	418	28

RFSS Wildlife Species	Township, Range	Section	Compartment	Stand(s)
	T13N, R16W	27	418	68
	T13N, R16W	31	414	6
	T13N, R16W	32	414	59
	T13N, R16W	32	416	8
	T13N, R16W	34	418	7, 65, 67, 96
Hill-Prairie Spittlebug	T13N, R17W	36	414	16
Northern Goshawk (active nest and individuals seen)	T13N, R16W	11	422	3, 8
Northern Goshawk (individual seen)	T13N, R16W	23	418	89
Red-Headed Woodpecker	T13N, R16W	26	418	116
	T13N, R16W	27	418	22
Whip-poor-will (active nest)	T13N, R15W	17	439	4, 11
Whip-poor-will (active nest)	T13N, R15W	17	458	7
Whip-poor-will (individual seen)	T13N, R16W	25	438	43
Wood Turtle	T13N, R16W	34	418	107
	T13N, R17W	36	414	16

RFSS associated with mid- to late-successional forest types that could occur within the Project Area include bald eagle, cerulean warbler, northern goshawk, red-shouldered hawk, Louisiana waterthrush, prothonotary warbler, and eastern box turtle. No proposed treatment units are within close proximity (within ½ mile) to any known bald eagle nests or roosts, and the Project Area is located outside essential bald eagle habitat on the HMNF (USDA Forest Service 2006c). The closest known active bald eagle nest is documented within the oak/pine forests around Big Blue Lake, which is a little over a mile from proposed treatment units. However, potential foraging habitat for bald eagles may occur within the Project Area. Cerulean warbler have been documented to occur within the floodplain forest along the South Branch of the White River and the floodplain forest along the White River and the edge of Big Blue Lake. Active northern goshawk nests have been documented within the boundaries of the Project Area. In addition, in 2008, northern goshawks were observed stooping and calling at three other locations within the Project Area. Primary (660 feet) and secondary (960 feet) buffers around these active nests, as directed by The Management Recommendations for the Northern Goshawk on the Huron-Manistee National Forests (USDA Forest Service 1993), would incorporate a number of proposed treatment units. Although there are no documented occurrences of red-shouldered hawk within the Project Area, potential nesting habitat does occur within the available mid- to late-successional forest types. Louisiana waterthrush have been observed nesting in shrubs along the White River at Diamond Point and prothonotary warblers have been documented in the floodplain forest along Cleveland Creek and along the South Branch of the White River.

Blanding's turtle and wood turtle are RFSS that could be associated with lakes, rivers, and creeks within the Project Area. Blanding's turtle and wood turtle are documented to occur in several rivers and creeks that are within dispersal distance (0.5 miles) of the proposed treatment units. Blanding's turtle is documented to occur in the South Branch of White River, in Bear Creek/Newman Creek, and crossing 136th Street near Bear Creek. In addition, during field

surveys in 2009, a Blanding's turtle was found crossing Arthur Road near Knutson Creek. Wood turtle have been documented to occur in Rockdale Pond, the White River, the North Branch of the White River near Arthur road, the South Branch of the White River and crossing a road near Knutson Creek. In addition, in 2008, a wood turtle was observed near Mud Creek, with an additional observation occurring in 2009.

(3.5b) Area of Analysis

Under the National Environmental Policy Act (NEPA), cumulative effects are defined as the impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Under Section 7 of the Endangered Species Act (ESA), cumulative effects include the effects of future State, tribal, local or private actions that are reasonably certain to occur in the Action Area considered in the BA/BE. The area of analysis for the direct and indirect effects on wildlife resources is the National Forest System lands where treatments will occur, and adjacent private lands included within the Savanna Ecosystem Restoration Project Area (Project Area) boundary. The cumulative effects analysis area for wildlife resources encompasses the Manistee National Forest (MNF). The size of this area provides an adequate geographical range to consider the effects that this project may have on the viability of the individual species that are considered in this analysis over the anticipated length of the project (~10 years).

(3.5c) Effects on Federally-Listed Endangered and Threatened Wildlife Species

(3.5d) Karner Blue Butterfly

Status and Distribution

In 1992, the Karner blue butterfly (KBB) was federally-listed as an Endangered species in the United States (USDI Fish and Wildlife Service 2003). KBB occur in heterogeneous oak/pine savanna/barrens habitats with abundant wild lupine (*Lupinus perennis*) (the sole food source for the KBB caterpillar), abundant adult nectar sources, warm season grasses for basking and roosting, and ants to protect larvae from parasites and predators (USDI Fish and Wildlife Service 2003). In addition, to maintain persistent metapopulations, dispersal between subpopulations needs to be maintained by connecting subpopulations with corridors and maintaining an average nearest neighbor distance of ≤1 km between subpopulations (USDI Fish and Wildlife Service 2003). Dispersal usually refers to the movement of individuals within and between suitable habitat sites. Research has shown dispersal of KBB to range from about 600 feet (183 meters) to about 2 miles (3.2 kilometers); however, dispersal distances are generally short, with most movements less than 1/8 mile (200 meters) (Rabe 2001, USDI Fish and Wildlife Service 2003). Detailed information on the ecology of the KBB and its status on the HMNF may be found in the KBB Recovery Plan (USDI Fish and Wildlife Service 2003), the DRAFT Management Strategy (USDA Forest Service 2004a), the Biological Assessment for the Huron-Manistee National Forests Environmental Impact Statement and Forest Plan (USDA Forest Service 2006a), and the Biological Opinion for the Huron-Manistee National Forests Land and Resource Management Plan (USDI Fish and Wildlife Service 2006).

Openings, prairies, savannas, and barrens have declined within the HMNF over the past century due to extensive reforestation and fire control efforts, and the process of natural succession. As naturally occurring open areas filled in with fire-intolerant woody and shade-tolerant herbaceous species, suitable KBB habitat became scarcer. Wild lupine, other important nectar plants, and warm season grasses were shaded out or out-competed. Overstory tree canopies closed, creating more uniform light conditions. KBB corridors disappeared and subpopulations decreased in size and became more isolated. The decline in KBB habitat quality and quantity has led to a reduction in occupied subpopulations within the HMNF.

The Project Area includes the White River and Otto Metapopulation Areas, described in the KBB Recovery Plan (USDI Fish and Wildlife Service 2003) and the DRAFT Management Strategy (USDA Forest Service 2004a). KBB subpopulations within the White River and Otto Metapopulation Areas have declined over the past decade. In the DRAFT Management Strategy (USDA Forest Service 2004a), 48 and 143 KBB subpopulations were identified within the White River and Otto Metapopulation Areas, covering approximately 620 and 848 acres, respectively. In 2009, 21 and 40 KBB subpopulations were identified within the White River and Otto Metapopulation Areas, covering approximately 199 and 240 acres (USDA Forest Service 2009a). Only 29 of the 61 KBB subpopulations monitored in 2009 were occupied; 21 in the Otto Metapopulation Area and 8 within the White River Metapopulation Area (USDA Forest Service 2009a). Not only has the number and acreage of KBB subpopulations declined within the White River and Otto Metapopulations, but also the number of KBB observed during surveys has declined. Within the White River Metapopulation Area, 181, 167, and 53 KBB were observed in 2007, 2008, and 2009 (USDA Forest Service 2009a). Within the Otto Metapopulation Area, 860, 470, and 378 KBB were observed in 2007, 2008, and 2009 (USDA Forest Service 2009a). Eighty-four percent (51 out of 61) of KBB subpopulations occupied in 2009 had Karner blue butterflies observed during field surveys (USDA Forest Service 2009b). Based on analyses of count data recorded in 2009, the estimated minimum KBB abundance was between 3,423 and 3,993 within the Otto Metapopulation Area and between 760 and 885 within the White River Metapopulation Area (USDA Forest Service 2009a).

Neither of the metapopulation areas meets the large viable metapopulation number goal (≥ 6,000) outlined in the KBB Recovery Plan (USDI Fish and Wildlife Service 2003). In addition, marginal habitat conditions are provided within both metapopulation areas, with subpopulations having an average of 2-4% cover of wild lupine and an average of 1-2% cover of blooming nectar plants (USDA Forest Service 2009a). The KBB subpopulations within the White River and Otto Metapopulation Areas also are relatively small, with an average area of 6-9 acres (USDA Forest Service 2009a). Neither metapopulation area has subpopulations distributed over 2/3 of a≥ 10 square mile area with at least 640 acres of suitable habitat (USDA Forest Service 2009a). KBB subpopulations within the White River Metapopulation Area also are mostly isolated and not well connected (USDA Forest Service 2009a). Areas occupied by Karner blue butterfly within the White River and Otto Metapopulation Areas consist of subpopulations that have low numbers of KBB, marginal habitat conditions, are small in size, are not well distributed, and/or are isolated and lack connectivity. As a result, they are subject to a high risk of extirpation from catastrophic events such as wildfire, and currently would not meet recovery goals for establishing a minimum or large viable metapopulation, as described in the KBB Recovery Plan and DRAFT Management Strategy (USDI Fish and Wildlife Service 2003, USDA Forest Service 2004a).

Currently, the Brohman and Bigelow Metapopulation Areas also are at risk of extirpation. Neither of these metapopulation areas meets recovery goals for establishing a minimum or large viable metapopulation (USDA Forest Service 2009a). The number of acres and sites occupied by KBB, and the number of KBB observed during surveys, have declined within both of these metapopulation areas to the point where currently no KBB are found on National Forest System lands (USDA Forest Service 2009a). All 4 known KBB subpopulations within the Bigelow Metapopulation Area occur on private lands (USDA Forest Service 2009a). KBB have not been observed within subpopulations located on National Forest System lands within the Brohman Metapopulation Area since 2005, and no occupied KBB sites are known to occur on non-National Forest System lands (USDA Forest Service 2009a). In addition, no new KBB subpopulations were identified within the Brohman or Bigelow Metapopulation Areas during inventory or presence/absence surveys conducted in 2007, 2008, and 2009 (USDA Forest Service 2009b).

The Forest believes that the following factors might be responsible for apparent KBB declines in the four metapopulation areas (USDA Forest Service 2006a, USDA Forest Service 2009a):

- Habitat loss due to natural succession is continuing at the same level, despite past treatments that have attempted to prevent woody encroachment into suitable KBB habitat. The number of acres of suitable KBB habitat experiencing woody encroachment is greater than the number of acres of suitable KBB habitat treated annually.
- Deer browsing of wild lupine, which might reduce KBB larval survival, is increasing within suitable KBB habitat.
- Weather conditions have shifted between drought conditions and very wet and cold springs and summers, with several spring frosts. As a result, availability of wild lupine and other important nectar plants has decreased within suitable KBB habitat. In addition, these conditions likely decreased over-winter survival of KBB eggs.
- Topography of these units, with low depressional areas, increases the occurrence of growing-season frost pockets that might damage wild lupine and other nectar plants.
- Vehicle/ORV use and dispersed camping occurs within suitable KBB habitat and might kill KBB and/or damage wild lupine and other important nectar plants. Road closures implemented under the Forest Plan's management direction for the White River Semiprimitive Nonmmotorized Area, and camp site closures in occupied KBB habitat that have been implemented under Forest Plan Standards and Guidelines have reduced these impacts in some metapopulation areas (USDA Forest Service 2006b).

Efforts to prevent the extirpation of the KBB have increased dramatically since the Forest Plan was signed in 2006. To meet recovery goals for viable KBB populations, the Forest Plan calls for the restoration and maintenance of 20,300 acres of savannas/barrens within the four designated KBB metapopulation areas and essential KBB habitat on National Forest System lands over the next 50 years (USDA Forest Service 2006b). Since 1992, hand cutting, prescribed burns, mechanical removal of vegetation (i.e., mowing, sheer-cutting, masticating, bulldozing), scarification, seeding/planting, and road closures have been used to manage 927 acres of occupied and 927 acres of unoccupied KBB habitat (USDA Forest Service 2009a). However, 1,148 out of 1,854 acres (62%) that received savanna/barrens restoration treatments were managed after 2005 (USDA Forest Service 2009a). Whereas management activities occurred on an average of 50 acres per year between 1992 and 2005, an average of 287 acres per year were

treated between 2006 and 2009 (USDA Forest Service 2009a). This represents more than a five-fold increase in restoration activities. The amount of acres treated within occupied and unoccupied KBB habitat also has changed. Up until 2005, treatments primarily focused on maintenance of occupied sites (USDA Forest Service 2009a). In 2006, treatments shifted to focusing on savanna restoration in unoccupied areas around and between KBB subpopulations (USDA Forest Service 2009a).

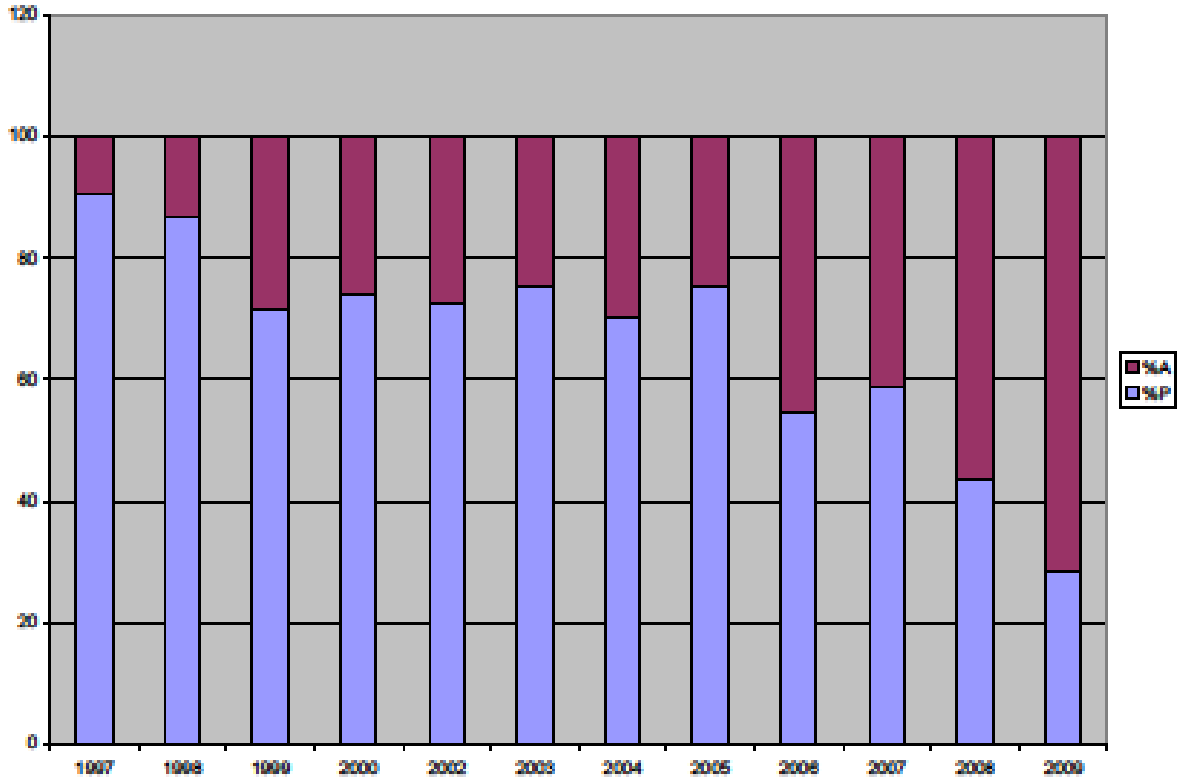
Currently, treatments to restore savanna/barrens for KBB are occurring within the White River Metapopulation Area under the Savanna/Barrens Restoration Project, for which a Decision Memo was signed in 2008 (USDA Forest Service 2008). Treatments to restore occupied KBB openings within the White River and Otto Metapopulation Areas are also occurring under the Karner Blue Butterfly Habitat Restoration Project, for which a Decision Memo was signed in 2009 (USDA Forest Service 2009c). The Proposed Action complements these two restoration efforts by expanding the acreage to be treated for savanna creation and opening restoration, and increasing the number of treatment techniques that can be used to meet restoration goals. For example, under the Karner Blue Butterfly Habitat Restoration Project, only hand tools may be used to remove woody vegetation and seed/plant native nectar species to restore occupied KBB sites (USDA Forest Service 2009c). Under this project, KBB opening restoration would incorporate a combination of mechanical equipment, hand tools, prescribed burning, herbicide application, soil scarification, and seeding/planting activities to reduce overstory and understory cover and to establish native nectar species.

The Baldwin/White Cloud Ranger District has increased dramatically its KBB monitoring program. These efforts include: determining how far designated metapopulation areas within the HMNF are from meeting recovery goals; developing a habitat suitability model for KBB within the MNF; identifying high priority areas to target management; and, evaluating the effectiveness of different management strategies for restoring KBB habitat. Between 2006 and 2009, the number of acres that were monitored for KBB on the District increased by more than three-fold (298 acres in 2006, 843 acres in 2007, 812 acres in 2008, 1,130 acres in 2009). This increase was due largely to increases in volunteer participation in the survey efforts (USDA Forest Service 2009a). These data will be used to focus management efforts in areas where there is a high probability of KBB occurrence and restoration success.

In addition, the District began a demonstration project in 2008 to determine the effectiveness of combining several types of mechanical treatments and prescribed burn prescriptions to restore KBB habitat. Activities conducted for the demonstration project are covered in the Savanna/Barrens Restoration Project (USDA Forest Service 2008). By applying what it learns from small scale demonstration projects at the landscape scale, the District will make restoration treatments more efficient and cost effective.

Based on the analyses of KBB count data, the estimated minimum KBB abundance within the MNF was 2-3 times lower in 2009 (10,333), than in 2008 (27,405) and 2007 (34,916) (USDA Forest Service 2009a). The percentage of sites designated as 'KBB present' has declined within the MNF since 1997 (Figure 3.1). By implementing restoration activities at a landscape scale using an adaptive management approach, as proposed under this project, the Baldwin/White Cloud Ranger District will improve its probability of effectively reversing the negative trend in KBB populations.

Figure 3.4: Changes in monitored Karner blue butterfly sites designated as 'present' and 'absent' between 1997 and 2009 within the Manistee National Forest (USDA Forest Service 2009a).



(3.5e) Direct and Indirect Effects

The primary sources of information for this section are the KBB Recovery Plan (USDI Fish and Wildlife Service 2003), the Biological Opinion on the Programmatic Biological Assessment for the Huron-Manistee National Forests Land and Resource Management Plan (USDI Fish and Wildlife Service 2006), and the Programmatic Biological Assessment for the Huron-Manistee National Forest (USDA Forest Service 2006a).

Alternative 1

Under Alternative 1, the quantity and quality of early successional vegetative types would continue to decline in the Project Area due to fire suppression and natural succession. As remnant openings and savannas/barrens filled in with fire-intolerant woody and shade-tolerant herbaceous species, suitable KBB habitat would likely become scarcer as wild lupine and other important KBB nectar plants are shaded-out or out-competed. Reductions in habitat quality and quantity within the 73 openings currently occupied by KBB would likely maintain the existing trend of decreasing population numbers within the Otto and White River Metapopulation Areas.

Alternative 1 would also not provide for the control of non-native invasive plant species within remnant openings and savannas/barrens. Many non-native invasive plant species may reduce wild lupine and other native plants that provide nectar sources for adult KBB, which could

decrease the numbers and distribution of KBBs within the Forest (USDI Fish and Wildlife Service 2006). Leafy spurge, autumn olive, honeysuckle, Canada thistle, garlic mustard, Cypress spurge, Japanese barberry, sweetclover, Scots pine, and spotted knapweed were among invasive species found during botanical surveys conducted in 2006, 2007, and 2009 within stands proposed for savanna creation or KBB opening restoration treatments. Depending on the species and the abundance, these invasive plants could shade out or out-compete, and subsequently replace, wild lupine and other important KBB nectar plants. Failure to successfully control these invasive species would allow continued infestation and degradation of KBB habitat.

