

Loggerhead shrike

General information

The loggerhead shrike is a migratory bird of prey that requires relatively large openings or fields to hunt prey. Some shrikes remain in the southern tier of the U.S. all year, whereas others migrate from as far south as northern Mexico to southern Canada to breed. The loggerhead shrike population is declining because of habitat degradation and loss from conversion of grasslands and shrublands to row-crop agriculture or overgrazed, nonnative grass pastures, and aesthetic mowing. The most important vegetation component is nesting cover (dense, thorny shrubs, and trees), but open areas with herbaceous vegetation and some bare ground are also critical for hunting prey. Shrikes will readily build nests and perch in shrubby areas less than 16 feet tall, but prefer taller trees where available. Scattered, thorny tree and shrub species, such as honey locust, are selected over non-thorny species. Taller trees are selected for perching during courtship displays and while hunting. Loggerhead shrikes uniquely utilize thorns, barbs, and barbed wire fences to impale prey.

Habitat requirements

Diet: insects and spiders, small mammals, small birds, reptiles, and amphibians

Water: water requirements are obtained through diet

Cover: nest in dense shrubs and trees; taller, thorny species are preferred; courtship and foraging sites are elevated, exposed perches over open areas with herbaceous vegetation and some bare ground; evergreens may be used in winter when available

Wildlife management practices

Conservation Easement: can protect critical habitat for this declining species

Control Nonnative Invasive Vegetation: when nonnative species are beginning to compete with native vegetation and reduce habitat quality for loggerhead shrike

Edge Feathering: to increase shrub cover around fields

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

Livestock Management: grazing should be managed to provide lush herbaceous groundcover and shrub cover

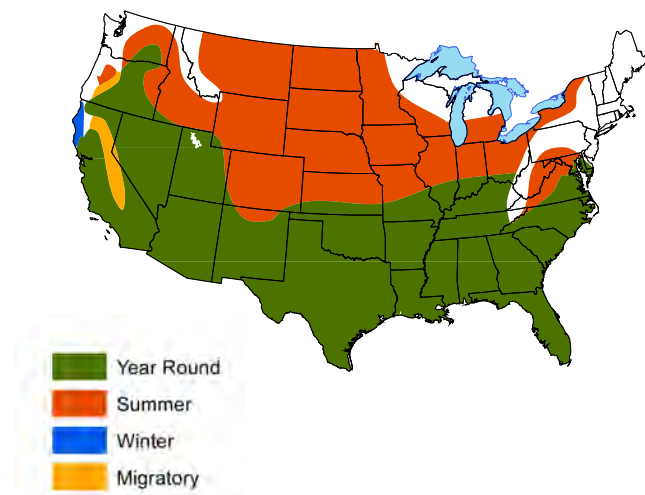
Plant Native Grasses and Forbs: when necessary to provide herbaceous vegetation in proximity to shrub cover

Plant Shrubs: where there is a lack of shrubs for nesting/perching sites

Plant Trees: where there is a lack of trees for nesting/perching sites



Dave Menke



Set-back Succession: *Disking* and *Prescribed Fire* are recommended to maintain early successional openings; *Chainsawing*, *Dozer-clearing*, and *Root-ploving* can reduce tree cover in forests to promote savanna conditions; *Herbicide Applications* may be used to reduce tree cover; *Chaining* and *Drum-chopping* may be used to maintain shrub cover

Wildlife or Fish Survey: walking transects to find nests, point counts, and breeding bird surveys can monitor population trends

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

Plant Trees: (in some ecoregions) to provide nesting,



Dave Menke



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

Soil Conservation Agriculture: 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; this practice also may be recommended when dense vegetation or steep slopes do not allow doves access around the edge of existing water sources.

