

American woodcock

General information

The American woodcock is a ground-dwelling, migratory shorebird of the eastern United States and southeastern Canada that primarily inhabits moist, young forest and shrubland. They breed, nest, and raise their broods from March to June in their northern range. Nests are located in slight depressions among dead leaves on the forest floor. They migrate to their southern range in the fall through winter. This gamebird has declined steadily over the past 25 years as a result of land-use changes that have resulted in forest maturation, fire suppression, and increased human development. High-quality woodcock habitat has a diverse arrangement of dense, young forest (and must include some moist sites) on 80 percent of the area, interspersed with large fields and small openings in close proximity.

Habitat requirements

Diet: invertebrates (earthworms represent 60 percent of diet)

Water: obtained through diet

Cover: openings with sparse herbaceous groundcover and scattered shrubs and/or young trees; for courtship and roosting; young hardwood forest 2- to 25-year-old, for foraging, nesting and brood rearing or shrub cover on moist sites

Wildlife management practices

Control Nonnative Invasive Vegetation: may be necessary if habitat quality is degrading and the native plant community is being outcompeted

Edge Feathering: will create a soft edge between openings or agricultural fields and the forest that will encourage shrub and/or young tree growth

Forest Management: *Forest Regeneration*, especially *Clearcut* and *Group Selection*, can provide dense structure in young stands that woodcock select for several years, especially when a mosaic of openings and young forest is well-interspersed; *Forest Stand Improvement* also may be used to reduce overstory tree density and increase stem density in the understory and midstory.

Livestock Management: exclude livestock from areas managed for American woodcock

Plant Shrubs: where there is a lack of interspersed shrubs for foraging, nesting, courtship, or roosting cover

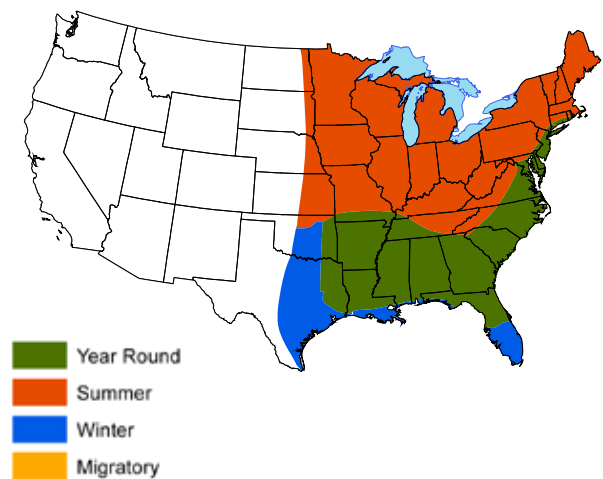
Plant Trees: where there is a lack of forest cover

Set-back Succession: *Prescribed Fire*, *Chainsawing*, *Drum-chopping*, and *Herbicide Applications* can be used to maintain young tree/shrub cover; *Chainsawing*, *Root-plowing*, and *Dozer-clearing* can be used to create forest openings

Wildlife or Fish Survey: surveys on singing grounds can



Richard Baetsen



be used to estimate the relative size of the woodcock breeding population

Brown thrasher

General information

Brown thrashers occur in the eastern two-thirds of the U.S. They are normally found in shrub and bramble thickets, hedgerows, shelterbelts, young forests, forest edges, and brushy riparian areas. Brown thrashers forage primarily on the ground, using their beaks to turn over leaves and debris looking for food. More food is available when there is substantial ground litter (leaves and debris). Nests are usually found in bushes or small trees 1 to 10 feet aboveground.

Habitat requirements

Diet: invertebrates and plant seeds are main items in diet, but soft and hard mast are also eaten

Water: water requirements are not known

Cover: dense shrubs and brambles interspersed with some trees are used for nesting and escape cover; will use areas that have only shrubs; need a minimum of 2.5 acres of habitat to support a breeding population

Wildlife management practices

Control Nonnative Invasive Species: when nonnative invasive species begin to compete with native species and degrade habitat for brown thrashers

Edge Feathering: will enhance habitat around the edge of fields

Field Borders: of brambles and shrubs will provide additional nesting and foraging cover

Forest Management: *Forest Regeneration*, especially *Clearcut*, *Shelterwood*, and *Seedtree* will improve vegetation structure for nesting and foraging; *Forest Stand Improvement* can improve habitat by stimulating understory development

Livestock Management: should exclude livestock from riparian areas, shrublands, and forests to allow shrubs and trees to regenerate

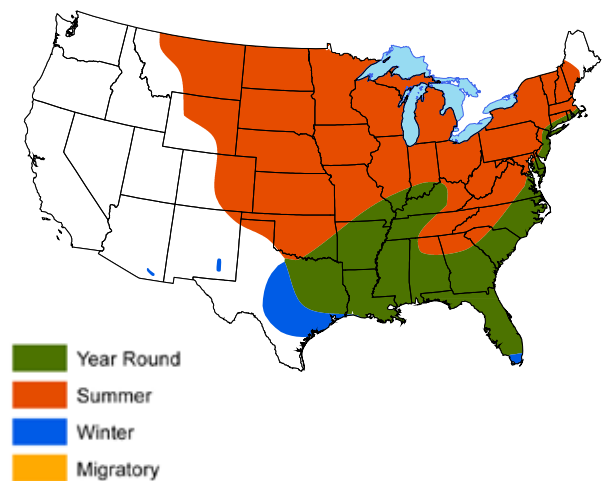
Plant Shrubs: in open areas of at least 2.5 acres to create additional cover for nesting/foraging

Set-back Succession: *Prescribed Fire*, *Chaining*, and *Herbicide Applications* can be used to maintain and rejuvenate shrub cover when habitat quality begins to decline; *Chainsawing* and *Dozer-clearing* can be used to clear woods and create additional brushy cover

Wildlife or Fish Survey: point counts can be used to survey populations



Dan Sudia



Eastern meadowlark

General information

Eastern meadowlarks are medium-sized songbirds that live in grasslands throughout the eastern U.S. They have a bright yellow breast with a black chevron marking on the chest. They are often seen singing from fencepost, power lines, or hay bale perches during spring. Eastern meadowlarks are grassland obligates; that is, they require and are only found in grasslands. Males require grassy fields of at least 6 acres to establish territories and, even then, they may not be present if the surrounding landscape is forested. They may prefer native grasslands, but will use pastures and fields of nonnative grasses if the vegetation structure is suitable. Eastern meadowlarks nest on the ground and the female builds the nest of dead grass leaves. Nests contain 2-7 eggs and eastern meadowlarks may have 2 broods per year. Females will usually abandon their nests if they are disturbed off the nest while they are incubating. Although males boldly sing in the spring, eastern meadowlarks are relatively shy, slinking away from intruders within the grass cover. Eastern meadowlarks primarily eat insects, but also consume various seed during winter. They forage while walking on the ground. Haying, overgrazing, and conversion of grasslands to row-crop agriculture or human development are major problems for reproductive success and population maintenance. Eastern meadowlark populations have declined 70 percent since 1970.

Habitat requirements

Diet: insects, especially grasshoppers, crickets, and caterpillars (moth larvae) and grubs (beetle larvae); various seed and grain in winter

Water: obtained in diet

Cover: grasslands at least 6 acres in size

Wildlife management practices

Conservation Easement: may protect relatively large tracts of grasslands in the eastern U.S. where habitat for eastern meadowlark is declining

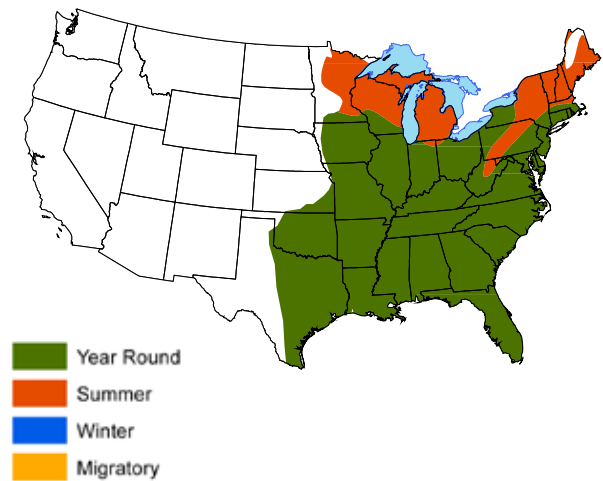
Control Nonnative Invasive Vegetation: when nonnative invasive vegetation begins to degrade habitat for eastern meadowlark

Livestock Management: grazing pressure should be managed to maintain an average grass height of at least 18 inches

Plant Native Grasses and Forbs: when grassland cover is limiting; little bluestem, broomsedge bluestem, and sideoats grama provide excellent nesting structure; native grasses and forbs should be planted when converting agricultural fields or forested areas to eastern



James W. Arterburn



meadowlark habitat to ensure optimum grass coverage and structure

Set-back Succession: *Prescribed Fire* is strongly recommended to maintain and rejuvenate grasslands; *Prescribed Fire* and *Herbicide Applications* can be used to reduce unwanted encroachment of woody species; *Chaining* can be used to reduce shrub cover; *Chainsawing*, *Dozer-clearing*, and *Root-plowing* can be used to convert forests to grasslands

Wildlife or Fish Survey: point counts are used to estimate trends in populations

Golden-winged warbler

General information

The golden-winged warbler is a ground-nesting songbird that requires herbaceous groundcover with scattered shrubs and young trees. They breed during summer in the Appalachian Mountains from north Georgia to southern New York and their winter range is in Central America and northern South America. Golden-winged warbler populations have been declining 2.3 percent per year since the 1960s, which can be attributed to loss of habitat through forest maturation and competition and hybridization with the blue-winged warbler. The USDA-NRCS included golden-winged warblers in its Working Lands for Wildlife Initiative in 2012. Successful recruitment is dependent on habitat above 2,000 feet elevation to avoid areas where blue-winged warblers occur. During the breeding season, golden-winged warblers are found in relatively small areas (1-12 acres) of young regenerating forest, reclaimed mine land, emergent wetlands, and old-fields within a landscape of contiguous forest (>70 percent of the landscape).