In addition, KBB habitat quantity and quality might decline under this Alternative because it would maintain the current road, trail, and camping densities within the Project Area. These densities are higher than Forest Plan objectives for the White River Semiprimitive Nonmotorized Area (WRSNA) (USDA Forest Service 2006b). In some areas of the Project Area, roads, trails, and concentrated use occur in potential or occupied KBB habitat. Currently, roads occur on 3.6 acres of occupied KBB habitat, and campsites occur on 1.5 acres of occupied KBB habitat. Dispersed camping sites have degraded occupied KBB habitat in the past (USDI Fish and Wildlife Service 2006). In addition, horseback riding occurs on Forest Service roads throughout the Project Area, and cross-county travel is permitted for horseback riding, except where posted signs exclude this form of recreation.

Some roads and trails within the Project Area provide KBB habitat (i.e., wild lupine and other nectar plants growing along roadsides, or road-rut ponds providing watering areas) and/or dispersal corridors. Foot traffic, dispersed camping, horseback riding, and vehicle use along roads and trails and within adjacent openings might damage or disturb KBB habitat (i.e., trampling, removing, or otherwise damaging wild lupine or other important nectar plants); temporarily displace, alter movement, or disrupt normal behavior of KBB (i.e., interfere with dispersal or mating activities). In addition, there would be increased risk of vehicle collisions, visitors directly harming, harassing, or killing KBB (all life stages), illegal collection, and wildfires (USDA Forest Service 2006a, USDI Fish and Wildlife Service 2006). Traffic along roads and trails might increase the risk of off-road vehicle use (i.e., all terrain vehicles, dirt bikes, snowmobiles), cross-country horseback riding, and dispersed camping, which might adversely affect KBB habitat via soil erosion and compaction, increases in bare ground, reduction in nectar plants, and increases in non-native invasive species (USDA Forest Service 2006a, USDI Fish and Wildlife Service 2006). Use of roads and trails that are close to, or pass through, potential or occupied KBB habitat have the greatest potential to have these direct and indirect effects. Thus, maintaining current levels of access and use would likely increase the risk of mortality and reduce habitat quantity and quality for KBB.

As KBB habitat quantity and quality decreases under Alternative 1, occurrences of KBB within subpopulations would likely decline within the Project Area. Surviving subpopulations would become even more isolated and disconnected, and thus subject to a higher risk of extirpation from catastrophic events. Without management, the HMNF would likely not meet the recovery goals for establishing two large viable metapopulations in the White River and Otto Metapopulation Areas (USDI Fish and Wildlife Service 2003). Overall, the "No Action" Alternative is likely to have adverse direct and indirect effects on KBB.

Alternatives 2 and 3

KBB opening restoration, proposed under Alternatives 2 and 3, would use a combination of hand cutting, mowing, brush hogging, mechanical slash/woody debris removal, prescribed burning, herbicide application, soil scarification, and seeding/planting activities to reduce tree/shrub density to an average <15% canopy cover and cover of undesired vegetation less than 2 meters in height to an average of <25% cover. In addition, these alternatives would establish 5-15% cover of wild lupine, 5-15% cover of other nectar plants, 60% presence of desired savanna plant species, and less than 5% presence of non-native invasive species. Disturbance from KBB opening restoration might displace or kill KBB within the 73 openings currently occupied by KBB within the Project Area. KBB have limited mobility and likely would not escape proposed management activities. While some KBB adults might be able to move out of treated areas, eggs and larvae are immobile and thus are particularly vulnerable and likely to be crushed during mechanical treatments such as brush hogging or discing, burned during prescribed burning, or trampled during hand cutting. Prescribed burning might directly affect KBB by killing all life stages. All other management activities proposed under KBB opening restoration would be prohibited between March 15 and August 15, which would minimize potential direct adverse effects on larval and adult life stages of KBB (see conservation measures for KBB in Appendix A of this document). However, these activities might still directly affect KBB by destroying overwintering eggs.

KBB opening restoration management activities also might damage or destroy wild lupine, reducing the availability of the sole food source for KBB caterpillars. KBB eggs and larvae primarily occur in association with wild lupine (USDI Fish and Wildlife Service 2003). As such, activities that damage or destroy wild lupine are more likely to destroy KBB eggs and larvae. Implementation of the proposed treatments may also temporarily disrupt the normal behavior of KBB, such as altering KBB dispersal or limiting the use of foraging or mating areas, potentially affecting productivity. KBB are most likely to be directly affected during the implementation of treatments by heavy equipment use (e.g., harvesters, skidders, trucks, bulldozers, discing, plowing) and prescribed burning. In addition, vehicle use and foot traffic along roads and within openings during management activities may temporarily increase the level of disturbance (e.g., human activity, noise, and habitat degradation), damage wild lupine and other nectar sources, temporarily displace, alter movement, or disrupt normal behavior of KBB, and increase the risk of vehicle collisions, and visitors directly harming, harassing, or killing KBB. However, given that few (≤10) KBB are present within most (84%) occupied KBB openings, and wild lupine and other nectar plants cover a small portion (1-4%) of occupied openings (USDA Forest Service 2009a, USDA Forest Service 2009b), the likelihood that KBB eggs, larvae, or adults, or wild lupine and other nectar plants would be exposed to KBB opening restoration activities is very low.

Savanna creation, prescribed burning, red pine thinning, and oak/aspen clearcuts, proposed under Alternatives 2 and 3, may also displace or kill adult KBB dispersing into stands that are adjacent to the 73 occupied openings. However, no occupied KBB subpopulations were located within areas proposed for these treatments during wildlife surveys conducted in 2006, 2007, and 2009. In addition, these proposed treatment areas are mostly forested and provide unsuitable habitat for KBB. Given that few (≤10) KBB are present within most (84%) occupied KBB openings and most areas proposed for savanna creation, prescribed burning, red pine

thinning, and oak/aspen clearcuts provide unsuitable habitat for KBB, it is highly unlikely that KBB would be directly affected by these treatments.

Management for the KBB may be detrimental to the species if not planned and executed appropriately (USDA Forest Service 2006a, USDI Fish and Wildlife Service 2006). The season, intensity, and frequency of management activities (particularly prescribed burns) could have detrimental effects on KBB through the killing of eggs, larvae, or adults. For example, operations during the larval and flight periods between March and August have the greatest potential of causing disturbance, damaging wild lupine and other nectar sources, and killing or disrupting the behavior of KBB. While KBB adults and larvae are less likely to be affected directly by management activities conducted between September and April (outside the larval and flight periods), implementation of treatments may still have short-term adverse direct effects via the crushing or burning of eggs (USDA Forest Service 2006a, USDI Fish and Wildlife Service 2006). In addition, restoration activities could eliminate a KBB subpopulation if they are conducted on the majority of an occupied KBB opening, and there is no source of individuals within a short distance to allow for repopulation (USDA Forest Service 2006a, USDI Fish and Wildlife Service 2006). For example, prescribed burning may threaten KBB populations if burning is conducted on the majority of a KBB site at one time, and if high intensity fires are used at frequent intervals (USDI Fish and Wildlife Service 2003). Mowing between late spring and early summer could damage wild lupine, eliminating food for KBB larvae, and mowing during adult nectaring periods might greatly reduce flower number and nectar availability (USDI Fish and Wildlife Service 2003). The mowing of wild lupine and nectar plants before seeds mature and disperse may reduce the reproduction of these food plants. This would have a long-term detrimental effect on KBB (USDI Fish and Wildlife Service 2003).

By implementing conservation measures outlined for KBB in Appendix A within occupied or potential unoccupied KBB habitat, management for KBB would be planned and executed to minimize adverse effects on KBB adults, larvae, and eggs and wild lupine and other nectar sources. Conservation measures for occupied KBB habitat would be implemented within the 73 openings covering 519 acres occupied by KBB. Based on the overlap of historical occurrences of savanna/barrens habitats and KBB, 2,542 acres within the Project Area have the potential to be restored to suitable KBB habitat. Conservation measures for potential unoccupied KBB habitat would be implemented within the 2,542 acres proposed for savanna creation under Alternatives 2 and 3. Should any new occupied KBB habitat be identified during treatment of units or in future surveys, these same conservation measures would be applied.

Conservation measures include all Forest Plan Standards and Guidelines (USDA Forest Service 2006b), as well as other suggested management practices described in the KBB Recovery Plan (USDI Fish and Wildlife Service 2003) and the DRAFT Management Strategy (USDA Forest Service 2004a). Standards and guidelines include, but not are limited to, the following:

1. Planning, both annually and cumulatively for the term of the project, for the appropriate amount, spatial arrangement, and rotation schedule of restoration sites to maximize habitat recovery and recolonization potential;
2. Seasonal time restrictions for each restoration technique to minimize the potential for direct effects and to maximize effectiveness;
3. Minimize incidental habitat damage due to equipment or methodology; and

4. Pre- and post-treatment monitoring for KBB and habitat responses (USDA Forest Service 2006a, USDI Fish and Wildlife Service 2006).

The monitoring of treatment results and progress allows for any necessary adjustments to be made to restoration techniques (USDA Forest Service 2006a, USDI Fish and Wildlife Service 2006). For example, to minimize the number of KBB killed and the amount of suitable KBB habitat impacted from prescribed burns, occupied KBB openings would be divided into at least 3 burn units based on the number of KBB and habitat conditions (i.e., occurrence of wild lupine and other nectar sources), the most degraded 1/3 would be treated first, and no more than 1/3 of an occupied opening would be burned in any one year. In addition, occupied KBB openings scheduled for burning would ideally be within ½ mile of unburned occupied KBB openings to aid recolonization. Using an approximate 4 year burn frequency would also give the burned areas time to regenerate and become repopulated by KBB so they could aid in recolonization when other units within occupied KBB openings were burned.

Except for prescribed burning, all of the other management activities would be prohibited between March 15 and August 15, during the larval and flight periods. This would minimize the adverse effects to KBB adults and larvae and important nectar plants such as wild lupine. Forest Service employees and contractors who perform management activities also would be educated to recognize and avoid wild lupine. In addition, annual surveys would be conducted to provide up-to-date information on distribution and status of KBBs, which would be applied to management activities to minimize take.

Some of the conservation measures outlined for occupied KBB habitat in Appendix A are not specified in the Forest Plan Standards and Guidelines (USDA Forest Service 2006b), but are consistent with the management suggestions proposed in the Standards and Guidelines, the KBB Recovery Plan (USDI Fish and Wildlife Service 2003), and the DRAFT Management Strategy (USDA Forest Service 2004a). For example, these conservation measures allow a combination of manual or mechanical tree/shrub removal, herbiciding, and/or seeding/planting to occur following a prescribed burn on 1/3 of an occupied KBB opening, as long as all treatments occur within the burned unit, during the same year that the area was burned. By combining treatments, restoration goals for occupied KBB habitat might be achieved more efficiently and effectively. For example, a prescribed burn might remove leaf litter and reduce fire-intolerant species that out-compete important nectar plants like wild lupine, but only top kill woody vegetation less than 3 inch dbh. By following the burn with hand cutting, larger shrubs and trees could be removed that are not killed during the prescribed burn, increasing incident sunlight and subsequently favoring the establishment of fire-tolerant nectar species. In addition, the desired composition of nectar plants might be achieved more efficiently and effectively by broadcast seeding burned areas in the fall. Also, some non-native invasive species, such as autumn olive or Japanese barberry, might be controlled more efficiently and effectively by following a prescribed burn with herbicide application. Although this conservation measure was not specified in the Forest Plan Standards and Guidelines (USDA Forest Service 2006b), it is consistent with the Standards and Guidelines given that the conservation measures for subsequent restoration techniques would be implemented. Minimal additional adverse effects to KBB or suitable KBB habitat would be likely to occur within the unit since: 1) it has already been burned; 2) no more than 1/3 of an occupied site would be treated within a given year; and 3) it represents the most degraded portion of an occupied site.

Another conservation measure outlined for occupied KBB habitat in Appendix A that is not specified in the Forest Plan Standards and Guidelines (USDA Forest Service 2006b) allows mechanical equipment, of similar size and weight to a mower or brush hog, to be used to remove slash/woody debris within an occupied KBB opening. This measure is consistent with the management suggestions proposed in the Standards and Guidelines, the KBB Recovery Plan (USDI Fish and Wildlife Service 2003), and the DRAFT Management Strategy (USDA Forest Service 2004a). Mechanical removal of slash/woody debris would be prohibited between March 15 and August 15, and would occur on no more than half of an occupied KBB opening each season unless there is a colonization source within one-fourth mile that has the capability to recolonize the opening. Cut vegetation within an occupied KBB opening that might contain KBB eggs would be left unless the cut vegetation is collected and placed in another suitable KBB habitat site. In occupied KBB openings that have experienced heavy woody encroachment, it is logistically unfeasible to remove slash/woody debris by hand after woody vegetation has been cut. By allowing the use of mechanical equipment, such as a farm tractor with a trailer, that is the size and weight of a mower or brush hog, the conservation measure requiring slash not to exceed 20 percent of an area would be achieved more efficiently and effectively. This conservation measure is consistent with the Forest Plan Standards and Guidelines (USDA Forest Service 2006b) given that the adverse effects of mechanical removal of slash/woody debris using equipment of similar size and weight to a mower or brush hog are assumed to be similar to those from mowing or brush hogging, and, as such, the conservation measures outlined for these two activities in Appendix A would be applied.

When management is planned and executed appropriately (e.g., conservation measures such as those in Appendix A are implemented), prescribed burning and mechanical treatments within occupied KBB habitat have been shown to not adversely affect KBB or wild lupine. For example, Pickens (2006) compared KBB abundance in burned, mowed, and unmanaged sites and found no significant difference in male or female abundance during the first brood. In the second brood, there were significantly more females in burned areas compared to the other two treatments, and significantly more males in burned and mowed areas compared to unmanaged areas (Pickens 2006). In addition, King (2003) compared control, mowed, and burned treatment effects on KBB populations and the cover of associated herbaceous plants, and found no treatment-related changes in KBB density or cover of wild lupine. Wild lupine responses also did not significantly differ among herbicide and mechanical treatments applied at annual, four, and eight year intervals in a study conducted by Forrester et al. (2005). However, wild lupine cover, clump size, and density of stems per clump increased following application of treatments in general (Forrester et al. 2005). The number and cover of nectar species, total herbaceous cover, and species richness also responded positively to treatment overall (Forrester et al. 2005). Also, lupine abundance and the proportion of lupine stems with signs of feeding were positively correlated with military training activities, suggesting that maintenance of lupine habitat can be achieved in concert with human uses such as military training when planned and executed appropriately (Smith et al. 2002). In general, many methods for removing and suppressing tree and shrub canopy can have a net positive effect on wild lupine and KBB, and should be timed and carried out in ways that minimize harm to the butterfly, wild lupine, and nectar plants (USDI Fish and Wildlife Service 2003).

Under Alternatives 2 and 3, strip/patch or spot application of gylphosate, triclopyr, or imazapyr is proposed to control non-native invasive species and to control persistent woody

vegetation within savanna creation and KBB opening restoration areas. Ecological risk assessments conducted for glyphosate, triclopyr, and imazapyr suggest that use at rates commonly used by the Forest Service poses little or no risk to wildlife (USDA Forest Service 2003a, USDA Forest Service 2003b, USDA Forest Service 2004b). The proposed herbicides are not highly toxic to avian receptors such as bald eagles, to insect species such as Karner blue butterflies, to reptile species such as Blanding's turtle or wood turtle, or to the small mammal, amphibian, and fish species that form the chief prey of carnivores such as red-shouldered hawks, northern goshawks, and bald eagles (USDA Forest Service 2003a, USDA Forest Service 2003b, USDA Forest Service 2004b). Proposed herbicides are not cholinesterase inhibitors such as organophosphate or a carbamate insecticide (or chemically related to such insecticides) that are highly toxic to wildlife, especially insects and other invertebrates. Nor are the proposed herbicides chemically related to chlorinated hydrocarbon insecticides such as DDT that are highly persistent in the environment and known for causing eggshell thinning of raptors (birds of prey) such as bald eagles and ospreys. Herbicide toxicity and risk data (Appendix C) for mammalian, aquatic, avian, and terrestrial wildlife species suggest glyphosate, triclopyr, and imazapyr are generally safe to mammals, birds, and other wildlife if used in accordance with the manufacturer label.

In addition, glyphosate, triclopyr, and imazapyr are not expected to bioaccumulate in the food chain (USDA Forest Service 2003a, USDA Forest Service 2003b, USDA Forest Service 2004b). KBB could be exposed to herbicides by direct contact with herbicide spray or with recently treated foliage. Oral exposure also could occur by ingesting contaminated nectar or by drinking from water sources that have received contaminated surface runoff. However, KBB are not likely to come in direct contact with herbicide spray or recently treated foliage, or consume contaminated nectar or water because only strip/patch or spot application of herbicides would be used to treat small areas within occupied KBB habitat. Research to date suggests that glyphosate can be used with minimal direct impact on the Karner blue butterfly (USDI Fish and Wildlife Service 2003). Studies indicate that glyphosate-imazapyr mixtures may be effective in reducing woody cover with positive effects on wild lupine populations (USDI Fish and Wildlife Service 2003). Sucoff et al. (2001) suggested that glyphosate-triclopyr mixtures may cause a slight (2%) reduction in the reproductive success of KBB.

Poorly timed or poorly located use of herbicides can have a negative effect on KBB, by killing or suppressing wild lupine or important nectar plants (USDI Fish and Wildlife Service 2003). Application of herbicides in KBB occupied areas is best done after wild lupine and nectar plants senesce (USDI Fish and Wildlife Service 2003). Any adverse effects to KBB and its habitat would be minimized by prohibiting herbicide application in or adjacent to occupied KBB habitat between April 1 and August 15, except when the wind is not blowing toward the habitat and there is a minimum buffer of 100 feet (30 m) between the habitat and treatment area, and by avoiding wild lupine during herbicide application, as outlined in the conservation measures for KBB in Appendix A. These conservation measures would ensure that herbicide applications are not completed at a time and place where there would be adverse effects to the species (USDA Forest Service 2006a, USDI Fish and Wildlife Service 2006).

Vegetative management proposed under Alternatives 2 and 3 would likely have a greater effect on local KBB populations through habitat change. Implementation of treatments might temporarily reduce densities of wild lupine and other native flowering plants that serve as food

sources for KBB larvae and adults, and/or the cover of warm season grasses that are used by adult KBB for basking and roosting. For example, prescribed burns might damage vegetation and increase the amount of bare ground within treated KBB openings, temporarily decreasing cover and the abundance of native grasses, herbs, wildflowers, and fruit-bearing shrubs. In addition, mechanical equipment such as a mower or brush hog might run over and destroy ant mounds during operations, which might subsequently increase the rates of parasitism and predation on KBB larvae. Without sufficient knowledge of what plant species are present on a given site and their response to different management activities, implementation of proposed treatments might increase undesired plant species. For example, fire may either increase the abundance of invasive species, such as spotted knapweed, and/or native species, such as Pennsylvania sedge, that compete with wild lupine and nectar plants.

Disturbance from restoration activities also might create conditions favorable for the establishment of non-native invasive species, such as spotted knapweed and St. John's wort. While non-natives like spotted knapweed do provide nectar sources for KBB, they tend to choke out some native plants, and consequently dominate and reduce overall site biodiversity, which might increase the risk of extirpation of KBB subpopulations (USDI Fish and Wildlife Service 2006). Proposed herbicide treatments under Alternatives 2 and 3 would minimize the occurrence of non-natives and favor more desirable native nectar species. Effects of herbicides on the growth and flowering of wild lupine and other nectar plant species varies, and at times might result in a temporary reduction in habitat quantity and quality for KBB (USDI Fish and Wildlife Service 2003). Potential adverse indirect effects to KBB habitat quality are expected to be minimized by implementing the conservation measures outlined for KBB in Appendix A, which maximize habitat recovery potential, minimize incidental habitat damage due to equipment or methodology, and use pre- and post-treatment monitoring to ensure treatments are efficient and effective.