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

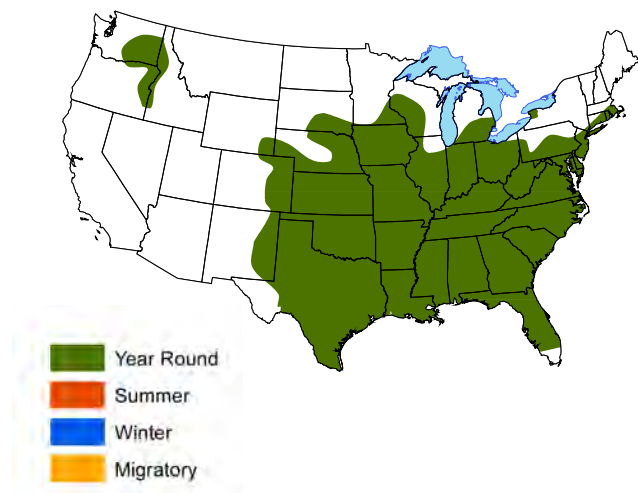
Edge Feathering: to increase usable space and increase escape cover around row-crop fields

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 to <50% canopy cover in pine stands and mixed pine-hardwood stands to enhance understory conditions; 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 open woodlands (<50% canopy cover); 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 to remove trees in any area and/or to convert hardwood forest to early succession or savanna; *Herbicide Applications* may be used to remove undesirable woody encroachment

Soil Conservation Agriculture: 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

Prothonotary warbler

General information

Prothonotary warblers are song birds that occur in mature bottomland hardwood forests near water, primarily in the southern U.S. They are most often found in forested wetlands, such as cypress swamps, and along blackwater streams and rivers. Prothonotary warblers are cavity nesters, so large, overmature trees and standing dead trees are important. They often use old cavities excavated by downy woodpeckers, but also will use nest boxes, even those designed for wood ducks. Cavities are often found in sweetgum, tupelo gum, willow, and bald cypress. Nests usually contain 3-7 eggs. Prothonotary warblers may have 1-3 broods per year. Prothonotary warblers feed primarily on insects in the lower canopy or at ground level. Thus, mature hardwood forest with complex vertical structure provides the structure necessary for insect populations that prothonotary warblers require. Prothonotary warblers winter primarily in Central and South America.

Habitat requirements

Diet: insects, especially ants, beetles, butterflies, moths, mayflies, aquatic larvae; snails and isopods; occasionally various seeds and fruits

Water: necessary water is obtained through the diet

Cover: mature bottomland hardwood forests; cypress swamps; dead standing timber help ensure presence of cavities

Wildlife management practices

Control Nonnative Invasive Vegetation: where nonnative invasive vegetation is competing with native vegetation and reducing habitat quality for prothonotary warblers

Create Snags: where natural cavities are limiting to provide possible cavity sites

Forest Management: *Forest Stand Improvement* can stimulate vertical structure where absent

Livestock Management: should exclude livestock from bottomland hardwoods

Nesting Structures: nest boxes are readily used and will provide suitable nesting cover where natural cavities are limiting

Plant Trees: in large bottomland fields where forest cover is lacking and natural regeneration is not sufficient or of desirable composition

Repair Spillway/Levee: if not functioning properly

Water Control Structures: should be installed if not present to manipulate water levels in wetlands managed for prothonotary warblers



Mark Musselman



Water Developments for Wildlife: shallow impoundments can be established in bottomland hardwoods for habitat enhancement

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

Red-cockaded woodpecker

General information

The red-cockaded woodpecker (RCW) is about 7 to 8 inches in length and lives in mature pine forests across the South. Historically, RCWs ranged from east Texas to Florida and northward to Missouri, Kentucky, and Maryland, but its range has been sharply reduced because of fire suppression and hardwood encroachment. The species was federally listed as an endangered species in 1970. RCWs have an unusual social organization. They live in a group called a clan. Each clan typically contains 2 to 9 birds, but there is never more than one pair of breeding birds. Some clans have non-breeding birds called helpers, which generally consist of male offspring 1 to 3 years of age that help incubate eggs, feed young, make new cavities, and defend the clan's territory against other RCWs. A clan nests and roosts in a group of as many as 20 cavity trees (called a cluster). RCWs have very specific habitat requirements. Cavity trees are live pine trees, rarely less than 30 to 40 years old and are often more than 70 years old. Older pines afflicted with red-heart fungal disease make it easier for RCWs to excavate cavities.