Habitat requirements

Diet: insects

Water: necessary water obtained from diet

Cover: forest openings with scattered shrubs and young trees with herbaceous groundcover for nesting and foraging; nests usually located at the base of forbs and brambles (such as goldenrod and blackberry) near thickets of shrubs and young trees; perches are important for males to establish territories through song displays

Wildlife management practices

Conservation Easement: can protect critical habitat from development

Control Nonnative Invasive Vegetation: sod-forming grasses, such as tall fescue, and other invasive species may limit coverage of more desirable forbs

Create Snags: creating snags around an opening may be desirable for temporary song perches, especially if perches are not present in the opening

Edge Feathering: will create a soft edge of forbs, brambles, shrubs, and young trees between openings or agricultural fields and the forest

Forest Management: *Forest Regeneration*, especially *Clearcut*, provides young forest (approximately 3-10 years old) structure desired by golden-winged warblers. Retaining single trees or groups of trees (10-15 trees per acre) for song perches is desirable. The more interspersed the retained trees are, the more breeding territories can be established in the recently harvested stand.



Laurie Smaglick Johnson



Livestock Management: may be necessary where livestock are present to prevent grazing nesting and shrub cover

Plant Shrubs: may be needed where there is a lack of interspersed shrub cover (or developing shrub cover) in an opening

Plant Trees: may be needed where there is a lack of interspersed trees (or young trees developing naturally) in an opening for song perches, or in large open areas where trees are lacking

Set-back Succession: *Prescribed Fire, Herbicide Applications, Chainsawing, and Dozer-clearing* can be used to create and maintain herbaceous groundcover and scattered shrubs and young trees in openings

Wildlife or Fish Survey: point-count surveys can be used to monitor populations

Great horned owl

General information

The great horned owl is a large, thick-bodied gray-brown bird with a white patch on the throat and characteristic ear-like tufts on its head. It is found throughout North America in a wide variety of environments, including forests, woodlands, farm woodlots, orchards, deserts, rocky canyons, grasslands, wetlands, and city parks. The great horned owl is mostly nocturnal, evident by its large eyes, and roosts during the day in trees or on sheltered rocky ledges. As a large raptor, it has large talons used to capture prey during a dive. The great horned owl's call is a familiar, and deep, 4 to 5 hoots. These owls nest in larger trees where they find cavities or previously used nests, laying 1 to 4 eggs. They are monogamous breeders and usually establish a territory near a nest site before laying eggs. The great horned owl remains abundant and widespread, most likely because of its ability to live in a wide range of environments.

Habitat requirements

Diet: extremely varied, but commonly includes small-to medium-sized mammals including rabbits, skunks, squirrels and others, as well as reptiles, amphibians, large insects, and fish

Water: water obtained from diet

Cover: nest in abandoned nests of hawks, crows, or herons, and in large tree cavities, stumps, caves, and ledges

Wildlife management practices

Control Nonnative Invasive Vegetation: when nonnative invasive species begin to compete with native species and degrade habitat for prey

Create Snags: where large snags (>12 inches diameter) are limiting to provide possible nesting and roosting sites

Edge Feathering: to increase usable space for prey around fields

Field Borders: to increase usable space for prey around crop fields, hayfields, and pastures

Forest Management: *Forest Regeneration* in large areas of mature forest may provide additional cover for a variety of prey species; *Forest Stand Improvement* will encourage understory development and enhance habitat for a variety of prey species

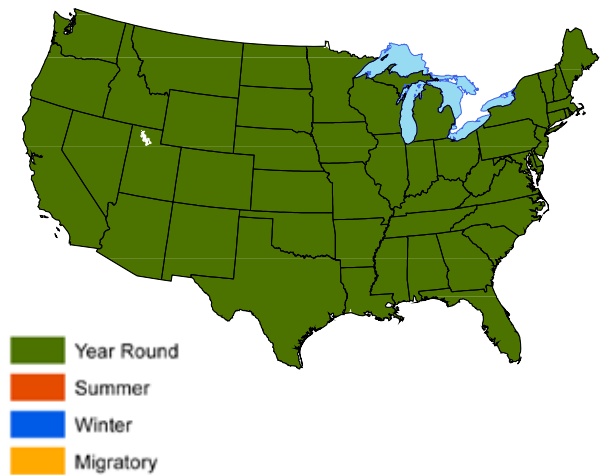
Livestock Management: where overgrazing may be limiting cover for prey

Plant Native Grasses and Forbs: where necessary to provide cover for prey

Plant Shrubs: where shrub cover is lacking and needed to enhance habitat for prey, especially cottontails



Dave Menke



Plant Trees: where perching sites are limited and where nesting cover does not exist

Set-back Succession: *Prescribed Fire, Disking, Herbicide Applications, Chaining, Root-plowing, Drum-chopping, and Mowing* may be used to maintain early successional communities that provide habitat for a variety of prey species; *Chainsawing* can be used to clear trees where needed (beyond *Forest Stand Improvement*) to enhance habitat for several prey species; *Prescribed Fire* can be used to stimulate understory development or maintain suitable structure in forests

Tillage Management: will facilitate hunting prey when waste grain is available

Wildlife Damage Management: may be necessary where an owl is killing poultry

Wildlife or Fish Survey: call counts are most often used to estimate trends in populations

Mourning dove

General information

Mourning doves may be found throughout much of the lower 48 states. They prefer areas of annual and perennial grasses and forbs for feeding with some shrubs and trees nearby for perching, nesting, and roosting. Interspersed bare ground is an important component of foraging sites because mourning doves do not scratch in the litter to find seed. Bare ground is also beneficial for doves to obtain grit (small gravel) to help in digesting food. Nests are made of twigs and placed on branches of shrubs or trees. Nests also may be placed on the ground in areas where trees are generally lacking. Mourning doves often use agricultural areas for feeding on a variety of grass and forb seeds. They also forage on waste grain from cropland and livestock feedlots. Mourning doves prefer shallowly sloping or flat shorelines without vegetation for drinking.

Habitat requirements

Diet: a variety of grass and forb seeds, as well as several agricultural grains; small areas of bare ground are beneficial for obtaining grit (small gravel) to help digest food

Water: freestanding water required daily

Cover: shrubs and trees are used for nesting and loafing; areas with open ground space required for foraging

Wildlife management practices

Control Nonnative Invasive Vegetation: when nonnative invasive vegetation begins to compete with native vegetation and reduce habitat quality for mourning dove; sod grasses, such as tall fescue and bermudagrass, are particularly problematic because they have no food value and their structure at ground level limits mobility of ground-feeding doves and their ability to search for seed

Delay Crop Harvest: (in some ecoregions) in spring to avoid nest destruction

Leave Crop Unharvested: for a variety of small grain crops, such as wheat, millets, grain sorghum, corn, and oats, to provide additional food resource

Livestock Management: should prevent overgrazing, which can eliminate preferred forbs that produce seed for mourning dove; in some cases, livestock can be used to reduce vegetation height and increase bare ground; livestock should be excluded from food plots

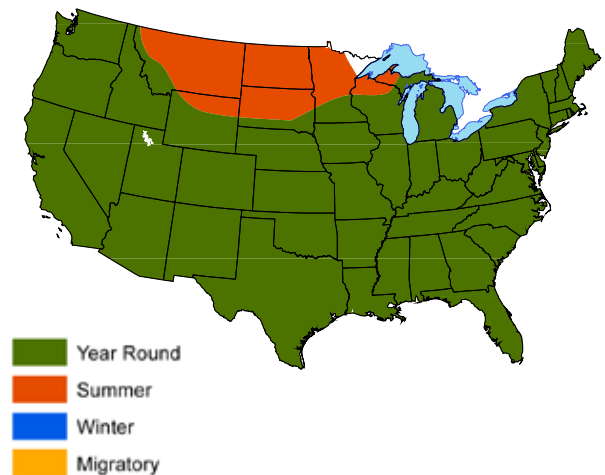
Plant Food Plots: grain plots may be planted in areas where food is lacking and to facilitate recreational hunting

Plant Native Grasses and Forbs: where food may be limiting, especially to increase some of the many native forbs that are extremely important sources of seed for mourning dove

Plant Shrubs: (in some ecoregions) to provide nesting, roosting, and loafing sites in areas where shrub/tree cover is limiting



Dave Menke



Plant Trees: (in some ecoregions) to provide nesting, roosting, and loafing sites in areas where shrub/tree cover is limiting

Repair Spillway/Levee: if not functioning properly

Set-back Succession: *Disking, Prescribed Fire,* and *Herbicide Applications* can be used to maintain annual forbs and grasses and provide bare ground; *Chaining, Drum-chopping, Root-plowing, Herbicide Applications,* and *Prescribed Fire* may be used to reduce shrub cover; *Chainsawing, Dozer-clearing,* and *Root-plowing* may be used to remove trees and clear forests and promote early successional plant communities

Tillage Management: tillage may be eliminated in the fall to allow access to waste grain; tillage may be delayed in spring (in some ecoregions) to allow nesting in standing stubble (especially wheat)

Water Control Structures: should be installed if none are present in existing dams or levees to allow water level manipulation

Water Developments for Wildlife: where water is limiting, small ponds, shallow impoundments, guzzlers, and windmills may be created or installed to provide freestanding water

Wildlife or Fish Survey: point counts and observation counts are commonly conducted to estimate trends in populations

Northern bobwhite

General information

The northern bobwhite is a stocky gamebird about 6 inches tall. They are considered shrubland obligates, which means they depend on low-growing shrubby cover, but also use grasslands, fallow fields, and savannas and woodlands with well-developed groundcover and interspersed shrub cover for foraging, nesting, brooding, and loafing. Ideally, bobwhite habitat consists of scattered patches of shrubby cover well interspersed with native grasses, forbs, and bare ground. Nests are on the ground, usually made of dead grass or forb leaves. A typical clutch is about 12 eggs. Both the male and female may incubate nests, with nesting primarily occurring May through August. Early successional areas dominated by forbs, such as ragweed, sumpweed, and horseweed, are commonly used for brooding. Northern bobwhite eat a wide variety of seeds, leaves, and insects. Bobwhite chicks primarily eat insects during the first 6-8 weeks of life. Northern bobwhite populations have been declining precipitously for more than 40 years because of habitat loss and degradation.