Under Alternatives 2 and 3, savanna creation and KBB opening restoration also might improve habitat for herbivores occurring within the Project Area. Wild lupine is browsed by deer, woodchucks, and insects (USDI Fish and Wildlife Service 2003). In particular, deer might experience an increase in habitat quantity and quality, potentially causing localized increases in deer numbers (USDI Fish and Wildlife Service 2006) and increased herbivory on wild lupine within savanna creation and KBB opening restoration areas (USDI Fish and Wildlife Service 2006). KBB eggs and larvae primarily occur in association with wild lupine (USDI Fish and Wildlife Service 2003), so herbivory on wild lupine also likely would destroy KBB eggs and larvae. High deer densities can devastate KBB habitat and cause direct mortality by the ingestion of larvae (Schweitzer 1994). Schweitzer (1994) recommends that deer populations be managed to levels where no more than 15 percent of lupine flowers are consumed. However, the management of deer populations is outside Forest Service jurisdiction and authority. In the long-term, deer herbivory might decrease the overall rate of KBB reproduction by limiting lupine growth (USDI Fish and Wildlife Service 2006). It is unknown whether other birds or mammals that might benefit from savanna creation and KBB opening restoration treatments such as wild turkey cause significant mortality at any life stage of the Karner blue butterfly (USDI Fish and Wildlife Service 2003). However, bird beak-marks have been observed occasionally on the wings of adult KBB (USDI Fish and Wildlife Service 2003).

Much of the habitat change expected from savanna creation and KBB opening restoration treatments proposed under Alternatives 2 and 3 would likely have beneficial indirect effects to local KBB populations. Prescribed burning would be used to suppress undesirable plant species, enhance the diversity and abundance of desirable plant species, raise soil pH, and expose mineral soils. Woody plant cover would be reduced, increasing the incident sunlight at ground level (USDI Fish and Wildlife Service 2003). Hand cutting, mowing, brush hogging, and herbicide application would mimic certain effects of fire, wild herbivore grazing and browsing, and insect and disease outbreaks, suppressing undesirable herbaceous and woody plants and increasing incident sunlight at ground level (USDI Fish and Wildlife Service 2003). Soil scarification would mimic certain effects of fire by exposing mineral soils and providing sunlit seed beds to promote the germination and growth of lupine and nectar plants (USDI Fish and Wildlife Service 2003). Soil scarification would be used when wild lupine or nectar plant densities are insufficient to meet KBB habitat management objectives, and would be followed by seeding or planting. Seeding/planting activities would increase the abundance of the KBB's host plant, adult nectar sources, and warm season grasses for basking and roosting. Herbicide treatments also would reduce stump sprouting of woody vegetation and establishment of non-native invasive species within treated areas, which could impede the establishment of wild lupine and other desired nectar sources through shading or competition (USDI Fish and Wildlife Service 2003).

Overall, savanna creation and KBB opening restoration would reduce overstory and understory cover, and increase sunlight and the overall open nature of the savanna/barrens habitats (USDI Fish and Wildlife Service 2006). These treatments would subsequently shift the competitive advantage away from shade-tolerant plant species and provide the variable light conditions required to promote the growth of wild lupine (the sole food source for the KBB caterpillar), other KBB nectar plants such as black-eyed Susan and horsemint, and native grasses such as big blue stem, little blue stem, and Indian grass. The expected net effect of savanna creation and KBB opening restoration would be improved habitat conditions for KBB. This would be evidenced by increased production and biomass of wild lupine and other important KBB nectar plants and the suppression of woody vegetation (USDI Fish and Wildlife Service 2006). These improved habitat conditions would likely increase adult foraging and breeding, and the development of eggs and larvae (USDI Fish and Wildlife Service 2006).

Currently, suitable KBB habitat occupies 519 acres within the Project Area. Without management, the quantity and quality of this habitat would continue to decline over time due to uncontrolled encroachment of woody vegetation and subsequent reductions of wild lupine and other nectar plants. Savanna creation and opening restoration activities would create up to 3,061 acres of suitable KBB habitat under Alternatives 2 and 3. This acreage would contribute to the Forest Plan's goal to restore 20,300 acres of savannas/barrens within the four designated KBB metapopulation areas and essential KBB habitat (USDA Forest Service 2006b).

Management activities under Alternatives 2 and 3 would create a heterogeneous habitat mosaic that provides subhabitat variation in tree canopy and shrub cover, plant community composition, thermal environment, topography, and soil moisture required for mating, roosting, adult feeding, oviposition (i.e., egg laying), and egg and larval growth and survival. In addition, these alternatives would develop a habitat design that maximizes connectivity between subhabitat types within subpopulations, as well as between subpopulations within the

Otto and White River Metapopulation Areas. This would meet the requirement to promote dispersal and support persistent viable metapopulations. By creating a heterogeneous habitat mosaic that provides subhabitat variation for all KBB life stages and maximizes connectivity between subhabitat types within and between KBB subpopulations, Alternatives 2 and 3 would increase the acreage, distribution, and connectivity of suitable KBB habitat as directed by the KBB Recovery Plan (USDI Fish and Wildlife Service 2003), the DRAFT Management Strategy (USDA Forest Service 2004a), and the Forest Plan (USDA Forest Service 2006b). Alternatives 2 and 3 would also follow an adaptive management approach, modifying treatments in response to effectiveness monitoring and using demonstration projects to determine the most efficient and effective restoration techniques. This would increase the probability of restoration success within the Project Area. As management activities increase the amount of suitable KBB habitat around and between extant subpopulations and increase dispersal opportunities between occupied and unoccupied habitat patches, the number of occupied KBB subpopulations and the total number of KBB within Otto and White River Metapopulation Areas would likely increase.

Overall, vegetation management activities proposed under Alternatives 2 and 3 may have direct and indirect effects on KBB within the Project Area. However, KBB opening restoration and savanna creation are necessary to preserve, enhance, and create habitat for KBB to promote persistent populations within the Otto and White River Metapopulation Areas. Without these treatments, KBB populations would likely continue to decline within the Otto and White River Metapopulation Areas, and surviving subpopulations would become even more isolated and disconnected, and thus subject to a higher risk of extirpation from catastrophic events. KBB opening restoration and savanna creation are expected to have an overall beneficial effect on KBB populations by increasing the acreage, distribution, and connectivity of suitable habitat with the goal of establishing two large viable metapopulations in the White River and Otto Metapopulation Areas as directed by the KBB Recovery Plan (USDI Fish and Wildlife Service 2003), the DRAFT Management Strategy (USDA Forest Service 2004a), and the Forest Plan (USDA Forest Service 2006b).

Off-road vehicle use (i.e., all terrain vehicles, dirt bikes, snowmobiles), cross-country travel via foot or horseback, and dispersed camping may increase within areas proposed for savanna creation and KBB opening restoration under Alternatives 2 and 3. Increased recreational use might reduce the quantity and quality of potential and occupied KBB habitat by:

1. Damaging or disturbing KBB habitat elements (i.e., trampling, removing, or otherwise damaging wild lupine or other important nectar plants, or increasing non-native invasive species);
2. Increasing the risk of vehicle/KBB collisions, visitors directly harming, harassing, or killing KBB (all life stages);
3. Temporarily displacing, altering movement, or disrupting normal behavior of KBB (i.e., interfere with dispersal or mating activities);
4. Increasing soil disturbance, erosion, compaction, and the amount of bare ground;
5. Increasing the risk of illegal collection; and/or
6. Wildfires (USDA Forest Service 2006a, USDI Fish and Wildlife Service 2006).

Potential adverse effects would be minimized with the implementation of the conservation measures outlined for KBB in Section Appendix A. Signs would be installed within areas proposed for savanna creation and KBB opening restoration treatments explaining the benefits

of restoring native plant communities and requesting recreationists to stay on designated roads and trails. If damage from recreational use within treated areas is noted in KBB habitat, public access to managed savannas and openings would be blocked via a variety of methods such as barrier posts or piling brush around the perimeter of treatment areas.

Recreation and transportation management activities proposed under Alternatives 2 and 3 would have primarily beneficial effects to local KBB subpopulations within the Project Area by reducing the conflicts that would occur between humans and KBB as a result of these activities. Following the Forest Plan management direction for the WRSNA all Forest System roads that are currently open within the WRSNA would be closed under Alternatives 2 and 3. Both Alternatives also propose the development of a parking area for motorized vehicles within the WRSNA. In addition, under Alternatives 2 and 3, the number of motorized-dependent camping sites would be limited to 11 designated sites. Currently, roads occur on 3.6 acres of occupied KBB habitat, and campsites occur on 1.5 acres of occupied KBB habitat.

The White River Metapopulation Area occurs within the WRSNA. Under Alternatives 2 and 3, all Forest System roads and campsites that currently occur in potential or occupied KBB habitat within the White River Metapopulation Area would be closed. All dispersed motorized camping sites that occur within occupied KBB habitat in the Otto Metapopulation Area also would be closed under Alternatives 2 and 3. However, neither Alternative proposes closing all Forest System roads within the Otto Metapopulation Area. Under Alternative 2, 0.2 miles of Forest System roads would be closed to motorized use within occupied KBB habitat in the Otto Metapopulation Area; Forest System roads would still occur on 0.8 acres of occupied KBB habitat. Alternative 3 would reduce human access and use more than Alternative 2 by closing an additional 0.7 miles of Forest System roads that occur within occupied KBB habitat to motorized use, with the exception of seasonal snowmobile use. However, Forest System roads would still occur on 0.3 acres of occupied KBB habitat in the Otto Metapopulation Area under Alternative 3.

By closing roads and dispersed motorized camping sites that occur within potential or occupied KBB habitat, as proposed under Alternatives 2 and 3, human use would be less likely to damage or disturb KBB habitat (i.e., trampling, removing, or otherwise damaging wild lupine or other important nectar plants); temporarily displace, alter movement, or disrupt normal behavior of KBB (i.e., interfere with dispersal or mating activities); or result in vehicle/KBB collisions, visitors directly harming, harassing, or killing KBB (all life stages), illegal collection, and wildfires. Reduced traffic along roads also would likely decrease the risk of off-road vehicle use (i.e., all terrain vehicles, dirt bikes, snowmobiles) and cross-country travel, which might adversely affect KBB habitat via soil erosion and compaction, increases in bare ground, reduction in nectar plants, and increases in non-native invasive species. Roads and trails that border savanna creation and KBB opening restoration treatments would likely experience an increase in nectar plant availability, increasing the quality and quantity of KBB dispersal corridors within the Project Area.

Human use and its associated impacts (i.e., damaging wild lupine or other habitat elements, killing or disrupting the behavior of individual KBB, spreading non-native invasive species, soil disturbance or compaction) might adversely affect KBB where county roads and Forest System roads remain open to motorized use within potential and occupied KBB habitat. Potential

adverse effects from Forest System roads that would remain open within KBB habitat would be minimized with the implementation of conservation measures outlined for KBB habitat in Appendix A. Signs and barriers would be installed along all Forest System roads that would still occur within occupied KBB habitat, to prevent off-road vehicle use (i.e., all terrain vehicles, dirt bikes, snowmobiles) and dispersed camping. If Forest System roads and their associated uses are found to adversely impact KBB or its habitat, they would be relocated or decommissioned. Potential adverse effects from county roads that would remain open to motorized use within potential and occupied KBB habitat in the White River and Otto Metapopulation Area also would be minimized with the implementation of conservation measures outlined for KBB habitat in Appendix A.

Currently, horseback riding occurs on Forest System roads throughout the Project Area, and cross-country travel is permitted for horseback riding, except where posted signs exclude this form of recreation. Under Alternative 2, cross-country travel for horseback riding would no longer be permitted within the WRSNA, and thus the White River Metapopulation Area. Horseback riding would be limited to a 19.7 mile designated trail which occurs outside potential and occupied KBB habitat. In addition, Alternative 2 proposes the development of a day-use parking area for horse rigs within the WRSNA, and would require the removal of horse manure, feed, and hay at the designated day-use parking area and at designated camping areas within the WRSNA. Alternative 2 also would allow for the watering of horses with buckets at identified permanent water sources on National Forest System lands. Alternative 3 would reduce this form of non-motorized use more than Alternative 2 by prohibiting horseback riding within the WRSNA. Neither Alternative would reduce horseback riding within the Otto Metapopulation Area. Cross-country travel for horseback riding and riding along Forest System roads would still be permitted within the Otto Metapopulation Area under Alternatives 2 and 3. In addition, under Alternatives 2 and 3, horseback riding would still occur on county roads that occur within potential or occupied KBB habitat within the White River and Otto Metapopulation Areas.

Because of their relatively large weight and small area in contact with ground, horses have a relatively high potential for environmental damage: more than 20 times the pressure of a man wearing boots and more than twice the pressure by a trail bike or four-wheel drive vehicle (Landsberg, et. al. 2001). Horse use has been shown to result in soil erosion and compaction (Cole and Spildie 1998, Deluca et al. 1998, Campbell and Gibson 2001, Pickering et al. 2009). In addition, horse use has been shown to damage forbs and shrubs via trampling and grazing, and cause defoliation and nutrient enrichment by urination and defecation, reducing plant height and biomass and changing plant species composition along trails (Cole and Spildie 1998, Pickering et al. 2009). Studies also have shown that horses can transport the seeds of non-native invasive species in their manure and thus have the potential to spread invasive species (Campbell and Gibson 2001, Landsberg, et. al. 2001, Cosyns, et. al. 2005, Wells and Lauenroth 2007, Pickering, et. al. 2009, Stroh and Struckhoff 2009, Pickering and Mount 2010). The risk of invasive species establishment is highest when manure is deposited in disturbed, damp sites, especially off-track (Landsberg, et. al. 2001).

In addition to adversely affecting soil and vegetation, horse use has been reported as a contributing factor to the decline of several invertebrate species. Vaughan and Black (2002) reported that within one site occupied by the Taylor's checkspot butterfly, 15-16 horses

trampled much of the area containing Indian paintbrush (the larval hostplant) and might have played a role in the extirpation of the Taylor's checkerspot from the site. Development of the Mt. Adams Horse Camp at Bugle Springs in the Gifford Pinchot National Forest was expected to be detrimental to Mardon skippers as a result of trampling by humans and horses, and grazing by horses within Mardon skipper habitat (Black, et. al. 2002). Recreation also has been found to disrupt the normal behavior of KBB and other listed butterfly species, potentially reducing availability of suitable habitat and reducing productivity. Hiking, jogging, and dog walking along trails in occupied KBB habitat at Indiana Dunes National Lakeshore was found to significantly disturb KBB (personnel communication, Dr. Tory Bennett, Oregon State University, May 9, 2010). Post-disturbance female KBBs flew for longer periods of time than male KBBs before returning to natural behavior, such as ovipositing, nectaring, host plant searching behavior and basking (Ibid). Empirical data suggests that if female KBB are frequently disturbed, they select host plants further from trails, essentially degrading the quality of KBB habitat in proximity to trails and reducing the total amount of suitable habitat available to females (Ibid). These results have implications for female KBBs in terms of energy expenditure (potentially impacting their survival and egg production), their oviposition rate (potentially decreasing the number of eggs laid over an individual's flight period), and host plant selection (potentially limiting females from ovipositing on lupines near trails). KBB sensitivity to horse use along trails in occupied habitat would likely be greater than hiking, jogging, and dog walking.

By reducing horseback riding within potential or occupied KBB habitat within the WRSNA as proposed under Alternatives 2 and 3, this non-motorized use would be less likely to trample KBB (all life stages); temporarily displace, alter movement, or disrupt normal behavior of KBB (i.e., interfere with dispersal or mating activities); damage wild lupine or other important nectar plants; reduce presence and productivity of savanna nectar species; increase non-native invasive species; or increase soil disturbance, erosion, soil compaction, and the amount of bare ground. Requiring removal of horse manure, feed, and hay at the designated day-use parking area and at designated camping areas within the WRSNA also likely would reduce the risk of introducing and spreading non-native invasive species within the Project Area. Allowing for watering horses with buckets at identified permanent water sources is not expected to affect KBB or its habitat, as the watering locations would not occur within potential or occupied KBB habitat.

Horseback riding and its associated impacts (i.e., damaging and reducing wild lupine or other important nectar species, killing or disrupting the behavior of individual KBB, spreading non-native invasive species, increasing soil disturbance, erosion, compaction, and bare ground) might adversely affect KBB where county roads, Forest System roads, and National Forest System lands remain open to this non-motorized use within potential and occupied KBB habitat. Potential adverse effects from cross-country travel and horseback riding along Forest System roads within potential and occupied KBB habitat in the Otto Metapopulation Area would be minimized with the implementation of conservation measures outlined for KBB habitat in Appendix A. Signs and barriers would be posted to ensure the public stays on Forest System roads within occupied KBB habitat. If damage from horseback riding is noted within occupied KBB habitat, Forest System roads providing access to damaged occupied sites would be relocated or decommissioned. Signs would be posted to ensure the public stays on roads within unoccupied KBB habitat. If damage from horseback riding is noted within unoccupied

KBB habitat, barriers would be installed to ensure the public stays on Forest System roads. Potential adverse effects from county roads that would remain open to horseback riding within potential and occupied KBB habitat in the White River and Otto Metapopulation Areas also would be minimized with the implementation of conservation measures outlined for KBB habitat in Appendix A.

Overall, recreation management activities proposed under Alternatives 2 and 3 would likely decrease the risk of mortality and improve habitat quantity and quality for KBB within the Project Area. Alternative 3 would reduce potential adverse effects of recreational use to KBB and its habitat more than Alternative 2, given that it proposes a greater reduction in human access and use within potential and occupied KBB habitat. Both Alternatives would meet Forest Plan management objectives for the WRSNA (USDA Forest Service 2006b).

(3.5f) Cumulative Effects

Increases in human populations and associated land development, road construction, and recreational uses are expected on private lands within the MNF. These activities would likely result in the degradation and permanent loss of KBB habitat and directly impact individual Karner blue butterflies by:

- Increasing the level of disturbance (e.g., human activity, noise, and habitat degradation);
- Damaging wild lupine and other important KBB nectar plants;
- Temporarily displacing, altering movement, or disrupting normal behavior of KBB; and
- Increasing the risk of vehicle/KBB collisions, wildfires, visitors directly harming, harassing, or killing KBB (all life stages), illegal collection, dispersed camping, and cross country travel.

Additional actions performed on private lands that may adversely affect KBB in the future within the MNF are fire suppression, mowing and grazing, off-road vehicle use (i.e., all terrain vehicles, dirt bikes, snowmobiles), application of pesticides, and timber harvest. In addition, mineral developments are reasonably certain to occur in the foreseeable future within the MNF and have the potential to cumulatively affect KBB and its habitat. Although land development activities may increase non-forested areas on private lands within the MNF, herbaceous species favorable to KBB are not likely to increase proportionately. Overall, habitat quantity and quality for the Karner blue butterfly and KBB occurrences would likely decline on private lands within the MNF. As a consequence, suitable KBB habitat on federal lands within the MNF is likely to become more important in the future.

The Forest Plan directs restoration and maintenance of 20,300 acres of savanna/barrens within designated KBB population management areas and essential KBB habitat within the HMNF (USDA Forest Service 2006b). Within the White River and Otto Metapopulation Areas, 2,814 and 2,209 acres (respectively) are proposed to be treated to develop savanna/barrens and openings that are accessible and usable by Karner blue butterflies (USDA Forest Service 2004a). Savanna creation and KBB opening restoration treatments proposed under this project would help achieve this goal. Implementation of the conservation measures presented above in Appendix A would minimize potential adverse effects to KBB and its habitat on National Forest System lands within the Project Area. Although increases in human populations and associated

land uses and developments are expected within the MNF in the future, positive effects of Forest Service projects such as the Proposed Action should mitigate potential the negative effects of activities on private lands.

In addition, current treatments to restore savanna for KBB are occurring on 365 acres within the White River Metapopulation Area under the Savanna/Barrens Restoration Project (USDA Forest Service 2008). Treatments to restore occupied KBB openings on 431 acres within the White River and Otto Metapopulation Areas also are occurring under the Karner Blue Butterfly Habitat Restoration Project (USDA Forest Service 2009c). The activities included under Alternatives 2 and 3 complement these two restoration efforts by expanding the acreage to be treated for savanna creation and opening restoration, and increasing the number of treatment techniques that can be used to meet restoration goals.