Habitat requirements

Water: necessary water is obtained through diet

Diet: ants, beetles, roaches, caterpillars, wood-boring insects, spiders, and occasionally fruits and berries

Cover: mature stands of Southern yellow pines, especially longleaf and shortleaf; relatively open stands with very little midstory and a diverse herbaceous understory are most desirable for foraging; a cluster site is the stand of trees surrounding and containing cavity trees and should be at least 100 acres

Wildlife management practices

Conservation Easement: can protect longleaf and shortleaf pine systems for this declining species

Control Nonnative Invasive Species: when nonnative species begin to compete with native vegetation and reduce habitat quality for RCWs

Forest Management: *Forest Regeneration (Single-tree Selection)* is the preferred method to regenerate and manage longleaf pine; *Forest Stand Improvement* can be used to thin pine stands, especially shortleaf and loblolly pine, and thus enhance structure for foraging

Nesting Structures: artificial cavity inserts can be installed into mature pine trees at cluster sites where cavity trees are limiting

Plant Trees: loblolly and shortleaf pine can be planted where lacking within the distribution of RCWs to provide habitat; this may be where there are large open areas or where hardwoods dominate



James Hanula



Set-back Succession: *Prescribed Fire* is required to reduce hardwood encroachment, limit midstory development, and encourage herbaceous groundcover; *Chainsawing* and *Herbicide Applications* may be necessary where hardwoods have become too large to effectively reduce with fire

Wildlife or Fish Survey: observational counts and cluster monitoring are used to monitor RCWs

Red-eyed vireo

General information

The red-eyed vireo is a common migratory songbird found in mature deciduous forests throughout eastern North America and the upper Midwest. They are also found in forested urban parks. They are more often heard than seen, with their persistent song that sounds like they are saying “*where-are-you, here-I-am, over-here.*” Red-eyed vireos have olive-green backs with a pale breast and dark red eyes. Red-eyed vireos usually forage in the middle to upper layer of the forest canopy, but often nest in the understory or midstory. The nest is made of twigs, bark, and grasses, usually in an open cup shape and suspended from a branch. They eat insects and fruits.



Greg Lavaty

Habitat requirements

Diet: mostly insects and spiders during spring and summer; more soft mast during winter

Water: necessary water is obtained from diet

Cover: midstory and overstory of mature mixed deciduous forest

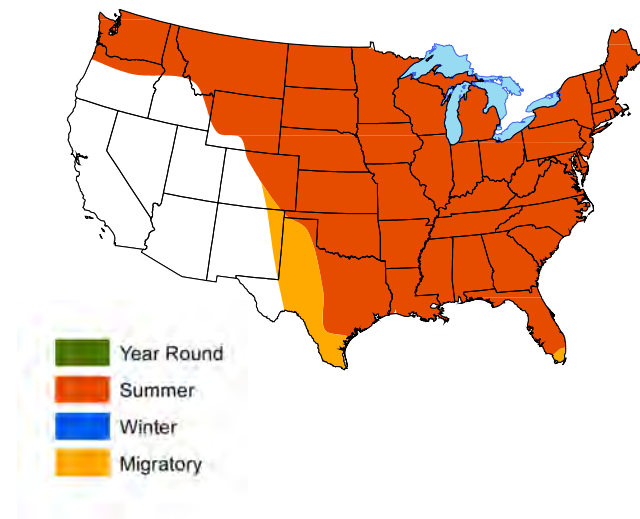
Wildlife management practices

Control Nonnative Invasive Vegetation: when it begins to reduce habitat quality for red-eyed vireos; a common example in the South is kudzu, which can reduce forest cover by overtaking and killing trees