Habitat requirements

Diet: young quail eat insects and other invertebrates (such as spiders); adult quail eat a variety of seeds (especially legumes, ragweed, crotons, lespedeza, etc.), green vegetation (mostly forbs), invertebrates, various crops (corn, soybeans, wheat, grain sorghum), and mast (such as acorns and blackberries)

Water: necessary water is obtained through the diet

Cover: shrub cover for escape and thermoregulation throughout the year; forbs and grasses for nesting; native forbs for brood rearing

Wildlife management practices

Conservation Easement: can protect critical habitat for this declining species in some ecoregions

Control Nonnative Invasive Vegetation: nonnative sod grasses, such as tall fescue and bermudagrass, are especially problematic as they limit bobwhite mobility and provide poor cover and structure; there are many other nonnative invasive species that can degrade habitat quality for northern bobwhite across their range

Edge Feathering: to increase usable space and increase escape cover around row-crop fields

Field Borders: to increase usable space around row-crop fields

Forest Management: (in some ecoregions) in pine forests, *Forest Regeneration*, especially *Clearcut* and *Seed Tree*, will enhance habitat for a few years until regenerating pines close canopy; *Forest Stand*



Heather Inman



Improvement can be used to reduce tree density in pine stands and mixed pine-hardwood stands down to 50 square feet of basal area and enhance habitat; see **Set-back Succession** for managing hardwood forests for bobwhite

Leave Crop Unharvested: to provide additional food through fall and winter; corn, soybeans, wheat, and grain sorghum are readily eaten

Livestock Management: grazing pressure should be managed so sufficient groundcover remains for nesting and brood rearing; grazing management should discourage a uniform structure of plants across the landscape; cattle grazing in combination with prescribed fire can mimic historic natural disturbance events; grazing management should maintain dense shrub cover in some areas; up to one-third of an area can be grazed

more intensively to encourage annual forb production for brood rearing cover, assuming the same areas are not repeatedly grazed the same way; livestock should be excluded from food plots

Plant Food Plots: relatively small linear food plots (one-fourth acre) may be established adjacent to escape cover where food is a limiting factor (this is rare; shrubby cover for escape and forb cover with open structure underneath are more often limiting factors)

Plant Native Grasses and Forbs: where nesting and brood cover is limiting and planting is necessary to develop nesting and brooding cover (suitable nesting and brooding cover usually establishes naturally after undesirable plants are controlled and after tree cover is removed or thinned)

Plant Shrubs: where shrub cover is limiting; if shrub patches are within 50 to 75 yards of each other, additional shrub cover is not needed

Set-back Succession: *Prescribed Fire* is strongly recommended to maintain and rejuvenate early successional plant communities, shrublands, savanna, and woodlands; fire consumes dense litter, limits succession of woody species, and encourages herbaceous groundcover; *Disking* can be used to reduce litter build-up, encourage annual forbs and grasses, and provide open structure at ground level underneath forb cover; *Chaining* can be used to set-back shrub cover when it becomes too dense and tall; *Chainsawing*, *Dozer-clearing*, and *Root-plowing* may be used remove trees and convert hardwood forest to early succession or savanna; *Herbicide Applications* may be used to remove undesirable woody encroachment

Tillage Management: eliminate fall tillage to provide waste grain

Decrease Harvest: may be necessary if populations are declining in areas of good habitat and data suggest mortality from hunting is additive or limiting population growth

Wildlife or Fish Survey: covey counts, whistle counts, point counts, and hunter harvest and observation data are used to estimate trends in populations

Ovenbird

General information

The ovenbird is a ground-dwelling warbler found in uplands of closed-canopy, mature deciduous or mixed deciduous-coniferous forests throughout the eastern third of the U.S. Territorial males are quite vocal with their characteristic “teacher-teacher-teacher” or “sweet, sweet, sweet” song. Ovenbirds are typically found in mature forests with relatively little underbrush and plenty of leaf litter that harbors abundant insects and other invertebrates. They often forage in the leaf litter, but also may glean insects from leaves and tree bark. They construct a dome nest of dead leaves, grasses, bark, and hair with an oval side entrance that usually faces downhill, all in the shape of an outdoor bread oven; hence the name. The nest is usually well hidden in leaf litter or herbaceous vegetation on the forest floor, often near a fallen tree or regrowth within a canopy gap. Ovenbirds are rather unique in that after the clutch (3-6 eggs) hatches, the female takes half the brood and parts ways with the male, who remains with the other half of the brood. Ovenbirds may produce 1-2 broods per year.

Habitat requirements:

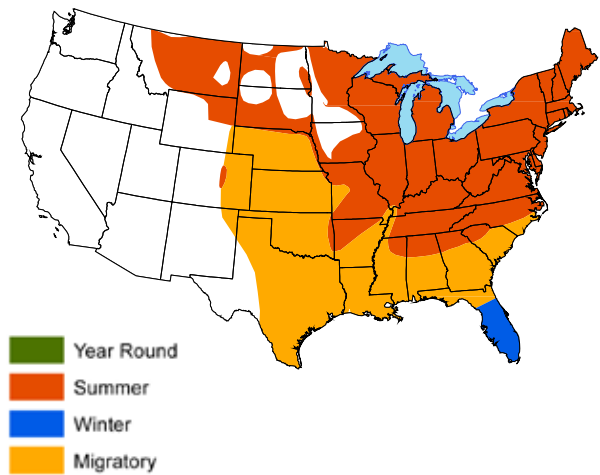
- Diet:** adult beetles and larvae, caterpillars, ants, and flies
- Water:** usually obtain necessary water from diet, but may use free-standing water when available
- Cover:** mature deciduous forest with sufficient leaf litter for nesting and foraging

Wildlife management practices

- Control Nonnative Invasive Vegetation:** when nonnative invasive vegetation begins to reduce habitat quality for ovenbirds; several nonnative species, such as Japanese stiltgrass, threaten to reduce habitat quality for ovenbird in the *Eastern Deciduous Forest*
- Livestock Management:** livestock should be excluded from forests managed for ovenbirds
- Plant Trees:** in large open areas to produce future habitat
- Wildlife or Fish Survey:** point counts are used to estimate population trends



Greg Lavaty



Ovenbird nest

Wild turkey

General information

Wild turkeys are large gamebirds found across the U.S. They are adapted to use a wide variety of vegetation types, from deciduous forest to desert shrub to open grassland interspersed with tree-lined riparian areas. Their distribution is largely limited only by snow depth and persistence to the north, which limits their ability to forage on the ground, and by trees or large shrubs needed for roosting at night in arid regions. Wild turkeys flock together during fall and winter. Breeding occurs in spring when males gobble to attract females. Nests are a slight depression on the ground, usually placed adjacent to a log, shrub, or some other structure to aid in concealment. Shrub cover is often used for nesting, but wild turkeys also nest in open woods and in fields. Nests are lined with leaves and other vegetation and usually contain about 12 eggs. Poults (young turkeys) are precocial, meaning they are able to walk around with the hen and forage for themselves soon after hatching. Herbaceous openings, especially those with a forb canopy and open ground structure, are preferred for brooding. Although wild turkeys spend most of their time on the ground, except when they fly up into trees in the evening to roost for the night, they can fly well and often take flight for short distances to escape predators.

Habitat requirements

Diet: extremely varied; hard mast, especially acorns and beechnuts in the fall and winter; soft mast, such as blackberries, mulberries, and black cherry; insects and other invertebrates, including spiders and snails, are especially important for young poults and hens prior to nesting; miscellaneous seeds; leaves from forbs and grasses; grain from a variety of agricultural crops

Water: obtain water from diet, but may use free-standing water when available

Cover: mature forest, young regenerating forest, brushy areas, and old-fields for nesting; mature forest, herbaceous openings, and grain fields for foraging; trees or tall shrubs for roosting

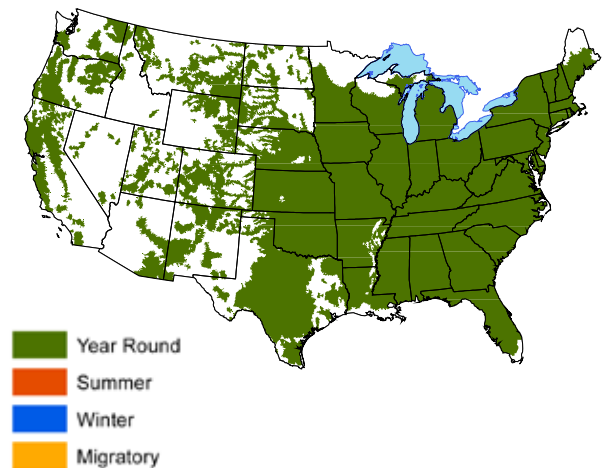
Wildlife management practices

Control Nonnative Invasive Vegetation: when nonnative invasive vegetation begins to reduce habitat quality for wild turkeys; common examples include sod grasses, such as tall fescue, orchardgrass, bermudagrass, bahiagrass, smooth brome, and others, such as cogongrass, which limit mobility for turkey poults and food availability; kudzu and shrub honeysuckle are other species that often degrade habitat in forested areas