The Forest Service is also working in cooperation with the Michigan Department of Natural Resources and Environment, Consumer's Energy, The Nature Conservancy, and by extension, private landowners, to conduct coordinated management activities, particularly prescribed burning, to maximize increases in total KBB habitat creation and connectivity across different land ownerships. In addition, the Forest Service has a Karner blue butterfly Volunteer Outreach Program, which encourages private citizens to actively participate in KBB surveys and provides information about how to manage lands for savanna-dependent species.

Over the next 50 years, stands proposed for treatment under Alternatives 2 and 3 would regenerate and mature, again favoring wildlife species that prefer mature forest types. However, based upon management direction in the Forest Plan, reversion to pre-treatment conditions would be prevented as vegetation management would continue to occur within the MNF in the future. Stands restored to savanna/barrens and openings would be maintained as such before they converted to other forest types, thus continuing to provide suitable KBB habitat. Overall, the net long-term cumulative effect of the proposed restoration treatments and other protective measures and planned activities within the MNF would be beneficial to the KBB.

(3.5g) Indiana Bat

Status and Distribution

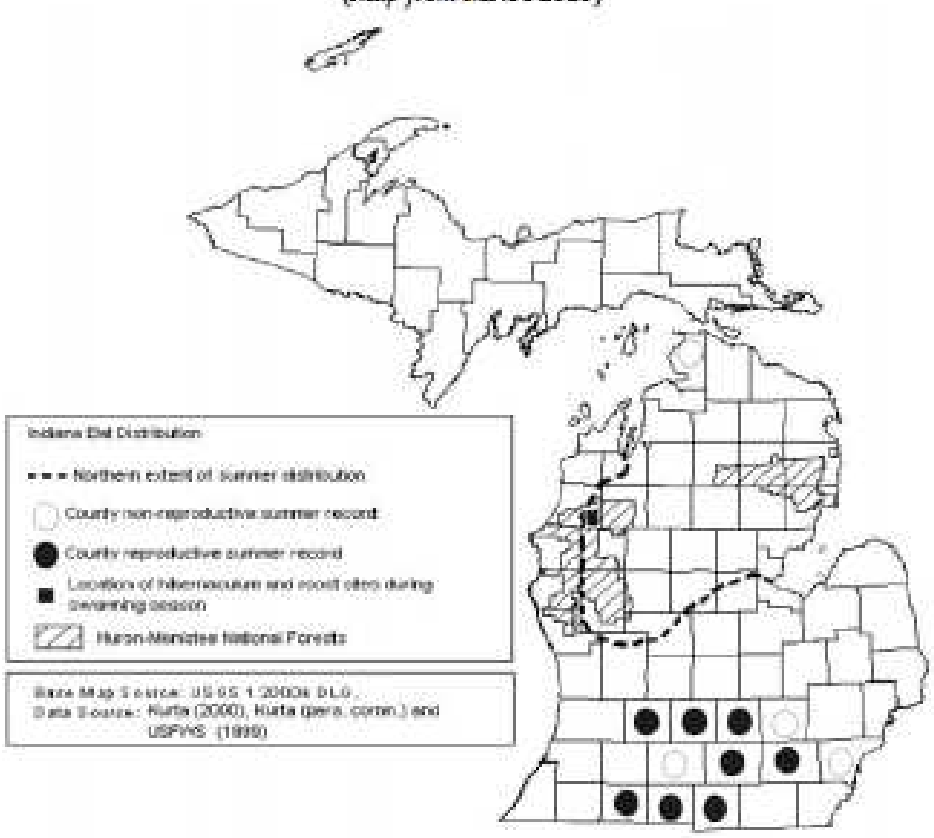
In 1967, the Indiana bat was listed federally as an Endangered species in the United States (USDI Fish and Wildlife Service 2006). A portion of the proposed activities under Alternatives 2 and 3 are within the potential breeding habitat area for Indiana bat on the HMNF (USDA Forest Service 2006a, USDI Fish and Wildlife Service 2006). Indiana bats roost and form maternity colonies under loose, exfoliating bark of trees (usually dead), in live shag-bark trees, or in hollows and cavities of mature trees in floodplain and bottomland forests, riparian zones, wooded wetlands, and upland forests (MNFI 2010, USDA Forest Service 2006a, USDI Fish and Wildlife Service 2006, USDI Fish and Wildlife Service 2007). Roost trees are typically within canopy gaps in a forest, in a fencerow, or along a wooded edge (USDI Fish and Wildlife Service 2007). In Michigan, savanna habitats adjacent to riparian corridors may have been historically important for roost sites, as the bats are thought to prefer sun-exposed trees for maximum warmth at the northern limit of their range (MNFI 2010). Indiana bats eat terrestrial and aquatic insects while foraging in forested stream corridors, upland bottomland forests, and over

impounded bodies of water at night (USDI Fish and Wildlife Service 2006). Detailed information on the ecology of Indiana bat and its status on the HMNF may be found in the Indiana Bat (*Myotis sodalis*) Draft Recovery Plan: First Revision (USDI Fish and Wildlife Service 2007), the Biological Assessment for the Huron-Manistee National Forests Environmental Impact Statement and Forest Plan (USDA Forest Service 2006a), and the Biological Opinion for the Huron-Manistee National Forests Land and Resource Management Plan (USDI Fish and Wildlife Service 2006).

Summer (May 15 through August 15) distribution of Indiana bat in Michigan occurs in the southern portion of the state and includes Barry, Branch, Calhoun, Case, Clinton, Eaton, Emmet, Hillsdale, Ingham, Jackson, Lenawee, Livingston, St. Joseph, Van Buren, Washtenaw, and Wayne Counties (Figure 3.5). Historical records from Emmet County represent the northern most summer sightings of this species in Michigan (USDA Forest Service 2006a). A small number of Indiana bats also are known to hibernate at Tippy Dam, which is located within the administrative boundary of the MNF on the Manistee River in Manistee County (USDA Forest Service 2006a). Tippy Dam is the only known Indiana bat hibernaculum in the state (USDA Forest Service 2006a), and autumn swarming and spring staging are likely restricted to this area (USDA Forest Service 2006a). The potential range of Indiana bat extends into the northwestern part of the MNF along Lake Michigan (Figure 3.5), and includes a total of 441,214 acres (USDA Forest Service 2006a). National Forest System lands within this range might provide summer habitat for maternity colonies and males (USDA Forest Service 2006a). Except for records in the Tippy Dam area, no occurrences are documented for Indiana bat on the HMNF, and the closest known summer maternity record for Indiana bat is near Vermontville, Michigan (Eaton Co.), approximately 62 miles southeast of the MNF (USDA Forest Service 2006a). No Indiana bats were found outside the Tippy Dam area on HMNF lands during surveys conducted in 1986, 1998, 1999 (USDA Forest Service 2006a). In addition, no vocalizations of Indiana bat were recorded during bat echolocation surveys conducted on HMNF lands in the summer of 2009 (USDA Forest Service 2009d).

Figure 3.5: Distribution of Indiana bat in Michigan.

(Map from MNFI 2010)



(Map from USDA Forest Service 2006a)

(3.5b) Direct Effects

Primary sources of information for this section are the Indiana bat (*Myotis sodalis*) Draft Recovery Plan: First Revision (USDI Fish and Wildlife Service 2007), the Biological Assessment for the Huron-Manistee National Forests Environmental Impact Statement and Forest Plan

(USDA Forest Service 2006a), and the Biological Opinion for the Huron-Manistee National Forests Land and Resource Management Plan (USDI Fish and Wildlife Service 2006).

All Alternatives

No direct effects to Indiana bat would occur under Alternatives 1, 2, or 3. The Project Area is approximately fifty miles from Tippy Dam, the only known hibernaculum, and the Tippy Management Zone (swarming habitat). Therefore, no impacts to swarming bats, the hibernaculum, or wintering bats would occur. Although the Project Area is within the potential breeding (summer) range for Indiana bat, breeding Indiana bats are unlikely to occur within the Project Area. No suitable breeding habitat was found during wildlife surveys conducted in 2006, 2007, and 2009, and no vocalizations of Indiana bat were recorded during bat echolocation surveys conducted in summer 2009. Echolocation is used to distinguish different types of bat species in the field (personnel communication, Eric Britzke, U.S. Army Corps of Engineers, April 1, 2010). In addition, except for records in the Tippy Dam area, no occurrences have been documented for Indiana bat on the HMNF. We also conducted a review of GIS vegetative data layers and tree record data to identify potential breeding habitat for Indiana bat within the Project Area. Based on this review, breeding habitat for Indiana bat may occur within 5 of the stands proposed for treatment in the Project Area under Alternatives 2 and 3 (Project File - Review of Tree Record Data for Potential Indiana Bat Breeding Habitat within the SER Project Area). The likelihood of an individual bat or colony occupying one of these stands during project implementation is very low, given that, at most, approximately 65 Indiana bats are estimated to occur within the HMNF and 441,214 acres of potential Indiana bat habitat are estimated to occur within the HMNF (USDA Forest Service 2006a, USDI Fish and Wildlife Service 2006).

To further diminish the potential for direct exposure of Indiana bats to treatments proposed under Alternatives 2 and 3 during the summer maternity period, seasonal restrictions on management activities described for Indiana bat in the Forest Plan Standards and Guidelines (USDA Forest Service 2006b) would be implemented within these 5 stands (see conservation measures outlined for Indiana bat in Appendix A). Bat echolocation surveys occur annually on the Baldwin/White Cloud Ranger District. Conservation measures consistent with the Forest Plan Standards and Guidelines (USDA Forest Service 2006b) would be implemented in stands not currently listed as providing breeding Indiana bat habitat if Indiana bats are discovered during treatments or in future echolocation surveys.

(3.5i) Indirect Effects

Primary sources of information for this section are the Indiana bat (*Myotis sodalis*) Draft Recovery Plan: First Revision (USDI Fish and Wildlife Service 2007), the Biological Assessment for the Huron-Manistee National Forests Environmental Impact Statement and Forest Plan (USDA Forest Service 2006a), and the Biological Opinion for the Huron-Manistee National Forests Land and Resource Management Plan (USDI Fish and Wildlife Service 2006).

Alternative 1

Although no Indiana bat roosting or foraging areas within the Project Area are known, Alternative 1 might change the availability of potential breeding or foraging habitat within the Project Area. Under Alternative 1, the quantity and quality of mid- to late-successional forest

habitats would likely increase within the 5 stands of potential Indiana bat habitat, and in the Project Area as a whole, due to fire suppression and natural succession. Over time, Alternative 1 may create large blocks of maturing habitat spatially distributed across the Project Area. The Indiana bat may experience an increase in available potential breeding habitat within such blocks as tree diameters and snags increase, the proportion of hardwoods increases, and canopy gaps that could increase solar exposure of roosting trees developed. However, if natural succession leads to the loss of interspersed forest openings, wooded corridors, or forested wetlands, or if forested stands develop dense understory vegetation, the availability of potential foraging and roosting habitat and/or travel corridors for Indiana bat might decline within the areas where potential breeding habitat was identified, and in the Project Area as a whole.

Alternative 1 also would fail to control Scots pine and other non-native invasive species within the areas where potential breeding habitat was identified, and in the Project Area as a whole. Scots pine may replace native forest species, including hardwoods, reducing the quantity and quality of available potential breeding habitat for the Indiana bat. NNIS may also replace native plants that provide food and cover for terrestrial and aquatic insects, reducing potential foraging habitat and prey base for the Indiana bat.

Alternative 1 would maintain current road and trail densities and, thus, human access and use in the areas where potential Indiana bat habitat has been identified. As a result, the availability of potential foraging and breeding habitat may change. These densities are higher than Forest Plan objectives for the WRSNA (USDA Forest Service 2006b). Traffic along these roads and trails may increase human activity within potential breeding habitat, which may increase the risk of potential roost trees being cut down for firewood. These activities also may damage vegetation and increase the amount of bare ground within forest openings and wooded corridors, and/or reduce water quality in forested wetlands via soil erosion or sediment delivery. Degradation of forest openings, wooded corridors, and/or forested wetlands my lead to a reduction in available prey within potential foraging habitat. However, human disturbance and associated reductions in potential breeding or foraging habitat would likely affect small acreages in localized areas within the Project Area in any given time period, allowing breeding and foraging potential in those areas that are undisturbed. Indiana bats also may benefit from forest trails and roads because they minimize understory vegetation and provide more efficient travel corridors (USDI Fish and Wildlife Service 2006). Overall, any change in the availability of potential roosting or foraging habitat under Alternative 1 would be expected to be negligible given the small number of Indiana bats estimated to occur within the HMNF, and the large forested landscape within Indiana bat range on the HMNF that has breeding and foraging potential.

Alternatives 2 and 3

Although no Indiana bat roosting or foraging areas within the Project Area are known, Alternatives 2 and 3 may change the availability of potential breeding or foraging habitat within the Project Area. Savanna creation, KBB opening restoration, red pine thinning, oak/aspen clearcuts, and prescribed burning as proposed under Alternatives 2 and 3 may result in the loss of potential roost trees for the Indiana bat in the areas where potential breeding habitat was identified. Loss of potential roost trees would be unlikely because of the Forest Plan Standards and Guidelines (see conservation measures outlined for Indiana bat in Appendix A; USDA Forest Service 2006b) requiring that management activities avoid and preserve potential roosts

and favor trees of the size, structure, and species that Indiana bats are known to frequently use. The remaining density of leave trees in these areas would be at least 9 trees per acre. These conservation measures would also be implemented during management activities within the rest of the Project Area to increase the availability of potential breeding habitat for Indiana bat. As a result, implementation of the proposed treatments may create potential roost trees, open the forest canopy, and create stands with irregular borders and openings, and subsequently increase solar exposure for potential roost trees (USDA Forest Service 2006a, USDI Fish and Wildlife Service 2006). Proposed treatments may also increase the overall tree size and proportion of hardwoods in treated stands and increase the potential for large dead trees or snags suitable for roosting (USDA Forest Service 2006a, USDI Fish and Wildlife Service 2006).

Under Alternatives 2 and 3, savanna creation, KBB opening restoration, red pine thinning, oak/aspen clearcuts, and prescribed burning may also kill and/or temporarily reduce habitat quality for insects that are eaten by Indiana bat within the areas where potential breeding habitat was identified. Insect species that are vulnerable to fire may be killed during prescribed burns (USDA Forest Service 2006a, USDI Fish and Wildlife Service 2006). Mechanical removal of trees may damage herbaceous vegetation and increase bare ground. Prescribed burning may temporarily increase soil erosion and sediment delivery into streams and other aquatic habitats, temporarily reducing habitat quality and quantity for terrestrial and aquatic insects eaten by Indiana bats. However, adverse effects to potential foraging habitat and the prey base of Indiana bat are unlikely because Forest Plan Standards and Guidelines (see conservation measures in Appendix A; USDA Forest Service 2006a) requiring management activities to maintain potential foraging habitat and travel corridors, and limit the potential for erosion into aquatic habitats. These conservation measures also would be implemented during management activities within the rest of the Project Area to increase availability of potential foraging habitat for Indiana bat. Implementation of proposed treatments may reduce understory vegetation within forested stands and increase the availability of wooded corridors that could be used for travel (USDA Forest Service 2006a, USDI Fish and Wildlife Service 2006). This would increase foraging opportunities throughout the Project Area. Given that Indiana bats also forage within clearings with early successional vegetation (USDA Forest Service 2006a), creation and enhancement of openings and savannas/barrens may also increase the availability of native plants that provide food and cover for terrestrial insects, subsequently increasing the abundance of terrestrial insects, and hence prey availability for Indiana bat.

Strip/patch or spot application of glyphosate, triclopyr, or imazapyr to control non-native invasive species, as proposed under Alternatives 2 and 3, may also kill and/or temporarily reduce habitat quality for insects eaten by Indiana bat. Ecological risk assessments conducted for the herbicides proposed for use suggest that application of the studied herbicides at rates commonly used by the Forest Service poses little or no risk to wildlife (USDA Forest Service 2003a, USDA Forest Service 2003b, USDA Forest Service 2004b). The proposed herbicides are not highly toxic to avian receptors, to insect species, to reptile species, to bat species (such as Indiana bat), or to small mammal, amphibian, and fish species that form the chief prey of carnivores such as hawks and eagles (USDA Forest Service 2003a, USDA Forest Service 2003b, USDA Forest Service 2004b). The proposed herbicides are not cholinesterase inhibitors such as organophosphate or a carbamate insecticide (or chemically related to such insecticides) that are highly toxic to wildlife, especially insects and other invertebrates. Nor are proposed herbicides chemically related to chlorinated hydrocarbon insecticides such as DDT that are highly

persistent in the environment and known to cause eggshell thinning of raptors (birds of prey) such as bald eagles and ospreys.

Herbicide toxicity and risk data (Appendix C) for mammalian, aquatic, avian, and terrestrial wildlife species suggest glyphosate, triclopyr, and imazapyr are generally safe to mammals, birds, and other wildlife if used in accordance with the manufacturer label. The Round-Up formulation of glyphosate and butoxyethyl ester formulations of triclopyr are exceptions to this generalization due to extremely low LC_{50} values for aquatic species (Appendix C). Only formulations labeled for use in aquatic areas would be used in wetlands or riparian areas. Insects eaten by Indiana bat may be exposed to herbicides by direct contact with herbicide spray or with recently treated foliage. Insects eaten by Indiana bat also may be exposed by ingesting treated foliage, contaminated nectar, or by drinking from water sources that have received contaminated surface runoff. Risk assessments for glyphosate and triclopyr conclude that small birds and animals that consume vegetation or insects from areas treated with the maximum application rate for an extended period of time could experience adverse effects. However, this type of treatment would not occur. In addition, glyphosate, triclopyr, and imazapyr are not expected to bioaccumulate in the food chain (USDA Forest Service 2003a, USDA Forest Service 2003b, USDA Forest Service 2004b). Because of the small area of treatment, insects eaten by Indiana bat would not likely come in direct contact with herbicide spray or recently treated foliage, and would not be likely to feed solely on plant parts recently treated with herbicide sprays.

Spot and strip/patch application would also reduce the likelihood that insects would come into direct contact with the herbicide spray or recently treated foliage, and minimize exposure for nearby plant species. This would further reduce opportunities for insects to feed on treated foliage or contaminated nectar. Thus, chemical removal of non-native invasive species is not expected to adversely affect potential foraging habitat or the prey base for Indiana bat by killing insects and damaging native plants that provide food and cover for insects. In addition, control of Scots pine may reduce understory vegetation and create wooded corridors and stands with irregular borders and openings, increasing the availability of travel corridors and potential breeding and foraging habitat. In the long-term, mechanical and chemical removal of non-native invasive species would likely benefit Indiana bat by improving biodiversity, and hence potential foraging habitat and prey availability within the areas where potential breeding habitat was identified, and within the Project Area as a whole.