Forest Management: *Forest Regeneration (Single-tree Selection and Group Selection)* can encourage insect and soft mast availability; *Forest Stand Improvement (light thinning)* can also stimulate understory and midstory development to enhance nesting cover in relatively open woods and encourage additional soft mast availability

Plant Trees: in large open areas, trees may be planted to provide future habitat

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



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, and woodlands with a well-developed understory 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

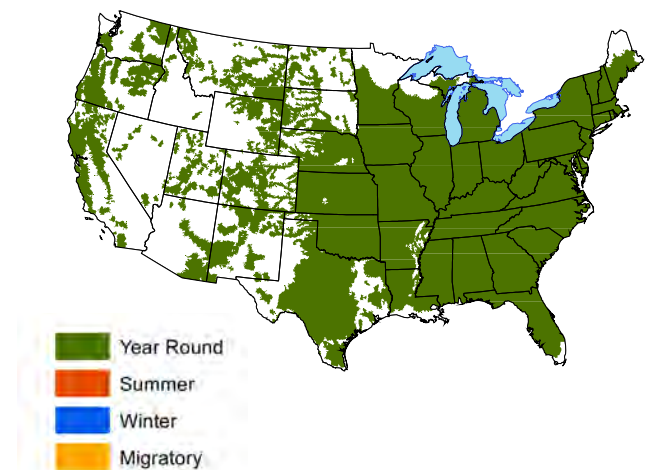
Cover: mature forest, young regenerating forest, brushy areas, and old-fields for nesting; mature forest, woodlands, savannas, herbaceous openings, and grain fields for foraging; trees or tall shrubs for roosting

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



Robert Burton



Edge Feathering: can enhance nesting and brooding 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

Soil Conservation Agriculture: 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 streams), 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 since the mid-twentieth century.

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

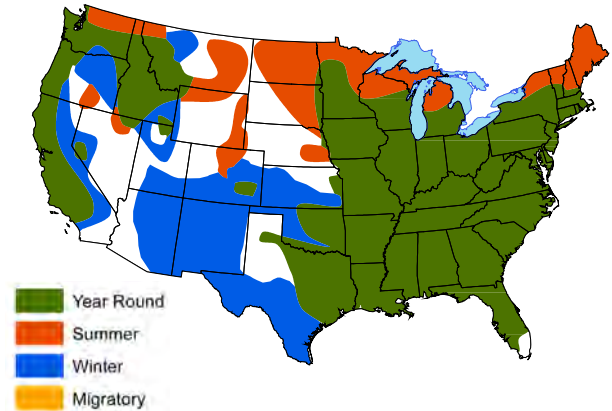
Leave Crop Unharvested: especially corn, to provide high-energy food source during fall and winter; this is especially important in fields that can be flooded and those adjacent to a water source used by wood ducks

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* can be used to create openings in bottomland hardwoods that can be flooded; *Prescribed Fire* and *Herbicide Applications* can be used to reduce tree and shrub cover in woods that can be flooded and stimulate herbaceous cover and provide increased food availability

Soil Conservation Agriculture: 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

Coyote

General information

Coyotes are found throughout the continental U.S. and have even been observed in large cities and urban areas. Grasslands, shrubland, and farmland provide optimal habitat for coyotes, but they also use forested areas as well. Coyotes den in a variety of places, including brush-covered slopes, steep banks, rock ledges, thickets, and hollow logs. Coyotes are most active at night, during early morning, and around sunset, but they may be active throughout the day. Coyotes live in packs, alone, or in mated pairs, depending on the time of year. Coyotes are considered omnivores as they have an extremely varied diet that fluctuates with the seasons.