Edge Feathering: can enhance nesting and brooding



Robert Burton



cover around fields

Field Borders: to increase usable space for nesting and brooding around row crop fields

Forest Management: (in some ecoregions) *Forest Regeneration (Clearcut, Shelterwood, Group Selection, Seed-tree)* can enhance nesting and brooding cover and stimulate increased soft mast and miscellaneous seed for a few years after harvest; *Forest Stand Improvement* can improve the structure of the understory for nesting and brood rearing, increase production of soft mast and miscellaneous seed, and enable crowns of desired trees to grow and produce additional mast; *Forest Road Maintenance* may involve daylighting roads and planting forages where forage may be limiting

Leave Crop Unharvested: especially corn, soybeans, and grain sorghum, to provide supplemental food source during fall and winter

Livestock Management: should prevent livestock from degrading habitat by overgrazing and damaging planted trees and shrubs and food plots

Plant Food Plots: to provide supplemental foods where food may be limiting; corn, soybeans, wheat, chufa, and clovers are often used

Plant Native Grasses and Forbs: where early successional vegetation is limiting and planting is necessary

Plant Shrubs: where additional soft mast or brushy cover is needed

Plant Trees: where additional hard mast production, especially acorns, is needed and where roosting sites are limited

Set-back Succession: *Prescribed Fire* is recommended to maintain herbaceous openings, rejuvenate shrubland, and improve understory structure and composition for foraging, brooding, and nesting in forests, woodlands, and savannas; *Disking* can be used to maintain herbaceous openings and reduce thatch build-up; *Herbicide Applications, Chaining, Root-plowing,* and *Drum-chopping* can be used to reduce shrub cover and stimulate more herbaceous groundcover; *Chainsawing, Dozer-clearing,* and *Root-plowing* can be used to remove trees and create herbaceous openings, especially where brooding cover may be limiting

Tillage Management: eliminate tillage in the fall to provide additional waste grain during winter, especially when adjacent to tall shrub or forest cover

Water Developments for Wildlife: can be useful when there is little or no free-standing water

Decrease Harvest: may be necessary if populations are declining and data suggest mortality from hunting is additive or limiting population growth

Increase Harvest: where populations can sustain additional harvest pressure for hunting recreation and where populations need to be lowered

Wildlife Damage Management: may be necessary in rare instances when wild turkeys are depredating crops

Wildlife or Fish Survey: gobble surveys, poult surveys, and hunter success rates are used to estimate population trends

Wood duck

General information

Wood ducks are spectacularly colored ducks found throughout most of the U.S. They primarily use forested and shrub-emergent wetlands and riparian systems (rivers and creeks), but also may forage and loaf in flooded fields, especially if there is plenty of emergent vegetation. Wood ducks nest in tree cavities, usually within or adjacent to flooded timber, but possibly up to 1 mile from water. Cavity availability is critical for a sustainable population. Thus, artificial cavities (nest boxes) are readily used by wood ducks and have been, most likely, the number one reason for the increase in wood duck populations during the past 50 years.

Habitat requirements

Diet: acorns are the primary diet item in fall and winter; other hard mast, miscellaneous seeds and soft mast, as well as waste grain (especially corn) also are eaten; insects and other invertebrates are most important for wood duck chicks and hens prior to and during the nesting season

Water: obtained through diet and drink free-standing water regularly

Cover: shallowly flooded bottomland hardwoods, emergent wetlands, swamps, and marshes are commonly used for loafing and foraging cover; tree cavities in forested areas and artificial cavities used for nesting

Wildlife management practices

Control Nonnative Invasive Vegetation: when nonnative invasive vegetation begins to reduce habitat quality for wood ducks; this is applicable in wetlands as well as adjacent uplands where wood ducks may be foraging

Create Snags: where relatively large cavity nesting sites (trees >12 inches in diameter) may be limiting

Forest Management: *Forest Regeneration (Shelterwood, Group Selection)* in relatively large forested areas that can be flooded will create openings with emergent woody vegetation that will attract foraging and loafing wood ducks; *Forest Stand Improvement* in bottomland hardwoods that can be flooded can lead to larger crowns of favored trees and increased mast production; woody stem density should increase following FSI and improve cover in stands that can be flooded

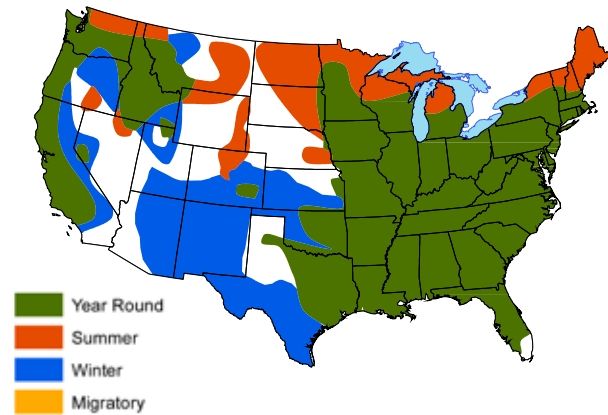
Leave Crop Unharvested: especially corn, to provide high-energy food source during fall and winter; this is especially important in fields that can be flooded and those adjacent to a water source used by wood ducks

Livestock Management: should prevent overgrazing in fields that are flooded for wood ducks; livestock should be excluded from bottomland hardwoods and areas where trees and shrubs have been planted, as well as food plots

Nesting Structures: nest boxes should be erected where a lack of natural cavities may be limiting the wood duck population; nest boxes for wood ducks should be at least 100 yards apart and should not be placed within sight of



Thomas G. Barnes



each other to prevent dump nesting (if a wood duck hen sees another hen entering a cavity or nest box, she may be stimulated to enter that cavity and “dump” her own eggs instead of laying in her own nest; thus, heat from incubation is not even over all the eggs and fewer eggs hatch overall)

Plant Food Plots: shallowly flooded grain plots, especially corn, can provide an important source of energy in fall/winter, especially during years of poor mast production

Plant Shrubs: where there is a lack of emergent woody vegetation in open areas that can be flooded

Plant Trees: mast trees planted adjacent to or within open areas suitable for flooding may provide future food and nesting cavities in areas where these trees may be limiting

Repair Spillway/Levee: if not functioning properly

Set-back Succession: *Chainsawing, Prescribed Fire, and Herbicide Applications* can be used to reduce tree and shrub cover in woods that can be flooded and create openings where needed to stimulate more herbaceous cover and provide increased food availability

Tillage Management: eliminate tillage in the fall to provide additional waste grain during winter, especially corn fields that can be shallowly flooded

Water Control Structures: should be installed in existing dikes if there are none present so water level can be manipulated

Water Developments for Wildlife: shallow impoundments should be created where topography allows, providing increased feeding and nesting space for wood ducks

Wildlife or Fish Survey: nest box usage rates, brood counts, and flush counts are used to estimate population trends

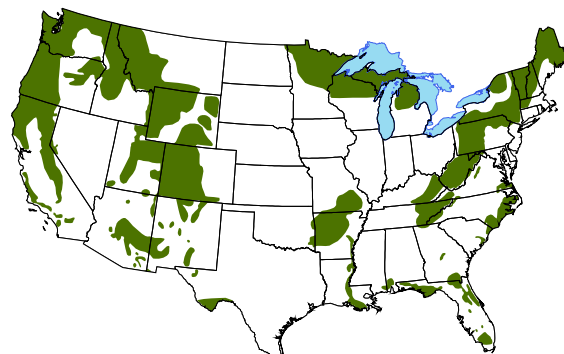
Black bear

General information

Black bears are game mammals that primarily use mature deciduous or mixed deciduous/coniferous forest interspersed with early successional openings containing soft mast.



Steve Hillebrand



Young regenerating stands, shrub thickets with dense brushy cover, and riparian corridors also are used. Black bears generally are secretive and avoid human contact. However, black bears are highly adaptable and may occur in and around human dwellings and become problematic, especially if food is available. Black bears are primarily nocturnal, but may be seen anytime during the day. They hibernate in winter (even in warm climates such as Florida and Louisiana) and have large home ranges (several square miles) that vary based on sex, age, and/or time of year. In general, adult male home ranges (up to 50 square miles) are much larger than female home ranges (15 square miles). Black bears are omnivorous. However, more than 90 percent of their diet consists of vegetation. Liberalizing or restricting females in the harvest influences population growth. Regulation of bear population density is influenced by public tolerance toward bear-human conflicts, property damage, livestock and agricultural damage, and the desire to see bears.