Recreation and transportation management activities proposed under Alternatives 2 and 3 may improve the potential foraging and breeding habitat for Indiana bat. Closing Forest System roads and dispersed motorized camp sites and developing a parking area for motorized vehicles, as proposed under Alternatives 2 and 3, might reduce the risk of motorized users cutting down potential roost trees for firewood, damaging vegetation and increasing the amount of bare ground and non-native invasive species within forest openings and wooded corridors, and/or reducing water quality in forested wetlands via soil erosion or sediment delivery. Alternative 3 would reduce human use more than Alternative 2 by closing an additional 0.7 miles of Forest System roads to motorized use, with the exception of snowmobile use. In addition, Alternative 2 proposes to limit horseback riding to a 19.7 mile designated trail, develop a day-use parking area for horse rigs, and require the removal of horse manure, feed, and hay at the designated day-use parking area and at designated camping areas within the

WRSNA, while Alternative 3 proposes to prohibit horseback riding within the WRSNA. Limiting or prohibiting horseback riding as proposed under Alternatives 2 and 3 may reduce the risk of this non-motorized use damaging or reducing the presence and productivity of forbs and shrubs, introducing and spreading non-native invasive species via manure, and increasing soil disturbance, erosion, compaction, and the amount of bare ground. Also, limiting or prohibiting horse use may reduce the risk of non-motorized users cutting down potential roost trees for firewood. Alternative 2 also would allow for watering horses with buckets hand carried to and from identified permanent water sources on National Forest System lands. Because horses would no longer be watered by walking along or in streams and other water bodies, Alternatives 2 and 3 may reduce the risk of soil erosion and sediment delivery into aquatic habitats that could reduce habitat quality for, and subsequently numbers of, aquatic insects eaten by Indiana bat. Under Alternatives 2 and 3, areas that have been degraded due to motorized and non-motorized use would likely regenerate, which may increase native plants that provide food and cover for terrestrial and aquatic insects, subsequently increasing the prey base for Indiana bat. Forest System roads proposed to be closed would be gated, but the Forest Service would continue to maintain them to provide administrative access. Thus, understory vegetation would continue to be reduced along closed roads, providing efficient potential travel corridors for Indiana bat (USDA Forest Service 2006a, USDI Fish and Wildlife Service 2006). Both Alternatives 2 and 3 would meet Forest Plan management objectives for the WRSNA (USDA Forest Service 2006b).

Overall, management activities proposed under Alternatives 2 and 3 may have beneficial and negative effects to potential roosting or foraging habitat for Indiana bat. Any adverse effects would be expected to be minimal. Any change in the availability of potential roosting or foraging habitat under Alternatives 2 and 3 would be expected to be negligible, given the small number of Indiana bats estimated to occur within the HMNF, and the large forested landscape within the potential Indiana bat range on the HMNF that has roosting and foraging potential.

(3.5) Cumulative Effects

Increases in human populations and associated land development, road construction, and recreational uses are expected on private lands within the MNF. These activities could result in the permanent loss of potential Indiana bat habitat, and would likely increase the potential for human access and use near hibernaculum and roosting sites. Subsequently this will lead to increases in the level of disturbance (e.g., human activity, noise, and habitat degradation), the risk of vehicle collisions, the removal of roost trees, disruptions in the foraging behavior of Indiana bats, and the reduction of habitat quantity and quality for Indiana bat forage species. Timber harvesting, fire suppression, and the application of pesticides may adversely affect the Indiana bat on private lands within the MNF in the future. In addition, mineral developments are reasonably certain to occur in the foreseeable future within the MNF and have the potential to cumulatively affect Indiana bat. Mineral rights on federal lands are subject to an environmental analysis, review, oversight, and permit. The Forest Service might not be able to condition a permit in a manner that would preclude the development of the resource (USDA Forest Service 2006a, USDI Fish and Wildlife Service 2006). In such cases, the Forest may not be able to impose a "no surface occupancy" stipulation in the permit for mineral extraction in potential Indiana bat habitat and the species may be adversely affected (USDA Forest Service 2006a, USDI Fish and Wildlife Service 2006).

While the above activities may impact non-Federal lands within the MNF, 441,214 acres of potential Indiana bat habitat occur within the boundary of the HMNF. Of these, 178,214 acres are under HMNF ownership (USDA Forest Service 2006a, USDI Fish and Wildlife Service 2006). This is a significant amount of land and should provide enough habitat for Indiana bats that might occur in the MNF (USDA Forest Service 2006a). Implementation of the objectives listed in the Indiana bat (*Myotis sodalis*) Draft Recovery Plan: First Revision (USDI Fish and Wildlife Service 2007) and the conservation measures outlined for Indiana bat in the Forest Plan Standards and Guidelines (USDA Forest Service 2006b) are expected to produce long-term beneficial cumulative effects and improve the overall status of the species within the MNF.

(3.5k) Effects on Regional Forester's Sensitive Species and Other Wildlife

(3.5l) Wildlife Associated with Early Successional Vegetative Types

(3.5m) Direct and Indirect Effects

Alternative 1

Under Alternative 1, the quantity and quality of early successional vegetative types would continue to decline in the Project Area due to fire suppression and natural succession. As remnant openings and savannas/barrens filled in with fire-intolerant woody and shade-tolerant herbaceous species, suitable habitat favored by dusted skipper, frosted elfin, and hill-prairie spittlebug would likely become scarcer. Savanna plants such as little bluestem and wild lupine would be shaded-out or out-competed as the amount of sunlight reaching the understory vegetation becomes less. Other wildlife species preferring openings or savannas/barrens for parts of their life cycles that might experience a reduction in habitat quantity and quality under this alternative include the ruffed grouse, red-headed woodpecker, whip-poor-will, eastern box turtle, American woodcock, cottontail rabbit, snowshoe hare, fox and gray squirrel, red and gray fox, coyote, wild turkey, and white-tailed deer.

Alternative 1 would also fail to control non-native invasive plant species within remnant openings and savannas/barrens. Leafy spurge, autumn olive, honeysuckle, Canada thistle, garlic mustard, Cypress spurge, Japanese barberry, sweetclover, Scots pine, and spotted knapweed were among invasive species found during botanical surveys conducted in 2006, 2007, and 2009 within stands proposed for savanna creation or KBB opening restoration treatments. Failure to control invasive plants would not directly result in adverse impacts to local populations of wildlife. However, failure to successfully control these invasive species would allow the continued infestation and degradation of more areas of wildlife habitat within these early successional vegetative types. Aggressive invasive plants species such as leafy spurge tend to replace native plants upon which wildlife generally depend for food and cover. In general, species having relatively specific habitat requirements are more susceptible to adverse effects from the continued spread of invasive plants than habitat generalists. For example, habitat quantity and quality for frosted elfin would likely decline if autumn olive, honeysuckle, and/or leafy spurge shaded-out or out-competed wild lupine, wild indigo, or false indigo - its host plants - and other important nectar sources.

In addition, habitat quantity and quality for wildlife associated with early successional vegetative types might decline under Alternative 1 because it would maintain current road, trail, and camping densities within the Project Area. These densities are higher than Forest Plan objectives for the WRSNA (USDA Forest Service 2006b). Currently, roads, trails, and concentrated use are occurring in openings and savannas/barrens within the Project Area. In the past, dispersed camping sites have degraded habitat for listed species dependent on openings and savanna/barrens such as KBB (USDI Fish and Wildlife Service 2006). In addition, horseback riding occurs on Forest System roads throughout the Project Area, and cross-county travel is permitted for horseback riding, except where posted signs exclude this form of recreation. Some roads and trails within the Project Area provide habitat (i.e., wild lupine and other nectar plants growing along roadsides, or road-rut ponds providing watering areas) and/or dispersal corridors for species associated with early successional vegetative types. Vehicle use, dispersed camping, horseback riding, and foot traffic along roads and trails and within adjacent openings, may increase the level of disturbance (e.g., human activity, noise, and habitat degradation); damage host plants and other plant species used for food or cover; temporarily displace, alter movement, or disrupt normal behavior of wildlife; and increase the risk of vehicle collisions, visitors directly harming, harassing, or killing wildlife, illegal collection (including poaching), and wildfire. In addition, traffic along roads and trails might increase the risk of off-road vehicle use (i.e., all terrain vehicles, dirt bikes, snowmobiles), cross-country horseback riding, and dispersed camping, which might adversely affect wildlife habitat via soil erosion and compaction, increases in bare ground, reduction in nectar plants, and increases in non-native invasive species. Thus, maintaining current levels of access and use would likely increase the risk of mortality and reduce habitat quantity and quality for wildlife associated with early successional vegetative types.

As habitat quality and quantity decrease for wildlife associated with early successional vegetative types under Alternative 1, occurrences of these species within the Project Area would likely decline. Surviving populations would become even more isolated and disconnected, and thus subject to a higher risk of extirpation from catastrophic events. Overall, Alternative 1 is likely to have adverse direct and indirect effects on RFSS associated with early successional vegetative types.

Alternatives 2 and 3

KBB opening restoration, savanna creation, red pine thinning, oak/aspen clearcuts, and prescribed burning, proposed under Alternatives 2 and 3, may kill or temporarily displace small numbers of dusted skipper, hill-prairie spittlebug, frosted elfin, eastern box turtle, red-headed woodpecker, whip-poor-will, ruffed grouse, and other wildlife associated with early successional vegetative types within the Project Area. Eastern box turtle, dusted skipper, frosted elfin, and hill-prairie spittlebug have limited mobility and would likely not escape the proposed management activities. While eastern box turtles and some adult stages of dusted skipper, frosted elfin, and hill-prairie spittlebug may be able to move out of treated areas, the eggs and larvae of these species are immobile and thus are particularly vulnerable and likely to be crushed during mechanical treatments such as brush hogging or discing, burned during prescribed burning, or trampled during hand cutting. In addition, the proposed treatments may also affect the movement patterns and nests of red-headed woodpecker, whip-poor-will, ruffed grouse, and American woodcock. Ground disturbances within openings may also destroy eastern box turtle nests, reducing reproductive success. Management activities may

disrupt the normal behavior of wildlife, which could limit the use of foraging, nesting, roosting, or hibernation sites and potentially affect productivity. Vehicle use and foot traffic along roads and within openings during management activities may temporarily increase the level of disturbance (e.g., human activity, noise, and habitat degradation); damage plant species used for food or cover; temporarily displace, alter movement, or disrupt normal behavior of wildlife; and increase the risk of vehicle collisions, and visitors directly harming, harassing, or killing wildlife. In addition, amphibian populations would likely decrease within two years of regenerating a forested area due to leaf and moisture loss. This would likely rebound to normal levels after 20 years (Ash 1997).

Breeding birds, small mammals, and less mobile species, such as reptiles and invertebrates, are most likely to be directly affected in these operations due to the use of heavy equipment and the activities associated with prescribed burning. Operations during the breeding season would have the potential to cause disturbance, destroy or damage nests and dens, or kill/injure small young and less mobile species. Management activities conducted between September and March could directly impact wildlife use in the fall and small numbers of wintering animals, but would largely protect nesting birds, hibernating reptiles, and other breeding wildlife. For example, because the eastern box turtle occupies hibernacula underground during the winter, management activities are more likely to have a direct effect on the eastern box turtle between early spring and late fall when they are most active (Hyde 1999). The season, intensity, and frequency of management activities, particularly prescribed burns, also could have detrimental effects on dusted skipper, frosted elfin, and hill-prairie spittlebug through the killing of eggs, larvae, or adults. For example, operations during the larval and flight periods have the greatest potential of causing disturbance, damaging host plants, and killing or disrupting the behavior of dusted skipper, frosted elfin, and hill-prairie spittlebug.

Implementation of the conservation measures listed for KBB in Appendix A within the 73 openings proposed for KBB opening restoration would minimize the potential for adverse direct effects on invertebrates, nesting birds, and mating reptiles. For example, excluding prescribed burning, all management activities proposed under KBB opening restoration would be prohibited between March 15 and August 15. In addition, only a portion of openings proposed for KBB opening restoration would be treated each season, which would reduce take of invertebrates and facilitate recolonization of recently treated portions. Potential adverse effects would be reduced further with the implementation of the conservation measures outlined in the Programmatic Biological Evaluation for the Huron-Manistee National Forests for duster skipper, eastern box turtle, red-headed woodpecker, and whip-poor-will (USDA Forest Service 2005) in areas where RFSS associated with early successional vegetative types are documented or found. In addition, the locations of known nests, roosts, or burrows of RFSS would be flagged or marked, and management activities would be performed carefully to avoid physical injury to nests or burrows and less mobile RFSS. If other sensitive wildlife species associated with early successional vegetative types are found during project activities, appropriate protection measures would be implemented to reduce potential adverse effects.

Under Alternatives 2 and 3, strip/patch or spot application of glyphosate, triclopyr, or imazapyr is proposed to control non-native invasive species and persistent woody vegetation. Ecological risk assessments conducted for glyphosate, triclopyr, and imazapyr suggest that use at rates commonly used by the Forest Service poses little or no risk to wildlife (USDA Forest

Service 2003a, USDA Forest Service 2003b, USDA Forest Service 2004b). The proposed herbicides are not highly toxic to avian receptors (e.g., red-headed woodpecker, whip-poor-will), to insect species (e.g., dusted skipper, frosted elfin, hill-prairie spittlebug), to reptile species (e.g., eastern box turtle), or to the small mammal, amphibian, and fish species that form the chief prey of carnivores such as red-shouldered hawks, northern goshawks, and bald eagles (USDA Forest Service 2003a, USDA Forest Service 2003b, USDA Forest Service 2004b). Proposed herbicides are not cholinesterase inhibitors such as organophosphate or a carbamate insecticide (or chemically related to such insecticides) that are highly toxic to wildlife, especially insects and other invertebrates. Nor are the proposed herbicides chemically related to chlorinated hydrocarbon insecticides such as DDT that are highly persistent in the environment and known for causing eggshell thinning of raptors (birds of prey) such as bald eagles and ospreys. Herbicide toxicity and risk data (Appendix C) for mammalian, aquatic, avian, and terrestrial wildlife species suggest glyphosate, triclopyr, and imazapyr are generally safe to mammals, birds, and other wildlife if used in accordance with the manufacturer label.

Wildlife associated with early successional vegetative types could be exposed to herbicides by direct contact with herbicide spray or with recently treated foliage. Oral exposure also could occur by ingesting contaminated nectar or by drinking from water sources that have received contaminated surface runoff. However, because strip/patch or spot application of herbicide would be used to treat small areas, wildlife associated with early successional vegetative types would not be likely to come into direct contact with herbicide spray or recently treated foliage, and nectivores, insectivores, and fruitivores such as dusted skipper, hill-prairie spittlebug, and eastern box turtle are not likely to feed solely on plant parts recently treated with herbicide sprays. The risk assessments for glyphosate and triclopyr conclude that small birds and animals that consume vegetation or insects from areas treated with the maximum application rate for an extended period of time could experience adverse effects. However, this type of treatment would not occur. In addition, glyphosate, triclopyr, and imazapyr are not expected to bioaccumulate in the food chain (USDA Forest Service 2003a, USDA Forest Service 2003b, USDA Forest Service 2004b). If work is conducted in areas containing RFSS, locations of nests or other immobile wildlife features would be prominently marked whenever possible and operators would be trained to visually recognize the protected animals.

Vegetative management proposed under Alternatives 2 and 3 would likely have a greater effect on local populations of dusted skipper, hill-prairie spittlebug, frosted elfin, eastern box turtle, red-headed woodpecker, whip-poor-will, ruffed grouse, and other wildlife associated with early successional vegetative types through habitat change. For example, red-headed woodpeckers and other wildlife species dependent on hard mast production (e.g., wild turkey, squirrels, and white-tailed deer) would likely experience a reduction in food resources due to savanna creation treatments. Management activities also might damage vegetation and increase the amount of bare ground within treated openings, temporarily decreasing cover and the abundance of native grasses, herbs, wildflowers, and fruit-bearing shrubs that serve as host plants and/or food. In addition, without sufficient knowledge of what plant species are present on a given site and their response to different management activities, implementation of proposed treatments might increase undesired plant species. For example, fire may either increase the abundance of invasive species, such as spotted knapweed, and/or native species, such as Pennsylvania sedge, that compete with wild lupine and nectar plants. Disturbance from restoration activities also might create conditions favorable for establishment of non-

native invasive species, such as spotted knapweed and St. John's wort. Proposed herbicide treatments under Alternatives 2 and 3 would minimize occurrence of non-natives and favor more desirable native nectar species. Effects of herbicides on the growth and flowering of wild lupine and other nectar plant species varies, and at times might result in a temporary reduction in habitat quantity and quality for dusted skipper, hill-prairie spittlebug, and frosted elfin and other nectivores and herbivores. Such reductions are expected to be minimal with the seeding/planting of wild lupine and other native nectar plants. Controlling non-native invasive shrubs (e.g., autumn olive and honeysuckle) that bear fruit and serve as nectar sources for bees and other insects would likely reduce available habitat and food for wildlife associated with early successional vegetative types such as dusted skipper and eastern box turtle. Overall, potential adverse indirect effects to wildlife associated with early successional vegetative types are expected to be minimal with the implementation of the conservation measures listed for KBB in Appendix A within KBB opening restoration and savanna creation treatment areas, and the conservation measures outlined in the Programmatic Biological Evaluation for the Huron-Manistee National Forests for the duster skipper, eastern box turtle, red-headed woodpecker, and whip-poor-will (USDA Forest Service 2005) in areas where these RFSS are documented or found.

Under Alternatives 2 and 3, savanna creation and KBB opening restoration also may improve habitat for herbivores occurring within the Project Area. In particular, deer may experience an increase in habitat quantity and quality, potentially causing localized increases in deer numbers and increased herbivory on wild lupine and other nectar plants within savanna creation and KBB opening restoration areas. Herbivory on wild lupine and other nectar plants may destroy eggs and larvae of RFSS invertebrates such as frosted elfin, and reduce productivity in the long-term by limiting the growth of native nectar species. Such effects have been noted for KBB. High deer densities have been reported to kill KBB, reduce lupine populations, and potentially reduce KBB reproduction by limiting lupine growth (Schweitzer 1994, USDI Fish and Wildlife Service 2006). Schweitzer (1994) recommends that deer populations be managed to levels where no more than 15 percent of lupine flowers are consumed. However, management of deer populations is outside Forest Service jurisdiction and authority.

Much of the habitat change expected under the Proposed Action would likely have beneficial indirect effects to dusted skipper, hill-prairie spittlebug, frosted elfin, eastern box turtle, red-headed woodpecker, whip-poor-will, ruffed grouse, and other wildlife associated with early successional vegetative types. Proposed vegetative management activities would increase the quantity and quality of openland habitats (e.g., openings, savanna/barrens) and early successional aspen forest. Oak/aspen clearcuts would regenerate aspen and provide the age-class diversity required for whip-poor-will and ruffed grouse on approximately 23 acres under Alternatives 2 and 3. Savanna creation and KBB opening restoration activities, proposed under Alternatives 2 and 3, would create up to 3,061 acres of openings and savannas/barrens. This acreage would contribute to the Forest Plan's management goals for restoring savannas/barrens and upland openings (USDA Forest Service 2006b). KBB opening restoration and savanna creation activities would increase habitat quantity and quality for wildlife associated with early successional vegetative types by: maintaining open areas; providing a diversity of foraging habitats; promoting nectaring sources from shrubs and wildflowers, larval host plants including wild lupine, and savanna plant species such as warm season grasses

including bluestem; and providing other features important to wildlife, such as sunning areas, roosting sites, and nesting areas.

As openland habitats with bluestem, wild lupine, wild indigo, false indigo, and other nectar plants and warm season grasses increase, suitable habitat, and subsequently occurrences, of dusted skipper, hill-prairie spittlebug, and frosted elfin would likely increase. The red-headed woodpecker, eastern box turtle, and whip-poor-will have diverse habitat requirements that include openland habitats, and consequently would also benefit from savanna creation and KBB opening restoration activities. Red-headed woodpeckers require open woodlands with mast crop abundance and nesting cavities in live trees, dead stubs, snags, utility poles, or fence posts (USDA Forest Service 2005, NatureServe 2010). Eastern box turtles occur in upland forested habitats with sandy soils, thickets, old fields, pastures, marshes, vegetated dunes, and bog edges near or adjacent to a source of water, and require access to nearby sandy, open areas for nesting (Hyde 1999, USDA Forest Service 2005, NatureServe 2010). Whip-poor-wills occur in open coniferous, deciduous, and mixed woodlands with well spaced trees and a low canopy, abundant shade, nearby open areas, and sparse ground cover (USDA Forest Service 2005, NatureServe 2010). Because savanna creation and KBB opening restoration activities would create a heterogeneous habitat mosaic that provides subhabitat variation in tree canopy and shrub cover, plant community composition, thermal environment, topography, and soil moisture, these treatments would provide the range of habitat conditions required by red-headed woodpecker, eastern box turtle, and whip-poor-will, in addition to those required by the dusted skipper, hill-prairie spittlebug, and frosted elfin. Thus, oak/aspen clearcuts, KBB opening restoration, and savanna creation would lead to an increase in suitable habitat, which would likely increase the occurrence of dusted skipper, hill-prairie spittlebug, frosted elfin, eastern box turtle, whip-poor-will, red-headed woodpecker, and ruffed grouse within the Project Area.

Other wildlife species that may experience an increase in habitat quantity and quality, and subsequently population numbers, following treatments to enhance early successional vegetative types within the Project Area include, but are not limited to: American woodcock, cottontail rabbit, snowshoe hare, fox and gray squirrel, red and gray fox, coyote, wild turkey, and white-tailed deer. Overall, vegetative management activities proposed under Alternatives 2 and 3 are expected to have primarily beneficial direct and indirect effects on wildlife associated with early successional vegetative types within the Project Area, and any adverse direct and indirect effects are expected to be minimal.

Off-road vehicle use (i.e., all terrain vehicles, dirt bikes, snowmobiles), cross-country travel via foot or horseback, and dispersed camping may increase within areas proposed for savanna creation and KBB opening restoration under Alternatives 2 and 3. Increased recreational use might reduce the quantity and quality of early successional habitat by:

1. Increasing the level of disturbance (e.g., human activity, noise, and habitat degradation);
2. Damaging plant species used for host plants, food, or cover;
3. Increasing the risk of vehicle collisions, and visitors directly harming, harassing, or killing wildlife;
4. Temporarily displacing, altering movement, or disrupting normal behavior of wildlife (e.g., interfering with dispersal or mating activities);

5. Increasing soil disturbance, erosion, compaction, and the amount of bare ground;
6. Spreading and increasing non-native invasive plant species; and/or
7. Increasing the risk of illegal collection (including poaching), and wildfires.

The potential for adverse effects should be minimized with the installation of signs explaining the benefits of restoring native plant communities and requesting recreationists to stay on designated roads and trails. Implementing mitigation techniques would limit public access to managed savannas and openings. These would include barrier posts or piling brush around the perimeter of treatment areas.

Recreation management activities proposed under Alternatives 2 and 3 would have primarily beneficial effects to local populations of wildlife associated with early successional vegetative types within the Project Area. Closing Forest System roads, reducing the number of motorized-dependent camping sites, and developing a parking area for motorized vehicles might reduce the risk of motorized users:

1. Damaging or disturbing plant species used for food, cover, and/or hosts (e.g., trampling, removing, or otherwise damaging wild lupine or other important nectar plants);
2. Temporarily displacing, altering movement, or disrupting normal behavior of wildlife (e.g., interfering with dispersal or mating activities); and/or
3. Resulting in vehicle collisions, visitors directly harming, harassing, or killing wildlife, illegal collection (including poaching), and wildfires.

Reduced traffic along roads would also likely decrease the risk of off-road vehicle use (i.e., all terrain vehicles, dirt bikes, snowmobiles) and cross-country travel, which might adversely affect wildlife habitat via soil erosion and compaction, increases in bare ground, reduction in native nectar plants and warm season grasses, and increases in non-native invasive species. Roads and trails that border savanna creation and KBB opening restoration treatments would likely experience an increase in nectar plant availability, increasing the quality and quantity of dispersal corridors for invertebrates such as dusted skipper, hill-prairie spittlebug, and frosted elfin within the Project Area. Human use and its associated impacts may adversely affect wildlife associated with early successional vegetative types where county roads and Forest System roads remain open to motorized use within openland habitats. Potential adverse effects from Forest System roads that would remain open within KBB opening restoration and savanna creation treatment areas would be minimized with the implementation of conservation measures outlined for KBB occupied and potential unoccupied habitat in Appendix A.

Signs and barriers would be installed along all Forest System roads that would still occur within KBB opening restoration areas (i.e., occupied KBB habitat) to prevent off-road vehicle use (i.e., all terrain vehicles, dirt bikes, snowmobiles) and dispersed camping. If Forest System roads and their associated uses are found to adversely impact KBB or its habitat, they would be relocated or decommissioned. Signs explaining the benefits of restoring native plant communities and requesting recreationists to stay on designated roads and trails would be installed along all Forest System roads that would still occur within savanna creation areas (i.e., potential unoccupied KBB habitat). If damage from motorized users is noted within potential unoccupied KBB habitat, mitigation techniques would be implemented to limit public access such as barrier

posts or piling brush around the perimeter of treatment areas. Potential adverse effects from county roads that would remain open to motorized use within KBB opening restoration areas (i.e., occupied KBB habitat) and savanna creation areas (i.e., potential unoccupied KBB habitat) also would be minimized with the implementation of conservation measures outlined for KBB habitat in Appendix A. Alternative 3 would reduce human access and use more than Alternative 2 by closing an additional 0.7 miles of Forest System roads to motorized use, with the exception of snowmobile use.

Alternatives 2 and 3 also would also limit horseback riding within the WRSNA. Currently, horseback riding occurs on Forest System roads throughout the Project Area, and cross-country travel is permitted for horseback riding, except where posted signs exclude this form of recreation. Alternative 2 proposes to limit horseback riding to a 19.7 mile designated trail, develop a day-use parking area for horse rigs, and require the removal of horse manure, feed, and hay at the designated day-use parking area and at designated camping areas within the White River Semi-Primitive Non-Motorized Area (WRSNA), while Alternative 3 proposes to prohibit horseback riding within the WRSNA. Limiting or prohibiting horseback riding may reduce the risk of this non-motorized use: trampling wildlife; temporarily displacing, altering movement, or disrupting the normal behavior of wildlife (i.e., interfere with dispersal or mating activities); damaging or reducing the presence and productivity of wild lupine and other savanna nectar plants, grasses, and shrubs; introducing and spreading non-native invasive species; and/or increasing soil disturbance, erosion, compaction, and the amount of bare ground. Requiring the removal of horse manure, feed, and hay at the designated day-use parking area and at designated camping areas within the WRSNA would also likely reduce the risk of introducing and spreading non-native invasive species within the Project Area. Allowing for watering horses with buckets at identified permanent water sources would not be expected to affect wildlife associated with early successional vegetative types, as proposed watering locations would not occur within openlands and early successional forests.

Horseback riding and its associated impacts may adversely affect wildlife associated with early successional vegetative types where county roads, Forest System roads, and National Forest System lands remain open to this non-motorized use within early successional habitats. Potential adverse effects from cross-country travel and horseback riding along Forest System roads within early successional habitats would be minimized with the implementation of conservation measures outlined for KBB habitat in Appendix A. Signs and barriers would be installed explaining the benefits of restoring native plant communities and requesting recreationists to stay on Forest System roads within KBB opening restoration areas (i.e., occupied KBB habitat). If damage from horseback riding is noted within KBB opening restoration areas (i.e., occupied KBB habitat), Forest System roads providing access to damaged areas would be relocated or decommissioned. Signs also would be installed on Forest System roads within savanna creation areas (i.e., unoccupied KBB habitat). If damage from horseback riding is noted within savanna creation areas (i.e., unoccupied KBB habitat), barriers would be installed to ensure the public stays on Forest System roads. Potential adverse effects from county roads that would remain open to horseback riding within KBB opening restoration areas (i.e., occupied KBB habitat) and savanna creation areas (i.e., potential unoccupied KBB habitat) also would be minimized with the implementation of conservation measures outlined for KBB habitat in Appendix A.

Overall, recreation management activities proposed under Alternatives 2 and 3 would likely decrease the risk of mortality and improve habitat quantity and quality for dusted skipper, hill-prairie spittlebug, frosted elfin, eastern box turtle, red-headed woodpecker, whip-poor-will, ruffed grouse, and other wildlife associated with early successional vegetative types within the Project Area. Alternative 3 would reduce potential adverse effects of recreational use to wildlife associated with early successional vegetative types more than Alternative 2. Both Alternatives would meet Forest Plan management objectives for the WRSNA (USDA Forest Service 2006b).

(3.5n) Cumulative Effects

Increases in human populations and associated land development, road construction, and recreational uses are expected on private lands within the MNF. These activities would likely result in the degradation and permanent loss of habitat for wildlife associated with early successional habitats, and directly impact individuals of these species by:

- Increasing habitat fragmentation, level of disturbance (e.g., human activity, noise, and habitat degradation), amount of bare ground, and soil erosion, and introducing non-native invasive plant species;
- Increasing predation and/or competition by increasing wildlife populations associated with human residential areas such as raccoons, opossums, and skunks;
- Damaging host plants (e.g., wild lupine, bluestem) and other important plant species that provide food (e.g., foliage, nectar, or fruit) and/or cover, as well as other required habitat elements such as nesting, roosting, and/or hibernation sites;
- Temporarily displacing, altering movement, or disrupting normal behavior of wildlife associated with early successional habitats; and
- Increasing the risk of vehicle collisions, wildfires, visitors directly harming, harassing, or killing individual wildlife, illegal collection (including poaching), dispersed camping, and cross-country travel.

Additional actions performed on private lands that may adversely affect wildlife associated with early successional habitats in the future within the MNF are fire suppression, mowing and grazing, off-road vehicle use (i.e., all terrain vehicles, dirt bikes, snowmobiles), application of pesticides, and timber harvest. In addition, mineral developments are reasonably certain to occur in the foreseeable future within the MNF and have the potential to cumulatively affect wildlife associated with early successional habitats. Although land development activities may increase non-forested areas on private lands within the MNF, the habitat conditions preferred by wildlife associated with openlands that might occur within the Project Area are not likely to increase proportionately. For example, there is unlikely to be a proportionate increase in the host and nectar plants preferred by Regional Forester Sensitive Insect Species (e.g., dusted skipper, hill-prairie spittlebug, frosted elfin), or in habitat requirements such as nesting, roosting, and hibernation sites utilized by RFSS such as the red-headed woodpecker and the eastern box turtle.

In addition, newly created non-forested areas on private lands within the MNF are unlikely to provide the diverse habitat mosaics preferred by RFSS such as the red-headed woodpecker, whip-poor-will, and eastern box turtle. The creation of non-forested areas on private lands within the MNF also is reducing the acreage of early successional aspen stands. Private forested

lands are expected to shift towards a mix of young and mature oak and lowland hardwoods, replacing other forested types including aspen. As a consequence, there will likely be a decline in suitable habitat for ruffed grouse and whip-poor-will. Overall, habitat quantity and quality for wildlife associated with early successional vegetative types, and subsequent occurrences of these species, would likely decline on private lands within the MNF. With the increasing development and fragmentation of private lands, suitable habitat for wildlife associated with early successional vegetative types on National Forest System lands within the MNF is likely to become more important in the future.

The Forest Plan emphasizes management for oak barrens/savanna ecosystems, particularly for KBB conservation, and directs the restoration and maintenance of 20,300 acres of savanna/barrens within designated KBB population management areas and essential KBB habitat within the HMNF (USDA Forest Service 2006b). The 519 acres of KBB opening restoration and 2,542 acres of savanna creation proposed would help achieve this goal. Implementation of the conservation measures noted in Appendix A should minimize potential adverse effects to RFSS species associated with early successional vegetative types and their habitats on National Forest System lands within the Project Area. Although increases in human populations and associated land uses and developments are expected within the MNF in the future, beneficial effects of Forest Service projects such as the Proposed Action should help to mitigate potential negative effects of activities on private lands.

In addition, 365 acres of savanna creation is planned for KBB within the White River Metapopulation Area under the Savanna/Barrens Restoration Project (USDA Forest Service 2008), and 431 acres of opening restoration for KBB within the White River and Otto Metapopulation Areas is occurring under the Karner Blue Butterfly Habitat Restoration Project (USDA Forest Service 2009c). The actions that are proposed under Alternatives 2 and 3 complement these two restoration efforts by expanding the acreage to be treated for savanna creation and opening restoration, and increasing the number of treatment techniques that can be used to meet restoration goals. The Forest Service also is working in cooperation with the Michigan Department of Natural Resources and Environment, Consumer's Energy, The Nature Conservancy, and by extension, private landowners, to conduct coordinated management activities, particularly prescribed burning, to maximize increases in total KBB habitat creation and connectivity across different land ownerships. In addition, the Forest Service has a Karner blue butterfly Volunteer Outreach Program, which encourages private citizens to actively participate in KBB surveys and provides information about how to manage lands for savanna-dependent species. Overall, the net long-term cumulative effect of proposed opening restoration and savanna creation treatments and other protective measures and planned activities within the MNF would be beneficial to wildlife associated with early successional vegetative types.

(3.5o) Wildlife Associated with Mid- to Late-Successional Forest Types

(3.5p) Direct and Indirect Effects

Alternative 1

Under Alternative 1, the quantity and quality of mid- to late-successional forest habitats would continue to increase in the Project Area due to fire suppression and natural succession. Over time, Alternative 1 would create large blocks of maturing habitat spatially distributed across the

Project Area. The quality of forested stands within such blocks may increase for northern goshawk, red-shouldered hawk, bald eagle, cerulean warbler, Louisiana waterthrush, prothonotary warbler, eastern box turtle, black bear, and other wildlife species associated with mid- to late-successional forest types (e.g., pileated woodpecker, brilliant scarlet tanager, red and gray fox, coyote, black-throated green warbler, gray and fox squirrel, white-tailed deer, bobcat, and northern flying squirrel). Tree diameters, the proportion of hardwoods, large woody debris, snags, and tree cavities would all increase, and canopy gaps would develop. As these mature forest characteristics develop, northern goshawks, red-shouldered hawks, bald eagles, cerulean warblers, Louisiana waterthrushes, and prothonotary warblers may experience an increase in suitable nesting and foraging habitat.

In particular, an increase in mature forest near rivers, streams, lakes, ponds, swamps, and wetlands may increase the availability of nesting, roosting, and perching sites for bald eagle, red-shouldered hawk, cerulean warbler, Louisiana waterthrush, and prothonotary warbler. Increases in mature forest with canopy gaps near a source of water may also increase the foraging and nesting habitat for the eastern box turtle. In addition, greater understory growth and woody debris might increase the abundance and availability of potential denning sites and prey species for black bear. However, if succession leads to the loss of interspersed forest openings, uplands, and/or wetlands, the availability of suitable nesting and/or foraging habitat for wildlife associated with mid- to late-successional forest types may decline. For example, the loss of intermittent openings may reduce the availability of unshaded nesting sites adjacent to upland forests, which are critical for successful eastern box turtle reproduction (Hyde 1999).

Alternative 1 would also fail to control Scots pine and other non-native invasive species in the Project Area, reducing the quantity and quality of breeding and foraging habitat for wildlife species associated with mid- to late-successional forest habitats. Scots pine may replace native forest species, including hardwoods, reducing the quantity and quality of suitable nesting habitat for mid- to late-successional avian species. In addition, non-native invasive plant species might replace the native plants that provide food and cover for small mammals, birds, and terrestrial and aquatic insects. This would reduce the suitable foraging habitat and prey base for the RFSS associated with this habitat type. Reductions in native plants (such as berry producing species) and invertebrates resulting from the spread of invasive species may also reduce suitable foraging habitat and prey base for the eastern box turtle and the black bear. However, this potential adverse effect would likely be minimal due to the small acreages affected.

In addition, habitat quantity and quality for wildlife associated with mid- to late-successional forest types may decline under Alternative 1 because it would maintain current road and trail densities within the Project Area. These densities are higher than Forest Plan objectives for the WRSNA (USDA Forest Service 2006b). Traffic along these roads and trails may increase the level of disturbance (e.g., human activity, noise, and habitat degradation), and increase the risk of nest trees being cut down for firewood, ground nests of eastern box turtles being destroyed, vehicle collisions with wildlife, illegal collection (including poaching), wildfires, dispersed camping, and cross-country travel. Such disturbance may cause northern goshawks, red-shouldered hawks, bald eagles, cerulean warblers, Louisiana waterthrushes, prothonotary warblers, and other birds associated with forested habitats to abandon their nest sites, and disrupt the normal nesting and foraging behavior of wildlife associated with mid- to late-

successional forest types, limiting use of nest sites and foraging areas and potentially affecting productivity.

These activities may also damage vegetation and increase the amount of bare ground within forest openings and upland areas, and/or reduce water quality in rivers, streams, lakes, ponds, swamps, and wetlands via soil erosion or sediment delivery. Degradation of forest openings, uplands, and aquatic habitats might lead to a reduction in available foraging and/or nesting habitat for northern goshawk, red-shouldered hawk, bald eagle, cerulean warbler, Louisiana waterthrush, prothonotary warbler, eastern box turtle, black bear, and other wildlife associated with mid- to late-successional forest types. However, human disturbance and associated reductions in nesting or foraging habitat would likely affect small acreages in localized areas within the Project Area in any given time period, allowing nesting and foraging potential in those areas that are undisturbed. Overall, Alternative 1 is expected to have primarily beneficial direct and indirect effects on wildlife associated with mid- to late-successional forest habitats, and any adverse direct and indirect effects are expected to be minimal.

Alternatives 2 and 3

Savanna creation, KBB opening restoration, oak/aspen clearcuts, red pine thinning, and prescribed burning, proposed under Alternatives 2 and 3, may kill or temporarily displace small numbers of wildlife species associated with mid- to late-successional forest types within the Project Area. Traffic associated with implementation may temporarily increase the risk of mortality due to vehicle collisions. Vegetative management activities and vehicle and foot traffic associated with implementation may also temporarily increase the level of disturbance (e.g., human activity, noise, and habitat degradation) near active nests, potentially resulting in nest abandonment and/or the removal of nest sites. Severe nest site disturbance, such as road building or timber harvest activity, can cause abandonment of nests, particularly during incubation of the eggs (USDA Forest Service 2002a, Roberson et al. 2003). Timber harvest activity that occurs during the non-nesting season when the birds are not really attached to the site doesn't result in abandonment if the site is not severely changed, such as by a clearcut (USDA Forest Service 2002a, Roberson, et. al. 2003).

In addition, ground disturbance within forest openings may reduce the reproductive success of eastern box turtles if nest sites are destroyed. Management activities may also remove denning sites for black bears, and/or temporarily displace, alter movement, or disturb northern goshawks, red-shouldered hawks, bald eagles, cerulean warblers, Louisiana waterthrushes, prothonotary warblers, eastern box turtles, and black bears by limiting the use of potential breeding and foraging habitat, and potentially affecting productivity. Management activities conducted between September and March would largely protect northern goshawks, red-shouldered hawks, bald eagles, cerulean warblers, Louisiana waterthrushes, and prothonotary warblers, and eastern box turtles within the Project Area, as this time period is outside of the breeding and active periods of these RFSS.

Potential adverse direct effects that Alternatives 2 and 3 might have on the RFSS associated with mid- to late-successional forest types would be minimized with the implementation of the following conservation measures found in the following:

- The Northern Goshawk (*Accipiter gentilis atricapillus*) in the Western Great Lakes Region: A Technical Conservation Assessment (Roberson, et. al. 2003);
- Draft Western Great Lakes Northern Goshawk (*Accipiter gentilis atricapillus*) Conservation Assessment (USDA Forest Service 2007c);
- Management Recommendations for the Northern Goshawk on the Huron-Manistee National Forests (USDA Forest Service 1993);
- Conservation Assessment for Red-Shouldered Hawk (*Buteo lineatus*) (USDA Forest Service 2002a);
- Bald Eagle Management Plan for the Huron-Manistee National Forests (USDA Forest Service 2006c);
- Northern States Bald Eagle Recovery Plan (USDI Fish and Wildlife Service 1983);
- Conservation Assessment for Cerulean Warbler (*Dendroica cerulea*) (USDA Forest Service 2003c);
- Conservation measures for species viability for the cerulean warbler, northern goshawk, red-shouldered hawk, and eastern box turtle outlined in the Programmatic Biological Evaluation for the Huron-Manistee National Forest (USDA Forest Service 2005); and
- Forest Plan Standards and Guidelines (USDA Forest Service 2006b).