Habitat requirements

Diet: in spring, skunk cabbage, squaw root, grasses, and insects; occasionally, small to medium-sized mammals, such as deer fawns and young livestock (calves and lambs); during summer and early fall, a variety of soft mast, such as blackberry, blueberry, serviceberry, black cherry and pokeweed, are important; during late fall, acorns, beechnuts, and hickory nuts, as well as field corn and soybeans, help bears prepare for hibernation; when natural foods are scarce, bears may wander near human residences and feed on bird seed, dog/cat food, and other food scraps

Water: free-standing water is used for drinking; spring seeps and other shallow water sources are used to cool off and get away from biting insects; water is seldom a limiting factor because black bears have such a large home range

Cover: mature hardwood or mixed hardwood-conifer forests for foraging; brushy areas and young regenerating forest for loafing and escape; early successional openings primarily for foraging, usually for soft mast; rock crevices, excavations, hollow trees, dense mountain laurel and rhododendron thickets for hibernation

Wildlife management practices

Control Nonnative Invasive Vegetation: when nonnative invasive vegetation begins to reduce habitat quality for black bear

Edge Feathering: can stimulate increased soft mast production around row-crop fields (especially corn, soybean, and wheat)

Forest Management: *Forest Regeneration (Clearcut, Shelterwood, Group Selection)* creates dense escape and loafing cover for bears; an abundance of soft mast (pokeweed, blackberry, huckleberry, blueberry) is usually available in recently regenerated stands; *Forest Stand Improvement* practices can stimulate increased hard mast production and can stimulate groundcover, which usually increases soft mast production; *Forest Road Maintenance* may involve daylighting roads and planting forages where forage may be limiting

Leave Crop Unharvested: strips of corn, wheat, grain sorghum, or soybeans should be left standing, especially where adjacent to escape cover, to provide food close to cover

Plant Food Plots: where food may be limiting, forage (especially chicory) and grain plots (especially corn) may be planted to provide additional nutrition

Plant Shrubs: crabapple, blueberry, hawthorn, wild plum, elderberry, and others can be planted within forest openings where soft mast is lacking

Plant Trees: apple, pear, cherry, persimmon, mulberry, and dogwood are good choices to provide additional soft mast where lacking

Set-back Succession: *Prescribed Fire* can stimulate groundcover and soft mast in early successional openings, maintain shrub cover when quality begins to decline, and stimulate understory structure and soft mast availability in forests, especially where sufficient sunlight reaches the forest floor; *Dozer-clearing* and *Root-plowing* can be used to increase early succession

Tillage Management: eliminate tillage in the fall to provide additional waste grain during winter, especially when adjacent to dense shrub or forest cover

Decrease Harvest: may be necessary when additional bears are desired and hunting pressure may be limiting population growth

Increase Harvest: where populations can sustain additional hunting pressure for recreation and where populations need to be lowered

Wildlife Damage Management: may be needed if bear-human conflicts occur in agricultural or urban settings

Wildlife or Fish Survey: scent stations, winter den surveys, camera surveys, and hunter harvest data are used to estimate population trends

Bobcat

General information

Bobcats are carnivorous predators that occur throughout the U.S. They are seldom active during the day. Bobcats may be a significant cause of mortality to pronghorn and wild turkeys, but are not considered a major source of mortality for deer. They are classified as a furbearer game species in many states.

Habitat requirements

Diet: rabbits, rodents, opossums, raccoons, skunks, pronghorns, deer, snakes, and many bird species, including wild turkeys, ruffed grouse, northern bobwhite, domestic poultry, and other livestock

Water: water requirements are not well known; free-standing water is used

Cover: early successional areas, young regenerating forests, mature forest (pine and hardwood), rocky outcrops and ledges, hollow logs, and other sheltered spots for denning

Wildlife management practices

Control Nonnative Invasive Vegetation: when nonnative invasive vegetation begins to reduce habitat quality for bobcat prey species

Edge Feathering: can provide increased cover and food for prey species

Field Borders: can provide increased usable space for bobcat and prey species

Forest Management: *Forest Regeneration (Clearcut, Shelterwood, Seed-tree, Group Selection)* will provide increased dense cover and food resources for various prey species; *Forest Stand Improvement* can provide enhanced understory development and forage for various prey species; down woody debris (logs) can provide denning sites for bobcat

Livestock Management: should prevent overgrazing; livestock should be excluded from forests to prevent destruction of forest understory, which provides food and cover for many prey species

Plant Shrubs: in areas where additional shrub cover is needed to attract prey and provide security cover

Plant Trees: in areas where additional forest cover is needed to attract prey and provide security cover

Set-back Succession: *Prescribed Fire* can be used to maintain brushy cover, *Herbicide Applications, Chaining, Drum-chopping, and Root-plowing* can be used to reduce or maintain early successional communities, woodlands, and forest understory

Decrease Harvest: may be necessary when additional bobcats are desired and hunting or trapping efforts may be limiting growth



Increase Harvest: where populations can sustain additional hunting or trapping pressure for recreation and where populations need to be lowered

Wildlife Damage Management: may be necessary if poultry or other livestock depredation is a problem

Wildlife or Fish Survey: track counts, scent stations, trapper harvest data, and trail cameras are used to estimate population trends

Eastern cottontail

General information

Eastern cottontails occur in the eastern half of the country. They prefer brushy cover interspersed with herbaceous openings. Eastern cottontails also are found in suburban areas, parks, golf courses, and stream corridors. Eastern cottontails are prey for the majority of carnivorous predators within its range. They are prolific breeders; females may have 7 litters per year, with 3 to 6 young per litter. This reproductive rate is required to perpetuate populations because 70 to 80 percent of all rabbits die each year.

Habitat requirements

Diet: forbs and grasses, browse, and soft mast from spring through fall; in winter, bark of shrubs and trees, as well as buds and browse

Water: necessary water obtained from diet

Cover: shrub cover, brushpiles, native warm-season grasses and forbs for loafing and escape cover; burrows also are used for denning and escape

Wildlife management practices

Control Nonnative Invasive Vegetation: where nonnative invasive vegetation is competing with native vegetation and limiting habitat for cottontails; sod grasses, such as tall fescue and bermudagrass, can be especially problematic

Edge Feathering: to increase usable space around fields

Field Borders: to increase usable space around fields

Forest Management: *Forest Regeneration (Clearcut)*, provides optimal brushy cover for a few years; *Forest Road Maintenance* may involve daylighting roads and planting forages where forage may be limiting

Leave Crop Unharvested: to provide additional food and cover, especially corn, alfalfa, and wheat

Livestock Management: should prevent overgrazing to allow sufficient herbaceous vegetation for nesting, cover, and forage in fields and other early successional areas; exclude livestock from food plots

Plant Food Plots: where additional forage is needed; linear plantings may be situated adjacent to dense cover

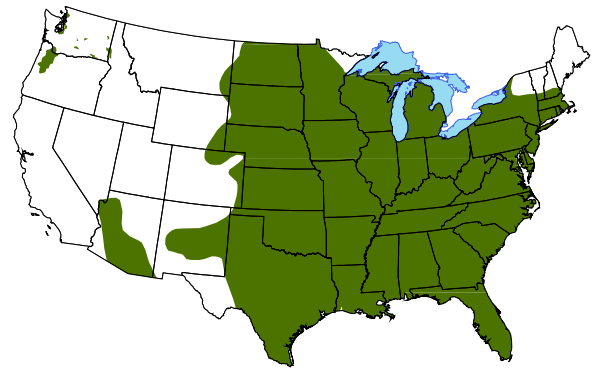
Plant Native Grasses and Forbs: where early successional cover is limiting and planting is required to promote additional grasses and forbs

Plant Shrubs: in relatively large openings with few shrubs; field borders, fencerows, and other idle land areas may be good places to plant but usually shrubs and brushy cover will develop naturally in most areas through succession

Set-back Succession: *Prescribed Fire*, *Disking*, and *Herbicide Applications* are recommended to maintain early successional areas, especially when litter accumulation or



Aubrey Deck



woody encroachment is excessive; *Chaining*, *Prescribed Fire*, and *Herbicide Applications* can be used to rejuvenate shrublands, especially where herbaceous groundcover is shaded out; *Chainsawing*, *Dozer-clearing*, and *Root-plowing* can be used to convert forest cover to early successional communities; *Mowing* can be used to maintain herbaceous openings in **Urban areas**

Tillage Management: fall tillage may be delayed until spring to allow use of standing stubble for cover and waste grain for food

Decrease Harvest: may be necessary when additional rabbits are desired and hunting or trapping efforts are limiting growth; low rabbit populations are almost always a result of inadequate habitat, not harvest levels

Increase Harvest: where populations can sustain additional hunting or trapping pressure for recreation or where populations need to be lowered

Wildlife Damage Management: shooting, trapping, and exclusion techniques can be used where there is damage to ornamental and garden plants

Wildlife or Fish Survey: observation counts, track counts, hunter harvest data, and transect flush counts can be used to estimate population trends

Eastern gray squirrel

General information

The eastern gray squirrel lives primarily in mature deciduous forests and woodlands. They also forage along the edge of crop fields, especially mature cornfields. Eastern gray squirrels have adapted to parks and other urban areas where mature trees are available. Eastern gray squirrels forage both in trees and on the ground. They den in cavities of mature trees and also build nests, generally 30 feet or more aboveground. Eastern gray squirrels will use nest boxes, but nesting structures are not necessary because squirrels build nests when cavities are not available. Thus, cavities are not a limiting factor for eastern gray squirrel populations.

Habitat requirements

Diet: a variety of hard and soft mast, miscellaneous seeds, grains, bark, buds, and mushrooms; they also may eat bird eggs

Water: necessary water generally is obtained through diet, but free-standing water is also used

Cover: mature forest and woodlands; suburban and urban areas with mature trees; den in tree cavities and also build nests of leaves and twigs

Wildlife management practices

Control Nonnative Invasive Vegetation: when nonnative invasive vegetation begins to compete with native species and reduce habitat quality for eastern gray squirrel; several nonnative trees, such as tree-of-heaven and royal paulownia, and nonnative groundcover and vines, such as Japanese stiltgrass, kudzu, and English ivy, can displace more valuable native species and make finding food difficult

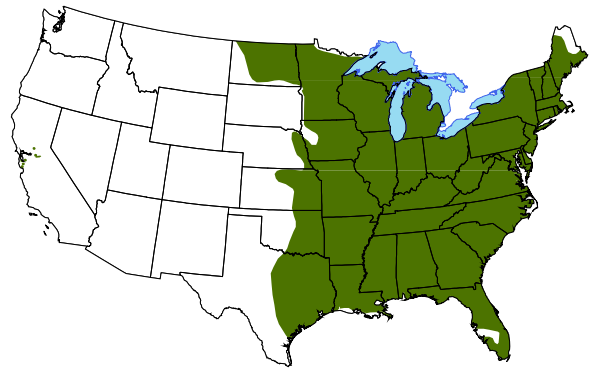
Forest Management: *Forest Regeneration (Group Selection, Single-tree Selection)* can increase soft mast and availability of various seed-producing plants used by eastern gray squirrels; *Forest Stand Improvement* can encourage larger crowns of mast-producing trees and enable oaks, hickories, beech, and others to produce more mast; also can increase soft mast availability and provide snags for potential den sites

Leave Crop Unharvested: (corn) where crop is adjacent to woods or tree line where squirrels can clean grain; especially important during years of poor mast production

Livestock Management: should prevent overgrazing in woodlands and forests; livestock should be excluded from riparian areas in open landscapes where tree cover is largely limited to riparian areas; livestock should be excluded from food plots and from areas where trees have been planted to enhance habitat for eastern gray squirrels



Laura Perfick



Plant Food Plots: grain food plots, especially corn, can provide an important food source during winters with poor mast availability

Plant Trees: plant mast trees (especially oaks and hickories) where they are limiting; most appropriate for large open areas that do not represent habitat for gray squirrels; also may be appropriate where composition of wooded areas is lacking mast and limiting gray squirrel population

Decrease Harvest: may be necessary when additional gray squirrels are desired and hunting pressure is limiting population growth

Increase Harvest: where populations can sustain additional hunting pressure for recreation and where populations need to be lowered

Wildlife Damage Management: may be required if gray squirrels become a nuisance around houses

Wildlife or Fish Survey: observation counts are most often used to estimate population trends

Artificial Feeders: may be used in urban areas to increase viewing opportunities

Elk

General information

Elk primarily occur in mountainous regions of western North America (from New Mexico to Oregon and Canada). They also have been reintroduced in multiple states of the eastern United States. Elk are ruminants (animals with a four-chambered stomach), as are other ungulate species in North America, such as white-tailed deer and mule deer. Elk stomachs are much larger than those of deer, which allows elk to eat more and bed down to chew their cud for an extended period. For this reason, elk may only feed twice a day during some portions of the year to avoid exposure and risk of predation. Elk use forest cover interspersed with openings. Male elk (bulls) rigorously defend a harem (breeding groups of up to 30 cows) during breeding season (September – October). Nutritional requirements and diet change seasonally. Elk rely on forbs and grasses in spring and summer, and eat browse such as aspen, maples, and poplar, during winter when food availability is limited. Elk that occupy ranges with high elevations will migrate to lower elevations and south-facing slopes in winter to find food and avoid deep snow and cold winds. When overabundant, elk can cause significant damage to ornamental plantings, forest crops, and row crops, and can be hazardous for motor vehicles.

Habitat requirements

Diet: predominantly forbs and grasses, but also browse, especially when palatable forbs and grasses are not available

Water: free-standing water used regularly in summer; water should be within one-half mile

Cover: mature woods for loafing and calving; early successional openings and young forest for foraging

Wildlife management practices

Control Nonnative Invasive Vegetation: when nonnative invasive vegetation begins to reduce habitat quality for elk

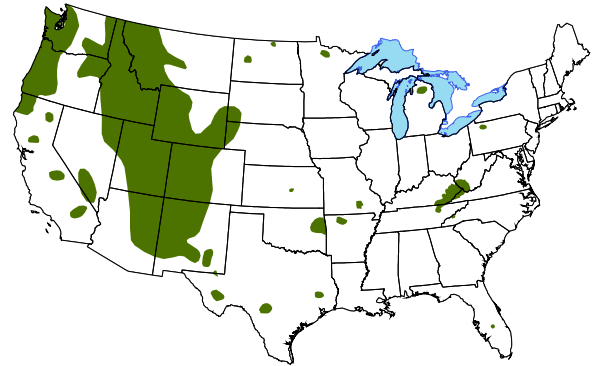
Edge Feathering: may increase forage availability in woods around fields

Forest Management: *Forest Regeneration (Clearcut, Shelterwood, Group Selection)* will provide additional forage for a few years; *Forest Stand Improvement* can improve forage availability and stimulate understory/midstory cover; *Forest Road Maintenance* may involve daylighting roads and planting forages where forage may be limiting

Livestock Management: livestock should be excluded from forested areas managed for elk; where elk is a focal species, livestock grazing in open lands and woodlands should be managed to prevent overgrazing and provide sufficient forage for elk



Erwin and Peggy Bauer



Plant Food Plots: where naturally occurring food sources are limiting, forage food plots may provide additional nutrition

Plant Native Grasses and Forbs: where early successional vegetation is limiting and planting is necessary for establishment

Plant Trees: where additional forest cover is needed

Set-back Succession: *Prescribed Fire and Herbicide Applications* is recommended to maintain early successional openings and stimulate additional herbaceous forage in forested areas with adequate sunlight; *Chainsawing, Dozer-clearing, and Root-plowing* may be used to convert forest to early succession and increase forage availability

Water Developments for Wildlife: small ponds may be constructed if water is not available within one-half mile

Decrease Harvest: may be necessary when hunting pressure is limiting growth of elk population where an increase is desired

Increase Harvest: where populations can sustain additional hunting pressure for recreation and where populations need to be lowered; when populations need to be lowered because of habitat considerations, increased harvest should concentrate on females

Wildlife Damage Management: necessary when elk begin to damage hay and crop fields, or when they become a nuisance in suburban areas; both lethal and nonlethal practices can be effective

Wildlife or Fish Survey: aerial surveys, observational counts, and trail cameras can be used to estimate population trends

Gray fox

General information

Gray foxes are common and widespread in North America. They are typically associated with deciduous forest landscapes, and generally avoid areas with large expanses of agriculture. They are most active at night or near dawn and dusk. Dens are used primarily during the breeding season. Gray foxes are unique among canids (species in the family that includes dogs) because of their ability to climb trees.

Habitat requirements

Diet: primarily small mammals, birds, insects, hard and soft mast, and occasionally carrion

Water: requirements largely unknown; gray foxes likely drink free-standing water and get some water from the foods they consume

Cover: mostly deciduous forest; breeding dens are located in brushy or wooded areas and found in hollow trees or logs, under large rocks, or in underground burrows; daytime resting sites are generally aboveground in trees, thickets, and brushy areas, or rocky crevices

Wildlife management practices

Control Nonnative Invasive Vegetation: when nonnative species begin to compete with native plant species and reduce habitat quality for gray fox

Create Snags: when large (>12 inches) down woody debris is needed for breeding dens or resting sites

Edge Feathering: to enhance cover for prey and provide additional soft mast around fields

Forest Management: *Forest Regeneration (Clearcut, Shelterwood, Seed-tree, Group Selection, Single-tree Selection)* in large areas of mature forest and *Forest Stand Improvement* practices may increase prey abundance, soft mast, hollow logs for breeding dens, and daytime resting sites

Livestock Management: livestock should be excluded from forested areas because they consume plants in the understory that provide cover and food for gray fox and associated prey

Plant Shrubs: in relatively large openings devoid of brushy cover or thickets to create resting sites, provide cover for den locations, and provide soft mast

Plant Trees: in large open areas to increase deciduous forest conditions

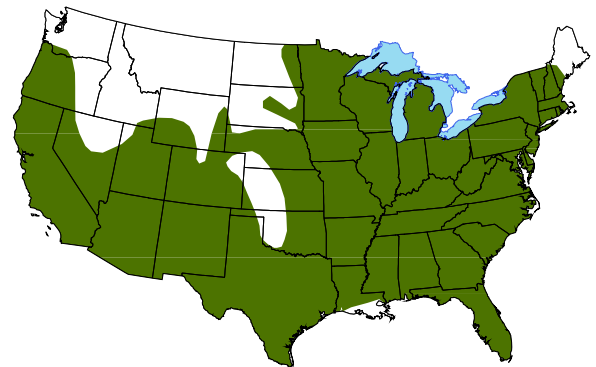
Set-back Succession: low-intensity *Prescribed Fire* can be used in forests and woodlands to enhance cover for prey and soft mast production

Decrease Harvest: to promote an increase in population where current harvest levels are limiting population

Increase Harvest: when the population can sustain



USFWS



additional harvest and increased harvest is desired for recreational trapping or hunting; to promote increased abundance of prey species, such as eastern cottontails or tree squirrels, if gray fox has been identified as limiting those populations; when population reduction is desired

Wildlife Damage Management: exclusion practices can discourage gray foxes from denning under human structures; exclusion practices and trapping can prevent gray foxes from preying on small livestock, such as chickens

Wildlife or Fish Survey: scent stations, track counts, trapper harvest data, and trail cameras may be used to estimate population trends

Indiana bat

General information

The Indiana bat is an endangered species that occurs over most of the eastern United States. The Indiana bat population is in decline because of susceptibility to disturbance during hibernation and a disease known as white nose syndrome. Bats must store fat reserves and then hibernate (from October – April) to survive through winter when food is limiting. If they are disturbed by human activity or if cave temperatures increase, they may starve from using critical energy reserves. Male Indiana bats roost alone or in small groups during spring and summer, whereas females roost in larger maternal colonies (100+ individuals). Females give birth to one pup in June, and then young are nursed under loose tree bark, usually in wooded areas near water. Inserting gates in front of cave openings that allow passage of bats but prevent human intrusion can prevent disturbing Indiana bats during hibernation.