These measures would ensure that the timing and spatial pattern of management activities avoid known nesting locations during the breeding season. For example, management activities would not occur within 400' of an occupied cerulean warbler nest tree during the breeding season (USDA Forest Service 2005). In addition, management activities would be prohibited within primary buffers (660') of active northern goshawk and red-shouldered hawk nests, and known northern goshawk and red-shouldered hawk nests would be protected during project implementation. Implementation of the Standards and Guidelines for Watershed Management described in the Forest Plan (USDA Forest Service 2006b: pages II-17 – II-22) would further reduce the potential for adverse direct effects on bald eagle, red-shouldered hawk, cerulean warbler, Louisiana waterthrush, and prothonotary warbler.

For example, the potential for direct effects would be reduced somewhat by the Guideline stating that equipment should not be operated within the Streamside Management Zone when soils are saturated or when rutting is likely to occur (USDA Forest Service 2006b). This would limit activities to periods when the soils in the riparian corridor were frozen, such as winter, which would be outside of the nesting season for these RFSS. To further reduce the potential for direct effects, the locations of known nests, roosts, and dens of rare or sensitive wildlife species would be flagged or marked, and management activities would be performed carefully to avoid physical injury to such structures and less mobile wildlife such as eastern box turtle. If other sensitive wildlife species associated with mid- to late-successional forest types are found during project activities, appropriate protection measures would be implemented to reduce potential adverse direct effects.

Under Alternatives 2 and 3, strip/patch or spot application of gylphosate, triclopyr, or imazapyr would be used to control non-native invasive species and persistent woody vegetation. Wildlife associated with mid- to late-successional vegetative types may be exposed to these herbicides:

1. By direct contact with recently treated foliage;

2. By consuming prey items that have come in direct contact with herbicide spray, recently treated foliage, or consumed parts of treated plants;
3. By consuming treated foliage; or
4. By drinking from water sources that have received contaminated surface runoff.

Ecological risk assessments conducted for glyphosate, triclopyr, and imazapyr suggest that rates commonly used by the Forest Service pose little or no risk to wildlife (USDA Forest Service 2003a, USDA Forest Service 2003b, USDA Forest Service 2004b). The proposed herbicides are not highly toxic to avian receptors (e.g., cerulean warblers, northern goshawks, red-shouldered hawks, Louisiana waterthrush, prothonotary warbler) to insect species (e.g., Karner blue butterfly), to reptilian species (e.g., eastern box turtle), or to the small mammal, amphibian, and fish species that form the chief prey of carnivores such as red-shouldered hawks, northern goshawks, and bald eagles (USDA Forest Service 2003a, USDA Forest Service 2003b, USDA Forest Service 2004b). Proposed herbicides are not cholinesterase inhibitors such as organophosphate or a carbamate insecticide (or chemically related to such insecticides) that are highly toxic to wildlife, especially insects and other invertebrates. Nor are the proposed herbicides chemically related to the chlorinated hydrocarbon insecticides such as DDT that are highly persistent in the environment and known for causing eggshell thinning of raptors (birds of prey) such as bald eagles and ospreys.

Herbicide toxicity and risk data (Appendix C) for mammalian, aquatic, avian, and terrestrial wildlife species suggest glyphosate, triclopyr, and imazapyr are generally safe to mammals, birds, and other wildlife if used in accordance with the manufacturer label. The Roundup formulation of glyphosate and butoxyethyl ester formulations of triclopyr are exceptions to this generalization, due to the extremely low LC_{50} values for aquatic species (Appendix C). However, only formulations labeled for use in aquatic areas would be used within 100 feet of wetlands or riparian areas. Risk assessments for glyphosate and triclopyr conclude that small birds and animals that consume vegetation or insects from areas treated with the maximum application rate for an extended period of time could experience adverse effects. However, this type of treatment would not occur. Because spot and strip/patch application would be used to treat small areas within the Project Area, it would be unlikely that wildlife associated with mid- to late-successional forest types would come in direct contact with recently treated foliage, or would feed solely on prey or plants that have been exposed to herbicide sprays. In addition, consumption of exposed prey would likely have a minimal effect on these wildlife species given that glyphosate, triclopyr, and imazapyr are not expected to bioaccumulate in the food chain (USDA Forest Service 2003a, USDA Forest Service 2003b, USDA Forest Service 2004b).

Management activities under Alternatives 2 and 3 would likely have a greater effect on local populations of northern goshawks, red-shouldered hawks, bald eagles, cerulean warblers, Louisiana waterthrushes, prothonotary warblers, eastern box turtles, black bears, and other wildlife associated with mid- to late-successional forest types through habitat change. Savanna creation, KBB opening restoration, oak/aspen clearcuts, red pine thinning, and prescribed burning would reduce the amount of mid- to late-successional forest habitat within the Project Area. Approximately 3,000 acres of mature forest would be converted to openland habitats (e.g., openings and savannas/barrens) and early successional forest. As a consequence, species dependent on hard mast production (e.g., red-headed woodpecker, wild turkey, squirrels, white-tail deer) may experience a reduction in food availability, which may subsequently lead

to a reduction in prey availability and abundance for foraging northern goshawks, red-shouldered hawks, bald eagles, and black bears. While savanna creation and KBB opening restoration may reduce hard mast production over the long term, oak/aspen clearcuts, Scots pine removal, and red pine thinning would likely reduce hard mast production over the short term, as stands receiving these treatments would regenerate to mature forests in the future.

In addition, the proposed management activities may damage vegetation and increase the amount of bare ground within forest openings and upland areas. This may lead to a temporary reduction in native plants that provide food and cover for small mammals, birds, and terrestrial and aquatic insects and a short-term decline in suitable foraging habitat and prey base for northern goshawk, red-shouldered hawk, bald eagle, cerulean warbler, Louisiana waterthrush, and prothonotary warbler. Reductions in native plants (such as berry producing species) and invertebrates may also temporarily reduce suitable foraging habitat and prey base for eastern box turtle and black bear. However, these potential short term effects would be expected to be minimal, given that human disturbance and associated reductions in foraging habitat would potentially affect only small acreages in localized areas within the Project Area in any given time period. This would allow foraging potential in those areas that remain undisturbed.

Management activities would also increase forest fragmentation and the amount of edge, which may reduce the nesting success of forest-interior bird species, such as the northern goshawk and red-shouldered hawk, due to higher rates of predation, higher rates of parasitism, and reductions in pairing success. Fragmentation of forest stands and the creation of larger openings favor the immigration of nest competitors and predators such as the red-tailed hawk and great-horned owl (Cooper 1999a). These species can either displace northern goshawk or red-shouldered hawk nesting pairs or directly depredate young and/or adults from a nest site (Cooper 1999a). Other effects related to fragmentation include: increased parasitism by brown-headed cowbirds, increased nest competition with species such as the house wren, and/or increased predation from species such as raccoons. These may reduce the reproductive success of cerulean warblers, Louisiana waterthrushes, and prothonotary warblers (Gibson 2007a, Gibson 2007b, Hyde et al. 2000).

Forestry practices such as clearcutting produce only temporary edges and fragmentation. For example, aspen regenerates quickly and within approximately 10 years, oak/aspen clearcuts would have closed canopies, and in about 20+ years, tree heights approach the original stands. Thus, any adverse effects from oak/aspen clearcuts, red pine thinning, and Scots pine removal would likely be short term for species favoring forest interior conditions. However, savanna creation and KBB opening restoration would likely reduce habitat quantity and quality for these interior-dependent species over the long term. Because a relatively small percentage (18%) of the Project Area would be affected by vegetative management activities, reductions in foraging and breeding habitat would not likely decrease the overall numbers of northern goshawks, red-shouldered hawks, bald eagles, cerulean warblers, Louisiana waterthrushes, prothonotary warblers, eastern box turtles, black bears, and other wildlife associated with mid- to late-successional forest types within the Project Area.

The proposed vegetative management activities under Alternatives 2 and 3 may also have beneficial indirect effects to the foraging and breeding habitat of wildlife associated with mid- to late-successional forest types. Management for early successional vegetative types may

increase the quantity and quality of interspersed forest openings and uplands, increasing the availability of native grasses, forbs, and shrubs that provide food and cover for small mammals, birds, and terrestrial insects, subsequently increasing the abundance and diversity of forage and prey species. As a consequence, suitable foraging habitat and prey base for wildlife associated with mid- to late-successional forest types may increase within the Project Area. An increase in opens areas within upland forests near waterbodies would also likely increase the availability of suitable nesting areas for eastern box turtle. Scots pine removal would control a non-native invasive species and replace it with native vegetation (i.e., aspen and oak). The newly established native species might increase species richness and diversity, and subsequently increase the quantity and quality of foraging and/or breeding habitat for wildlife species associated with mid- to late-successional forest habitats. Prescribed burning may also indirectly benefit these wildlife species by:

1. Reducing the potential for wildfire;
2. Damaging or killing trees, contributing to the production of snags, down wood, and potential perch trees; and
3. By maintaining forest openings that provide nesting or foraging areas for wildlife such as eastern box turtles and northern goshawks.

Overall, vegetative management activities under Alternatives 2 and 3 would have both beneficial and negative direct and indirect effects on wildlife associated with mid- to late-successional forest types within the Project Area. Adverse effects would be expected to be minimal.

Recreation management activities proposed under Alternatives 2 and 3 would have primarily beneficial effects to local populations of wildlife associated with mid- to late-successional forest types within the Project Area. Closing Forest System roads, reducing the number of motorized-dependent camping sites, and developing a parking area for motorized vehicles may decrease levels of disturbance (e.g., human activity, noise, and habitat degradation) and reduce the risk of motorized users:

1. Damaging or destroying nest trees, ground nests, and roost and perch trees;
2. Causing disturbance that leads to nest abandonment;
3. Temporarily displacing, altering movement, or disrupting the normal behavior of wildlife (e.g., interfering with nesting or foraging activities); and/or
4. Temporarily reducing suitable foraging habitat and prey base by damaging vegetation and increasing the amount of bare ground and non-native invasive species within forest openings and upland areas.

Reducing motorized use may also reduce the risk of vehicle collisions with wildlife, visitors directly harming, harassing, or killing wildlife, illegal collection (including poaching), and wildfires. Alternative 3 would reduce human use more than Alternative 2 by closing an additional 0.7 miles of Forest System roads to motorized use, with the exception of snowmobile use.

In addition, Alternative 2 proposes to limit horseback riding to a 19.7 mile designated trail, develop a day-use parking area for horse rigs, and require the removal of horse manure, feed,

and hay at the designated day-use parking area and at designated camping areas within the WRSNA. Alternative 3 proposes to prohibit horseback riding within the WRSNA. Limiting or prohibiting horseback riding as proposed under Alternatives 2 and 3 may reduce the risk of this non-motorized use damaging or reducing the presence and productivity of native forbs and shrubs used for food or cover by wildlife and/or their forage species, introducing and spreading non-native invasive species via manure, and/or increasing soil disturbance, erosion, compaction, and the amount of bare ground. Also, limiting or prohibiting horse use may reduce the risk of non-motorized users damaging or destroying ground nests or cutting down nest, roost, or perch trees for firewood, causing disturbance that leads to nest abandonment, and/or temporarily displacing, altering movement, or disrupting the normal behavior of wildlife (i.e., interfere with dispersal or mating activities).

In addition, requiring the removal of horse manure, feed, and hay at the designated day-use parking area and at designated camping areas within the WRSNA may reduce the risk of introducing and spreading non-native invasive species within the Project Area. Alternative 2 would also allow for the watering of horses with buckets hand-carried to and from identified permanent water sources on National Forest System lands. Because horses would no longer be watered by walking along or in streams and other water bodies, Alternatives 2 and 3 may reduce the risk of soil erosion and sediment delivery into rivers, streams, lakes, ponds, swamps, and wetlands. Under Alternatives 2 and 3, areas that have been degraded due to motorized and non-motorized use would likely regenerate, which may increase the native plants that provide food and cover for small mammals, birds, and terrestrial and aquatic insects, subsequently increasing suitable foraging habitat and prey base for wildlife associated with mid- to late-successional forest types.

Overall, recreation management activities proposed under Alternatives 2 and 3 would likely decrease the risk of mortality and improve habitat quantity and quality for northern goshawk, red-shouldered hawk, bald eagle, cerulean warbler, Louisiana waterthrush, prothonotary warbler, eastern box turtle, black bears, and other wildlife associated with mid- to late-successional forest types within the Project Area. Alternative 3 would reduce potential adverse effects of recreational use to these wildlife species more than Alternative 2. Both Alternatives would meet Forest Plan management objectives for the WRSNA (USDA Forest Service 2006b).

(3.5q) Cumulative Effects

Increases in human populations and associated land development, road construction, and recreational uses are expected on private lands within the MNF. In addition, a change in land use from larger forested parcels to smaller parcels with more development is occurring on private ownerships and is expected to continue into the foreseeable future. These activities would likely increase the potential for human access and use near northern goshawk, red-shouldered hawk, bald eagle, cerulean warbler, Louisiana waterthrush, prothonotary warbler, eastern box turtle, and black bear nesting, roosting, perching, foraging, and denning sites. Subsequently this will lead to increased levels of disturbance, habitat fragmentation, the risk of vehicle collisions with wildlife, illegal poaching and collection, wildfires, dispersed camping, and cross-country travel. Such disturbance might damage nesting, roosting, perching, or denning sites and/or cause such sites to be abandoned.

In addition, the increase in the number of residences and associated developments within the MNF has likely increased wildlife populations associated with human residential areas such as raccoons, opossums, and skunks, which may predate active nest sites. Increases in human development, access, and use also might remove potential nesting, roosting, perching, or denning sites and/or temporarily species associate with mid- to late- successional habitat. Human disturbance may also disrupt the normal foraging behavior of wildlife, limiting use of foraging areas and potentially affecting productivity. In addition, increases in human development, access, and use might decrease the quantity and quality of forest openings, upland areas, and aquatic habitats (e.g., rivers, streams, lakes, ponds, swamps, and wetlands), potentially decreasing the abundance and diversity of forage and prey species, and subsequently reducing foraging habitat and the prey base. Thus, increases in human populations and associated developments and uses could result in the permanent loss and degradation of breeding and foraging habitat on private lands within the MNF. This magnifies the importance of National Forest System lands to these species. Timber harvest, fire suppression, and the application of pesticides are also activities that might adversely affect wildlife species associated with mid- to late-successional vegetative types on private lands within the MNF in the future. In addition, mineral developments are reasonably certain to occur in the foreseeable future within the MNF and have the potential to cumulatively affect wildlife associated with mid- to late-successional forest types.

The amount of mid- to late-successional forest habitat is expected to be reduced under the Forest Plan's new management direction in localized areas (USDA Forest Service 2006b). Management for early successional vegetative types would decrease the amount of mature forest habitat available for northern goshawks, red-shouldered hawks, bald eagles, cerulean warblers, Louisiana waterthrushes, prothonotary warblers, eastern box turtles, and black bears, and increase the effects of forest fragmentation (such as increased competition from red-tailed hawks or house wrens, predation from raccoons, or nest parasitism by brown-headed cowbirds). However, other management directives delineated in the Forest Plan protect mid- to late-seral stages of forest vegetation.

Semiprimitive, wild and scenic river designations, rare plant areas, and candidate RNA's would protect hardwood forests, reducing habitat fragmentation. In these areas, there would be fewer roads, less vegetation manipulation, and reduced disturbance from recreational activities. The old growth designation would provide planned old growth in the northern hardwood and long-rotation oak type. In addition, management of the hardwood forest types would continue to provide a stable or increasing amount of mature habitat for wildlife associated with mid- to late-successional forest types, and would provide adequate amounts of regenerating hardwood types for prey habitat. The amount of pine thinnings, mature oak and aspen forest regeneration, and dead tree salvage treatments is projected to remain at 1979 – 2005 levels. Thus, overall, the Forest Plan's management directives would provide large blocks of maturing habitat spatially interspersed with early successional vegetative types across the MNF (providing habitat for early- and late-successional wildlife species). As a result, the amount of mid- to late-successional forest habitat is expected to remain stable at a broad scale across the MNF. In addition, in the long term, the overall quality of mid- to late-successional forest habitat would increase as stands matured and tree diameters increased, large woody debris and snags increased, and canopy gaps developed.

Implementation of the conservation measures noted in Appendix A will protect RFSS species associated with mid- to late-successional forest types and their habitats on National Forest System lands within the MNF from adverse affects that might potentially result from the Proposed Action. Therefore, the effects of the Proposed Action are expected to be local, and would not be expected to affect the viability of northern goshawk, red-shouldered hawk, bald eagle, cerulean warbler, Louisiana waterthrush, prothonotary warbler, and eastern box turtle within the MNF. Overall, populations of these RFSS are expected to remain stable or increase within the MNF.

(3.5e) Wildlife Associated with Streams, Creeks, Lakes, and Wetlands

(3.5e) Direct and Indirect Effects

Alternative 1

Under Alternative 1, the Forest Service would continue to manage for late seral stages along wetlands and riparian areas. As a consequence, the quantity and quality of forested habitat adjacent to water bodies would increase over time. Tree diameters and dead and down woody debris would increase and canopy gaps would develop. Increases in mature forest with canopy gaps near rivers, streams, creeks, lakes, and wetlands may increase nesting and/or foraging habitat for Blanding's turtle, wood turtle, and other water-dependent wildlife species (e.g., great blue heron, wood duck, mallard, black duck, Canada goose, and beaver). If succession leads to the loss of interspersed forest openings, uplands, and/or wetlands, then the availability of suitable nesting and/or foraging habitat for these species might decline. This alternative would also fail to control Scots pine and other non-native invasive species in the Project Area that may replace native forest species that provide food and/or cover for wildlife associated with aquatic habitats (e.g., streams, creeks, lakes, and wetlands). However, this potential adverse effect would likely be minimal due to the small acreages affected.

In addition, Alternative 1 would maintain current road and trail densities within the Project Area. These densities are higher than Forest Plan objectives for the WRSNA (USDA Forest Service 2006b). Traffic along these roads and trails may increase the level of disturbance (e.g., human activity, noise, and habitat degradation), the risk of vehicle collisions with wildlife, illegal collection (including poaching), wildfires, dispersed camping, and cross-country travel. Road and trail traffic may also:

1. Temporarily displace, alter movement, or disrupt the normal behavior of wildlife;
2. Lead to an increase in mammalian predators associated with human activities;
3. Destroy the ground nests of Blanding's turtles or wood turtles;
4. Damage or cause the abandonment of great blue heron, wood duck, mallard, black duck, or Canada goose roost or nest sites;
5. Damage or destroy hibernacula and forage plants; and/or
6. Reduce water quality in rivers, streams, creeks, lakes, and wetlands via increased erosion or sediment delivery.

Habitat fragmentation resulting from the road and trail system also might reduce wildlife productivity due to increases in nest predation near habitat edges. Thus, maintaining current levels of access and use might increase the risk of mortality, reduce available breeding and

foraging habitat, and limit the use of nesting and foraging areas for Blanding's turtles, wood turtles, and other wildlife associated with aquatic habitats. This would potentially affect the survivorship and reproductive success of these species. Overall, Alternative 1 is expected to have adverse direct effects, and beneficial and adverse indirect effects on wildlife associated with aquatic habitats.

Alternatives 2 and 3

Alternatives 2 and 3 may kill or temporarily displace small numbers of wood turtles, Blanding's turtles, and other wildlife associated with aquatic habitats (e.g., great blue heron, wood duck, mallard, black duck, Canada goose, and beaver) if management activities occur near rivers, streams, creeks, lakes, or wetlands. Savanna creation, KBB opening restoration, oak/aspen clearcuts, red pine thinning, prescribed burning, and vehicle and foot traffic associated with implementation may increase the risk of mortality due to vehicle collisions with wildlife, and temporarily increase the level of disturbance (e.g., human activity, noise, and habitat degradation) near nest, roost, or hibernation sites. This would potentially result in the abandonment and/or removal of such sites. Management activities also might temporarily disturb Blanding's turtles, wood turtles, and other wildlife associated with aquatic habitats searching for sunning, foraging, roosting, nesting, and hibernation sites, limiting the use of breeding and/or foraging habitat and potentially affecting productivity.