Habitat requirements

Diet: insects (up to half their body weight per night)

Water: although they get some from their food, they also use free-standing water by drinking while on the fly; bats commonly forage for insects over water bodies

Cover: winter hibernation occurs in caves, also known as hibernacula, or other areas that are cool, humid, with stable temperatures of 33-50 F (nearly half of all Indiana bats use caves); trees with flaky bark (like shagbark hickory or mature white oak) or snags along forest edges and water bodies are used for roosting; mature mixed deciduous forest with canopy gaps and riparian zones are used for foraging

Wildlife management practices

Conservation Easement: can protect property with caves that this declining species is using for hibernacula

Control Nonnative Invasive Vegetation: may be required if desirable trees for roosting are being outcompeted by nonnative invasive species

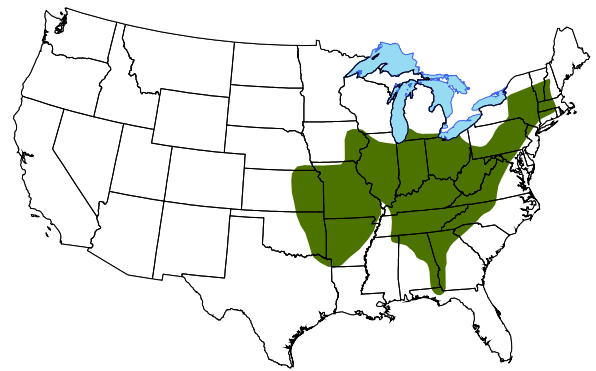
Create Snags: can provide temporary foraging and roosting sites if an adequate number of trees are not already available

Forest Management: *Forest Regeneration (Group Selection)* provides small openings used for foraging; *Forest Stand Improvement* can favor tree species with flaky bark used for roosting and create more open space around tree crowns where Indiana bats forage

Nesting Structures: artificial roosting structures, such as BrandenBark™, may be installed in addition to *Create Snags* for maternal colonies where roost sites are limiting



Susi von Oettingen



Plant Trees: in large open areas where forest cover is limiting

Set-back Succession: *Prescribed Fire* can be used in mature woods to reduce midstory and facilitate foraging

Water Developments for Wildlife: small impoundments and ponds (<1 ac) may be created in forested areas where surface water is limiting for Indiana bats

Wildlife or Fish Survey: roost counts during hibernation and acoustic sampling surveys are used to survey Indiana bat populations

White-tailed deer

General information

The white-tailed deer is the most important game animal in North America. There are more than 30 subspecies of white-tailed deer that occur throughout the U.S. and southern Canada. They are extremely adaptable and are found in a wide variety of areas including deciduous and coniferous forests, tropical evergreen forest, dry grasslands, and shrub desert. They are adaptable to humans and exploit suburban areas very well. Whitetails thrive in areas with fragmented areas containing well-interspersed vegetation types and successional stages. White-tailed deer are ruminants and are classified as concentrate selectors, meaning they concentrate their feeding on select plant species and select plant parts. Where overabundant, they can cause significant damage to ornamental plantings and row crops and can be hazardous for motor vehicles.

Habitat requirements

Diet: forbs, browse, acorns, beechnuts, soft mast (such as blackberry and persimmon), grains, grasses, and mushrooms; in the northern parts of the range, coniferous browse is important in winter

Water: obtain most of their water from diet, but drink free-standing water when available

Cover: dense woody vegetation as well as relatively tall early successional vegetation, including native grasses, forbs, and shrubs; at the northern edge of their range white-tailed deer use wintering areas, which are usually dense stands of spruce, fir, cedar, and hemlock to avoid deep snow and cold winds

Wildlife management practices

Control Nonnative Invasive Vegetation: when nonnative invasive vegetation begins to reduce habitat quality for white-tailed deer; sod grasses and sericea lespedeza can be particularly problematic in fields and Japanese stiltgrass (japangrass) often reduces forage availability in forests; although white-tailed deer may eat many nonnative invasive plants in some seasons to some extent, control of many of those plants, such as kudzu, Japanese honeysuckle, and Chinese privet, can lead to increased plant species diversity and increased forage quality during various seasons

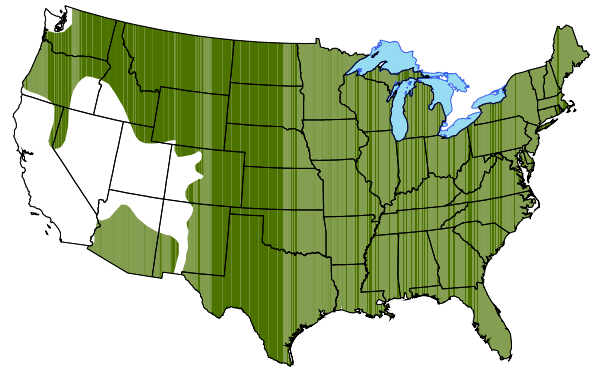
Edge Feathering: to increase forage availability around fields and enhance fawning cover

Field Borders: to increase forage availability (forbs and brambles) around crop fields

Forest Management: *Forest Regeneration (Clearcut, Shelterwood, Seed-tree, Group Selection)* will provide increased browse, soft mast production, and dense



Steve Hillebrand



escape cover; *Forest Stand Improvement* can provide increased browse and soft mast production and stimulate better cover in stands with a poorly developed understory; both methods are often used at the northern edge of their range to manage the quality and vigor of coniferous cover within a deer wintering area; *Forest Road Maintenance* may involve daylighting roads and planting forages where forage may be limiting

Leave Crop Unharvested: to provide additional food resource, especially near escape cover

Livestock Management: livestock should be excluded from forests managed for deer to avoid destruction of the forest understory; livestock should be excluded from riparian areas; should prevent overgrazing in woodlands and savannas; livestock should be excluded from food plots

Plant Food Plots: when naturally occurring food sources are limited, food plots may provide additional nutrition

Plant Native Grasses and Forbs: where early successional vegetation is limiting and planting is necessary for establishment

Plant Shrubs: where needed to provide additional soft mast, brushy cover, and browse; often useful in ravines, field borders, other idle land areas and across large open areas to provide travel corridors

Plant Trees: (in some ecoregions) in large open areas to maintain at least 30 to 40 percent forest cover; where mast producers are lacking, particularly oaks

Set-back Succession: *Prescribed Fire* and *Disking* is recommended to maintain herbaceous openings; *Prescribed Fire* is recommended to stimulate the forest understory for increased forage and soft mast; *Chaining* can be used to rejuvenate shrub cover; in areas dominated by mesquite, *Root-plowing* combined with seeding grasses and legumes may be the best way to increase herbaceous groundcover; *Chainsawing*, *Dozer-clearing* and *Root-plowing* when converting forest to early successional plant communities to increase forage and enhance fawning cover, and to kill or remove undesirable trees in woodlots and other areas

Tillage Management: eliminate fall tillage of grain crop residue adjacent to cover to make waste grain available as an additional food source

Water Developments for Wildlife: where lacking (within one-half mile), dugouts, ponds, and shallow impoundments can provide freestanding water

Decrease Harvest: if hunting pressure is limiting population growth where an increase is desired

Increase Harvest: when populations can sustain additional harvest pressure for hunting recreation and when populations need to be lowered because of overpopulation and habitat degradation; in these cases, it is necessary to concentrate increased harvest on females

Wildlife Damage Management: fencing, repellents, and scare tactics may be helpful to keep deer from ornamental plantings, vegetable gardens, and crops; reducing the population through shooting females is recommended when widespread overabundance is causing crop depredation and increasing vehicle collisions

Wildlife or Fish Survey: camera surveys, browse surveys, aerial surveys (in open areas such as South Texas, Kansas, or Oklahoma, and northern portion of range during winter when there is extensive snow cover), pellet surveys, and hunter observation and harvest data are used to estimate population trends

Reptiles

Eastern box turtle

General information

The eastern box turtle occurs throughout much of the eastern United States. It prefers deciduous or mixed woodlands, but also uses thickets, old-fields, pastures, and wetlands. The species is named for its high, domed-shaped shell that closes tightly into a “box” when the turtle is alarmed. The eastern box turtle is active throughout spring, summer, and fall. During the hot, dry summer months, it is often found soaking around the edges of ponds, streams, or wetlands. When temperatures begin to drop in late fall, it burrows into the leaf litter and loose soil to overwinter (for up to six months of the year). It burrows deeper into the ground as the soil temperature drops. The same overwintering location may be used year after year. Eastern box turtles are long-lived reptiles. They have been recorded to live more than 100 years in the wild.

Habitat requirements

Diet: omnivorous; earthworms, snails, slugs, insects, mushrooms, numerous leafy greens, and soft mast (fruit)

Water: requires water to soak during the hot, dry months of the active season

Cover: moist, forested areas with a diverse understory and abundant leaf litter; nesting cover found in moist or loose soil within small openings with an open structure at ground level; nests may be concentrated in openings where soil temperatures are warmer.

Wildlife management practices

Control Nonnative Invasive Vegetation: when nonnative invasive vegetation begins to compete with native vegetation and reduce habitat quality; sodgrasses in openings is particularly problematic for nesting; jangrass in forests is not a problem for eastern box turtle, but may be a problem for other species

Field Borders: to increase usable space around row crop fields

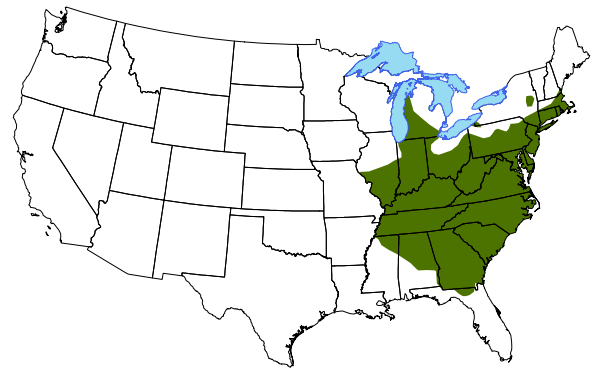
Forest Management: *Forest Regeneration (Group Selection)* and *Forest Stand Improvement* can increase understory vegetation for food and cover

Livestock Management: should prevent overgrazing in open areas; livestock should be excluded from forested areas to maintain understory

Plant Native Grasses and Forbs: where planting is necessary to provide cover in open areas where there is little to no vegetation



Katie A. Harris



Plant Shrubs: where adequate cover is lacking in large open areas

Plant Trees: where additional forest cover is needed

Set-back Succession: *Prescribed Fire, Herbicide Applications, and Disking* are recommended to maintain herbaceous openings and provide open structure at ground level; it is important that *Prescribed Fire* occurs during the inactive season to minimize negative effects on the turtles; *Chainsawing, Dozer-clearing, and Root-ploving* can be used to create forest openings where openings for nesting may be limited