Water-orientated wildlife species that have limited mobility and/or are breeding, such as Blanding's turtle and wood turtle, are most likely to be directly affected in these operations due to heavy equipment use and prescribed burning. Management activities are more likely to have an adverse direct effect on the wood turtle and Blanding's turtle if implemented near aquatic habitats between late spring to early fall when these species increase their use of adjacent uplands and forests for foraging, mating, and/or nesting (Lee 1999a, Lee 1999b). Between late fall and early spring, direct effects on these RFSS are expected to be insignificant as Blanding's turtles and wood turtles spend the majority of their time in aquatic habitats (Lee 1999a, Lee 1999b). This would largely protect them from any direct impacts. Direct effects on black-crowned night-heron also are expected to be minimal during this time period as wintering birds can readily move among roost sites.

To minimize the potential adverse direct effects that Alternatives 2 and 3 might have on Blanding's turtle, wood turtle, and other wildlife associated with this habitat type, conservation measures from the following sources would be incorporated in areas where these species are documented or found during project activities:

- The R9 Species Conservation Assessment for Wood Turtle – *Glyptemys insculpta* (USDA Forest Service 2004b);
- The Conservation Assessment for Blanding's Turtle (*Emydoidea blandingii*) (USDA Forest Service 2002b);
- The conservation measures for species viability for wood turtle and Blanding's turtle outlined in the Programmatic Biological Evaluation for the Huron-Manistee National Forest (USDA Forest Service 2005); and
- The Standards and Guidelines for Watershed Management described in the Forest Plan (USDA Forest Service 2006b: pages II-17 – II-22).

For example, the potential for direct effects would be reduced somewhat by the Guideline stating that equipment should not be operated within the Streamside Management Zone when soils are saturated or when rutting is likely to occur (USDA Forest Service 2006b). This would limit site preparation activities to periods when the soils in the riparian corridor were frozen, such as winter, which would correspond to the inactive period of reptilian species and would be outside the nesting season of waterfowl and shorebirds. In addition, the locations of nests or burrows of rare or sensitive wildlife species, such as the wood turtle and Blanding's turtle, would be flagged or marked, and management activities would be performed carefully to avoid physical injury to nests, burrows, and less mobile wildlife. If other sensitive wildlife species associated with aquatic habitats are found during project activities, appropriate protection measures would be implemented to reduce potential adverse effects.

Alternatives 2 and 3 propose strip/patch or spot application of glyphosate, triclopyr, or imazapyr to control non-native invasive species and persistent woody vegetation. Wildlife associated with aquatic habitats might be exposed to these herbicides by: direct contact with recently treated foliage; by consuming treated foliage or prey items that have come in direct contact with herbicide spray, recently treated foliage, or consumed parts of treated plants; or by drinking from or swimming in water sources that have received contaminated surface runoff. However, ecological risk assessments conducted for glyphosate, triclopyr, and imazapyr suggest that rates commonly used by the Forest Service pose little or no risk to wildlife (USDA Forest Service 2003a, USDA Forest Service 2003b, USDA Forest Service 2004b). The proposed herbicides are not highly toxic to avian receptors such as red-shouldered hawks or prothonotary warblers, to insect species such as Karner blue butterflies, to reptilian species such as Blanding's turtle or wood turtle, or to small mammal, amphibian, and fish species that form the chief prey of carnivores such as bald eagles (USDA Forest Service 2003a, USDA Forest Service 2003b, USDA Forest Service 2004b).

The proposed herbicides are not cholinesterase inhibitors such as organophosphate or a carbamate insecticide (or chemically related to such insecticides) that are highly toxic to wildlife, especially insects and other invertebrates. Nor are the proposed herbicides chemically related to the chlorinated hydrocarbon insecticides such as DDT that are highly persistent in the environment and known for causing eggshell thinning of raptors (birds of prey) such as bald eagles and ospreys. Herbicide toxicity and risk data (Appendix C) for mammalian, aquatic, avian, and terrestrial wildlife species suggest that glyphosate, triclopyr, and imazapyr are generally safe to mammals, birds, and other wildlife if used in accordance with the manufacturer label. The Roundup formulation of glyphosate and butoxyethyl ester formulations of triclopyr are exceptions to this generalization due to the extremely low LC_{50} values for aquatic species (Appendix C). However, only formulations labeled for use in aquatic areas would be used within 100 ft of wetlands or riparian areas.

Risk assessments for glyphosate and triclopyr conclude that small birds and animals that consume vegetation or insects from areas treated with the maximum application rate for an extended period of time could experience adverse effects. However, this type of treatment would not occur. Because spot and strip/patch application would be used to treat small areas within the Project Area, it would be unlikely that wildlife associated with aquatic habitats would come in direct contact with recently treated foliage, would feed solely on prey or plants that have been exposed to herbicide sprays, or would be exposed to contaminated water

sources. In addition, consumption of exposed prey would likely have a minimal effect on these species given that glyphosate, triclopyr, and imazapyr are not expected to bioaccumulate in the food chain (USDA Forest Service 2003a, USDA Forest Service 2003b, USDA Forest Service 2004b).

Management activities under Alternatives 2 and 3 would likely have a greater effect on local populations of Blanding's turtle, wood turtle, and other wildlife associated with aquatic habitats through habitat change. Savanna creation, KBB opening restoration, oak/aspen clearcuts, red pine thinning, prescribed burning, and vehicle and foot traffic associated with implementation may damage vegetation and increase the amount of bare ground within treated openings and uplands near rivers, streams, creeks, lakes, and wetlands, temporarily decreasing cover and the abundance of important forage species, such as herbs, wildflowers, and berry producing shrubs. Increased habitat fragmentation near water bodies also may result from project implementation, potentially reducing productivity due to increased nest predation near habitat edges. Management activities, particularly prescribed burning, may also reduce dead and down woody debris that provides structure for thermal regulation and protection from predators. In addition to increasing the quantity and quality of forest openings and uplands, prescribed burning might indirectly benefit Blanding's turtle and wood turtle by reducing the potential for wildfire and damaging or killing trees.

The proposed vegetative management activities under Alternatives 2 and 3 may also have beneficial indirect effects to the foraging and breeding habitat of Blanding's turtles, wood turtles, and other water-oriented wildlife species. Management for early successional vegetative types may increase the quantity and quality of interspersed forest openings and uplands, increasing the availability of sunning and nesting areas, and increasing native grasses, forbs, and berry producing shrubs (i.e., increasing the abundance and diversity of forage species). Control of Scots pine and other non-native invasive species may also increase native species richness and diversity, increasing available for food and cover for wildlife associated with aquatic habitats. Overall, vegetative management activities under Alternatives 2 and 3 are expected to have adverse and beneficial direct and indirect effects on wildlife associated with aquatic habitats within the Project Area, and any adverse effects are expected to be minimal.

Recreation management activities proposed under Alternatives 2 and 3 would have primarily beneficial effects to local populations of Blanding's turtle, wood turtle, and other wildlife associated with aquatic habitats within the Project Area. Closing Forest System roads, reducing the number of motorized-dependent camping sites, and developing a parking area for motorized vehicles may decrease levels of disturbance (e.g., human activity, noise, and habitat degradation), and reduce the effects of fragmentation (e.g., nest predation near habitat edges). Reducing motorized use may also reduce the risk of motorized users:

1. Destroying or causing the abandonment of nests, roosts, or hibernation sites;
2. Temporarily displacing, altering movement, or disrupting the normal behavior of wildlife (e.g., interfering with nesting, foraging, sunning, roosting, or hibernation activities); and/or
3. Temporarily reducing suitable foraging habitat and prey base by damaging vegetation and increasing the amount of bare ground and non-native invasive species within forest openings and upland areas.

In addition, reducing motorized use may also reduce the risk of vehicle collisions with wildlife, visitors directly harming, harassing, or killing wildlife, illegal collection (including poaching), and wildfires. Alternative 3 would reduce motorized access more than Alternative 2 by closing an additional 0.7 miles of Forest System roads, with the exception of snowmobile use.

Currently, horseback riding occurs on Forest System roads throughout the Project Area, and cross-country travel is permitted for horseback riding, except where posted signs exclude this form of recreation. Limiting or prohibiting horseback riding as proposed under Alternatives 2 and 3 may reduce the damage to the presence and productivity of native grasses, forbs, and berry producing shrubs used for forage; introduction and spread of non-native invasive species via manure; and soil disturbance, erosion, compaction, and the amount of bare ground. Also, limiting or prohibiting horse use may reduce the risk of non-motorized users damaging or destroying ground nests of Blanding's turtles and wood turtles and/or temporarily displacing, altering movement, or disrupting the normal behavior of wildlife. In addition, requiring removal of horse manure, feed, and hay at the designated day-use parking area and at designated camping areas within the WRSNA may reduce the risk of introducing and spreading non-native invasive species within the Project Area.

Access to available water bodies for watering horses currently is unregulated within the Project Area. Alternative 2 would allow for watering horses with buckets hand carried to and from identified permanent water sources on National Forest System lands. Because horses would no longer be watered by walking along or in streams and other water bodies, Alternatives 2 and 3 may reduce the risk of soil erosion and sediment delivery into rivers, streams, creeks, lakes, and wetlands that could reduce habitat quality and quantity for water-oriented wildlife species. Under Alternatives 2 and 3, areas that have been degraded due to motorized and non-motorized use would likely regenerate, which might increase foraging, breeding, and hibernating habitat for Blanding's turtle, wood turtle, and other wildlife species associated with aquatic habitats.

Overall, recreation management activities proposed under Alternatives 2 and 3 would likely decrease the risk of mortality and improve habitat quantity and quality for wildlife associated with aquatic habitats within the Project Area. Alternative 3 would reduce potential adverse effects of recreational use to these species more than Alternative 2. Both Alternatives would meet Forest Plan management objectives for the WRSNA (USDA Forest Service 2006b).

(3.9) Cumulative Effects

Increases in human populations and associated land development, road construction, and recreational uses are expected on private lands within the MNF. These activities would likely increase the potential for human access and use within or adjacent to aquatic habitats used by wood turtles, Blanding's turtles, and other wildlife associated with aquatic habitats (e.g., great blue heron, wood duck, mallard, black duck, Canada goose, and beaver). Increased human access and use could increase the level of disturbance (e.g., human activity, noise, and habitat degradation), increase the risk of vehicle collisions with wildlife, illegal collection (including poaching), wildfires, dispersed camping, and cross-country-travel, disrupt the movements and normal behavior of individual animals, and/or increase predation by increasing mammalian

predator populations that are associated with human activities (e.g., raccoon, opossum, skunks). Development of residences near water bodies could also reduce habitat quantity and quality through the actual destruction of nesting sites, hibernacula, cover, and/or important plant species that provide food (e.g., foliage, fruit). Such developments could also increase habitat fragmentation and reduce water quality in streams and lakes via increased soil erosion or sediment delivery. Timber harvest, fire suppression, mowing, off-road vehicle (i.e., all terrain vehicles, dirt bikes, snowmobiles) and motorboat use, and the application of pesticides are also activities that might adversely affect wildlife associated with aquatic habitats on private lands. In addition, mineral developments are reasonably certain to occur in the foreseeable future within the MNF and have the potential to cumulatively affect wildlife associated with aquatic habitats. Overall, habitat quantity and quality for wildlife associated with aquatic habitats, and subsequent occurrences of these species, would likely decline on private lands within the MNF. With increasing development and fragmentation of private lands, suitable habitat for wildlife associated with aquatic habitats on National Forest System lands within the MNF is likely to become more important in the future.

Under the direction of the Forest Plan (USDA Forest Service 2006b), management actions to improve watershed condition would continue elsewhere within the MNF, focusing on erosion control, upgrading road stream crossings, lowering road densities, improving in-stream and lake habitat, and maintaining riparian buffer zones. As the forest continues to mature, more large woody debris (LWD) input into streams and lakes would occur. LWD can protect stream banks from erosion, provide habitat for aquatic insects, provide cover for fish, and provide habitat diversity. Although management for early successional vegetative types, as directed by the Forest Plan (USDA Forest Service 2006b), would decrease the amount of mature forest and lead to more open space within the watersheds located within the MNF, there should be a minimal effect on runoff and flow regimes because all of the sixth level watersheds will still have more than 33% of their area in a mature forest (>20 year age class) condition. While increases in human populations and associated land uses and development are expected within the MNF in the future, the positive effects of planned watershed management activities on the Forest should mitigate the negative effects of activities on private lands. Overall, there should be an improvement in water quality, aquatic habitat, and watershed health within the watersheds located within the MNF.

Implementation of the conservation measures noted in Appendix A should protect RFSS associated with aquatic habitats on National Forest System lands within the MNF from adverse affects that might potentially result from the Proposed Action. Therefore, the effects of the management activities under Alternatives 2 and 3 are expected to be local, and would not be expected to affect the viability of the wood turtle or Blanding's turtle within the MNF.

(3.5u) Determination of Effects for Endangered, Threatened, and Sensitive Wildlife Species

A Biological Assessment and Biological Evaluation was prepared for the Savanna Ecosystem Restoration Project (see Project Record) that documented the determinations of effects of Savanna Ecosystem Restoration Project activities on federally-listed or proposed-to-be-listed Endangered or Threatened species and critical habitat, and on Regional Forester's Sensitive Species (RFSS) by each alternative. Sixteen wildlife species that may be present or have habitat within the Project Area were analyzed in these documents including: Karner blue butterfly, Indiana bat, dusted skipper, hill-prairie spittlebug, frosted elfin, eastern box turtle, red-headed

woodpecker, whip-poor-will, bald eagle, cerulean warbler, Louisiana waterthrush, northern goshawk, prothonotary warbler, red-shouldered hawk, Blanding's turtle, and wood turtle. The determinations are listed below in Table 3.19. The determinations were made contingent on implementation of the conservation measures listed in Appendix A. The conservation measures would be implemented with the action alternatives. The ruffed grouse was not included in the Biological Assessment and Biological Evaluation because it is only a Terrestrial Management Indicator Species, not a federally-listed Endangered or Threatened Species or RFSS. However, the determinations of effects on this species also are included in Table 3.19.

Table 3.19: Determination of Effects for Endangered, Threatened, and Sensitive Wildlife Species that Might Occur within the Savanna Ecosystem Restoration Project Area

Common Name	Habitat Ecology	Status	Alternative 1	Alternative 2	Alternative 3
Karner Blue Butterfly *(Lycaeides melissa samuelis (Nabokov) [or Plebejus melissa (Edwards 1873)])*	Savanna/barrens habitats with abundant wild lupine (the sole food source for the caterpillar), abundant adult nectar sources, warm season grasses for basking and roosting, and ants to protect larvae from parasites and predators.	E+MIS	May Affect, Likely to Adversely Affect	May Affect, Likely to Adversely Affect	May Affect, Likely to Adversely Affect
Indiana Bat *(Myotis sodalist)*	Roost and form maternity colonies under loose, exfoliating bark of trees (usually dead), in live shag-bark trees, or in hollows and cavities of mature trees in floodplain and bottomland forests, riparian zones, wooded wetlands, and upland forests.	E	May Affect, Not Likely to Adversely Affect	May Affect, Not Likely to Adversely Affect	May Affect, Not Likely to Adversely Affect
Ruffed Grouse *(Bonasa umbellus)*	Mixed deciduous and conifer forests (especially early seral stages dominated by aspen) and oak-savanna woodland, with forests 5-25 years old providing brood habitat and cover, and older forest age classes providing nesting habitat and winter food sources.	MIS	MINT	MINT	MINT
Dusted Skipper *(Atrytonopsis hianna)*	Typically found in localized colonies in bluestem grassland, barrens, prairie, or other openland habitats where little bluestem - its larval food plant - occurs [larvae may also feed on big blue stem].	RFSS	MINT	MINT	MINT
Hill-Prairie Spittlebug *(Lepyronia gibbosa)*	Prairie bowls in mesic dry sand prairie zones with abundant forbs.	RFSS	MINT	MINT	MINT
Frosted Elfin *(Incisalia irus)*	Grassy openings or burn scars in barrens and savannas with abundant wild lupine, false indigo, or wild indigo – its host plants - and other nectar sources.	RFSS	MINT	MINT	MINT
Eastern Box Turtle *(Terrapene carolina carolina)*	Forested habitats (coniferous, deciduous and mixed) with sandy soils and openings near a source of water, and in adjacent fields, woodlands, and marshes.	RFSS	MINT	MINT	MINT

Table 3.19 (continued): Determination of Effects for Endangered, Threatened, and Sensitive Wildlife Species that Might Occur within the Savanna Ecosystem Restoration Project Area

Common Name	Habitat Ecology	Status	Alternative 1	Alternative 2	Alternative 3
Red-Headed Woodpecker *(Melanerpes erythrocephalus)*	Mature open woodlands, open deciduous or mixed forest habitats, or savanna-like forest habitat with nearby openings, snags and mast crop abundance.	RFSS	MINT	MINT	MINT
Whip-poor-will *(Caprimulgus vociferous)*	Open coniferous, deciduous, and mixed woodlands with well spaced trees and a low canopy, abundant shade, nearby open areas, and sparse ground cover.	RFSS	MINT	MINT	MINT
Bald Eagle *(Haliaeetus leucocephalus)*	Nests in tall, dominant deciduous or coniferous trees, and sometimes cliffs, along or close to major rivers, large lakes, deep marshes, or clusters of small lakes and streams where adequate prey is available and human disturbance is minimal to none.	RFSS	MINT	MINT	MINT
Cerulean Warbler *(Dendroica cerulean)*	Nests and perches in the canopy of large, tall, trees that occur in large tracts of mature deciduous forest, bottomlands, floodplains, and lowland hardwoods, with an open understory, close to rivers and the Lake Michigan shoreline.	RFSS	MINT	MINT	MINT
Louisiana Waterthrush *(Seiurus motacilla)*	Nests on the ground along clear, fast-flowing streams and rivers in contiguous, deciduous, and often hilly forests containing moderate to sparse undergrowth.	RFSS	MINT	MINT	MINT
Northern Goshawk *(Accipiter gentilis)*	Nests in large tracts of mature pine, hardwood, or mixed forests with an intermediate amount of canopy closure, large deciduous trees for nesting, small forest openings for foraging, and an open understory.	RFSS	MINT	MINT	MINT
Prothonotary Warbler *(Protonotaria citrea)*	Nests in tree cavities of dead snags and live trees within riparian corridors, wooded swamps, floodplain forests, and bottomland hardwood forests with dense underbrush near or over water.	RFSS	MINT	MINT	MINT
Red-Shouldered Hawk *(Buteo lineatus)*	Nests in large tracts of mature deciduous or mixed forests with closed canopies, large deciduous trees for nesting, nearby wetland and upland habitats interspersed for foraging, and variable amounts of understory vegetation.	RFSS	MINT	MINT	MINT
Blanding's turtle *(Emydoidea blandingii)*	Lakes, ponds, marshes, and creeks with abundant aquatic vegetation and soft bottoms, and in the spring and summer, occupies adjacent open, sunny, upland areas with sandy soils.	RFSS	MINT	MINT	MINT

Table 3.19 (continued): Determination of Effects for Endangered, Threatened, and Sensitive Wildlife Species that Might Occur within the Savanna Ecosystem Restoration Project Area

Common Name	Habitat Ecology	Status	Alternative 1	Alternative 2	Alternative 3
Wood Turtle *(Glyptemys insculpta)*	Streams and adjacent forested riparian and upland floodplain areas with numerous openings and a dense mixture of low herbs and shrubs, and in the summer may roam widely overland occupying nearby terrestrial habitats including fields, woodlands, and marshes.	RFSS	MINT	MINT	MINT
Status E = federally endangered T = federally threatened MIS = Terrestrial Management Indicator Species RFSS = Regional Forester Sensitive Species		Determinations MINT = May impact individuals or sub-populations, but not likely to cause a trend towards federal listing or loss of viability.			