Water Development for Wildlife: small ponds should be provided when water is absent

Wildlife or Fish Survey: transect counts and dogs are used to estimate population trends

Timber rattlesnake

General information

Timber rattlesnakes are found throughout much of the eastern U.S. They are most often found in forests, particularly those with rock outcrops, ledges, and steep slopes. Timber rattlesnakes are long-lived reptiles, capable of reaching 25 years of age or older. They are pit vipers, which means they have a heat-sensing organ behind the nostrils that can detect temperature differences, that allows the snake to determine if another animal is a predator or prey. Timber rattlesnakes spend approximately six months of the year hibernating underground (fall-spring) and will re-use a den for many years. They emerge in spring and are primarily active during the daylight hours. Timber rattlesnakes are sit-and-wait predators. They rely on their camouflage patterns as they ambush prey along runways, at the base of tree trunks, and adjacent woody debris. Timber rattlesnakes generally are shy and unaggressive. When approached, they will normally “freeze” or retreat to thick cover, but if cornered they will form a loose coil, raise their heads, rattle their tails, and may strike. The rattle is made of keratin, which is a protein, and a new segment is added each time the snake sheds. To rattle, rattlesnakes move the rattle back and forth as much as 40-60 times per second. A rattlesnake cannot be aged by counting the rattle segments because snakes shed at varying rates, often multiple times in one year, and rattle segments commonly break-off. Timber rattlesnakes are venomous and should not be handled.

Habitat requirements

Diet: small to moderate-sized mammals; chipmunks, mice, voles, and squirrels; occasionally small birds

Water: receives necessary water from diet, but will drink free-standing water if available

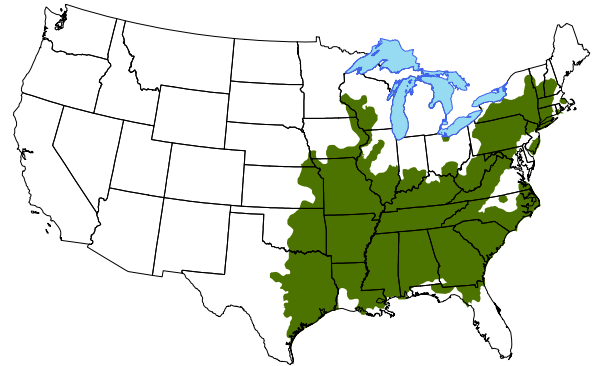
Cover: upland forests with deep leaf litter and large amounts of downed woody debris; winter cover is necessary for hibernation in the form of rock crevices, rodent burrows, and root systems

Wildlife management practices

Control Nonnative Invasive Vegetation: when nonnative invasive vegetation begins to reduce habitat quality for timber rattlesnakes; in particular, nonnative sod grasses should be eradicated

Edge Feathering: may be implemented to enhance habitat for prey species

Forest Management: *Forest Regeneration (Clearcut, Shelterwood, Group Selection)* and *Forest Stand Improvement* will provide dense groundcover that may support increased prey for several years and increased large woody debris for ambush sites and loafing cover; timing of *Forest Management* ideally should be



conducted during the inactive season, especially around denning sites

Livestock Management: should prevent overgrazing and leave adequate cover for prey; livestock should be excluded from forests where timber rattlesnakes are a focal species to avoid eliminating understory cover

Plant Trees: in relatively large open areas where additional forest cover is needed

Wildlife Damage Management: may be necessary to relocate timber rattlesnakes if found in or close to human dwellings or recreational areas, such as parks

Wildlife or Fish Survey: transect surveys and searches near known hibernacula sites during spring and fall when snakes are entering or leaving hibernacula are used to estimate population trends

Fish

Bluegill

General information

The bluegill is one of the most abundant Sunfish species. It thrives in a variety of conditions, ranging from freshwater lakes, ponds, and slow moving streams, to brackish waters of coastal areas. The bluegill's native range is the eastern U.S. from southern Canada to Florida and Texas, but they have been successfully introduced throughout the U.S.

Habitat requirements

Diet: a variety of zooplankton (microscopic animal life) during the first few months of life, progressing to insects and their larvae, eggs, earthworms, tadpoles, small minnows, and crayfish

Water: basic requirements include dissolved oxygen (minimum of 4 parts per million); pH between 6.5 and 9.0; and water temperature should reach at least 70 F during summer (one foot below surface in the shade)

Cover: aquatic environments with submerged rocks, woody debris, and aquatic vegetation where small fish (prey) hide

Wildlife management practices

Livestock Management: livestock should either be excluded from fish ponds or only allowed access to a small part of the fish pond; livestock watering facilities should be developed away from the fish pond

Repair Spillway/Levee: if not functioning properly

Water Control Structures: should be installed if none are present so water depth can be controlled

Decrease Harvest: refer to **Wildlife Management Practices** on page 240 for specifics on fish harvest

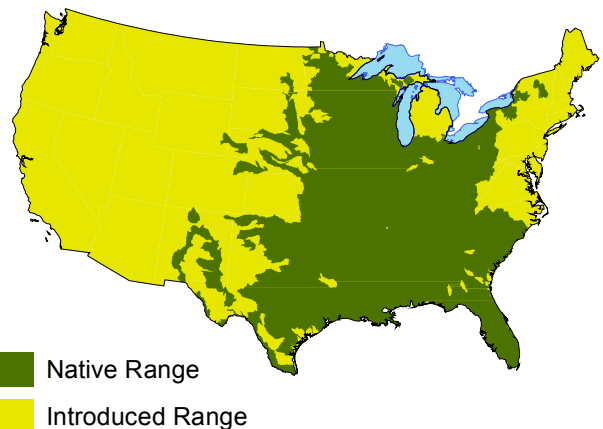
Increase Harvest: refer to **Wildlife Management Practices** on page 241 for specifics on fish harvest

Wildlife or Fish Survey: fishing records, seining, and electro-shocking are used to survey bluegill populations

Construct Fish Pond: where no suitable water source is present or where an existing fish pond needs extensive repair, especially to the dike or dam

Control Aquatic Vegetation: when necessary to discourage undesirable aquatic vegetation

Fertilize/Lime Fish Pond: fertilize to promote phytoplankton growth when visibility is more than 18 inches below the water surface; add agricultural limestone to increase soil pH if total alkalinity is below 20 ppm



Reduce Turbidity in Fish Pond: by reseeding watershed if soil is eroding into the pond and causing muddy water, by preventing livestock from entering pond, by eliminating bottom-feeding fish, or by reducing suspension of negatively charged clay particles

Restock Fish Pond: if the population is too far out of balance to correct via seining or fishing or if undesirable species are present

Largemouth bass

General information

Largemouth bass are not really bass but members of the Sunfish family. Largemouth bass are the most popular freshwater sportfish in states where they are found. They can be found in freshwater lakes, rivers, large streams, farm ponds, and brackish marshes. Their native range includes most of the eastern U.S., but largemouth bass have been stocked all over the country successfully.

Habitat requirements

Diet: young bass eat insects and other invertebrates (worms, crayfish, and zooplankton); adults eat small fish, such as bluegill, and a variety of minnows, as well as tadpoles, crayfish, and even ducklings

Cover: aquatic environments with submerged rocks, woody debris, and aquatic vegetation where small fish (prey) hide

Water: basic requirements include dissolved oxygen (minimum of 4 parts per million); pH should range between 6.5 and 9.0; water temperature should reach at least 70 F during summer (one foot below surface in shade)

Wildlife management practices

Livestock Management: livestock should either be excluded from fish ponds or only allowed access to a small part of the fish pond; livestock watering facilities should be developed away from the fish pond

Repair Spillway/Levee: if not functioning properly

Water Control Structures: should be installed if none are present so water depth can be controlled

Decrease Harvest: refer to **Wildlife Management Practices** on page 240 for specifics on fish harvest

Increase Harvest: refer to **Wildlife Management Practices** on page 241 for specifics on fish harvest

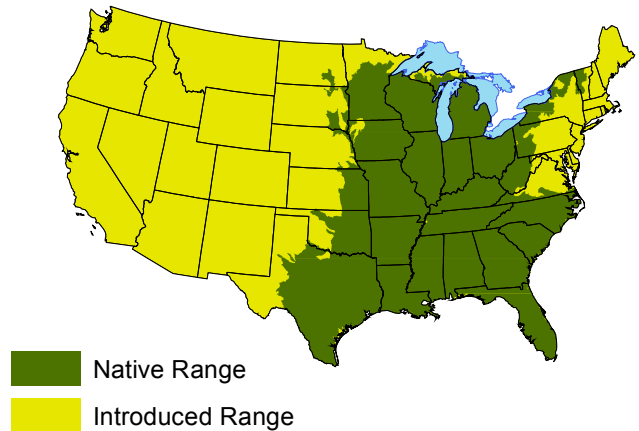
Wildlife or Fish Survey: fishing records, seining, and electro-shocking are used to survey largemouth bass populations

Construct Fish Pond: where no suitable water source is present or where an existing fish pond needs extensive repair, especially to the dike or dam

Control Aquatic Vegetation: when necessary to discourage undesirable aquatic vegetation

Fertilize/Lime Fish Pond: fertilize to promote phytoplankton growth when visibility is more than 18 inches below the water surface; add agricultural limestone to increase soil pH if total alkalinity is below 20 ppm

Reduce Turbidity in Fish Pond: by reseeding watershed if soil is eroding into the pond and causing muddy water, by preventing livestock from entering pond, by eliminating bottom-feeding fish, or by reducing suspension of negatively charged clay particles



Restock Fish Pond: if the population is too far out of balance to correct via seining or fishing or if undesirable species are present