Steve Thompson

Habitat requirements

Diet: rodents, rabbits, and other small mammals, insects, birds, eggs, deer, carrion, and soft mast; livestock and wild ungulates (deer, elk, pronghorn) usually are represented in coyote stomachs as carrion; however, in some cases, coyotes prey heavily on deer and pronghorn fawns, and can limit reproductive success in some situations

Water: requirements are not well documented; necessary water probably is obtained in diet

Cover: grasslands, shrublands, regenerating forest, mature forest; crevices and burrows along river banks, rock ledges, brushpiles, and holes under stumps or abandoned buildings are used as den sites for raising pups



Wildlife management practices

Control Nonnative Invasive Vegetation: when nonnative invasive vegetation reduces habitat quality for coyote prey species

Edge Feathering: (in some ecoregions) to increase cover and food availability for prey species around fields

Field Borders: to increase usable space for prey species around fields

Forest Management: (in some ecoregions) *Forest Regeneration (Clearcutting, Shelterwood, Seed-tree, Group Selection)* and *Forest Stand Improvement* can improve habitat for prey and lead to more abundant prey

Livestock Management: should maintain adequate cover for prey species

Plant Native Grasses and Forbs: where additional early successional cover is needed for prey and planting is necessary

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

Set-back Succession: *Prescribed Fire, Disking, Chaining, and Herbicide Applications* are recommended to maintain herbaceous openings; *Prescribed Fire* can be used to

enhance forest understory structure and composition; *Chainsawing* can be used to create additional forest openings where necessary

Decrease Harvest: where hunting or trapping has limited population and additional coyotes are desired to control a prey species that is overburdened

Increase Harvest: through hunting or trapping where coyote populations need to be lowered

Wildlife Damage Management: may be necessary where livestock or pet depredation is a problem, and more rarely where they are suppressing or causing a decline in the population of some species that have been identified as focal species for management, such as white-tailed deer or wild turkey (see **Wildlife Damage Management Techniques**)

Wildlife or Fish Survey: track counts, trapper harvest data, and camera surveys are used to estimate population trends

NOTE: Situations in which landowners would manage for coyotes are exceptionally rare. However, the coyote is a native predator and plays an important role in many ecosystems. Although management is rarely, if ever, implemented to promote coyotes, management for their prey helps both prey populations and coyote populations and promotes a healthy ecosystem.

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

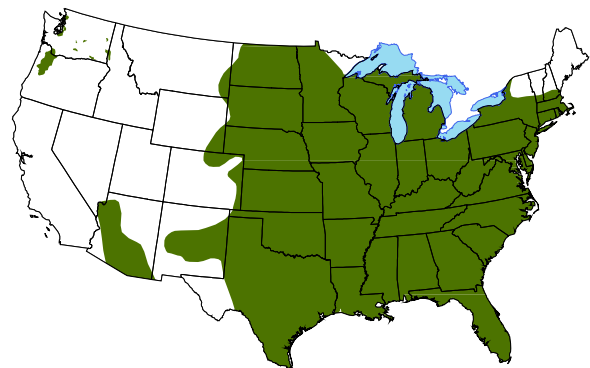
Plant Native Grasses and Forbs: where early successional cover is limiting and planting is required to promote additional grasses and forbs

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



Aubrey Deck



is limiting germination of the seedbank and when woody encroachment begins to shade-out herbaceous groundcover; *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 that may include brushy cover; *Mowing* can be used to maintain herbaceous openings in **Urban** areas

Soil Conservation Agriculture: 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 fox squirrel

General information

The eastern fox squirrel is found in the eastern half of the U.S., except for areas of New England. Eastern fox squirrels use mature forest interspersed with small openings, as well as oak and pine woodlands and savannas. Riparian areas are important in the Midwest. Fox squirrels also may be found in urban areas where there are lots of trees. Fox squirrels spend much time foraging on the ground. They build a leaf nest, usually in the crotch of the main trunk of a tree more than 30 feet aboveground, but will regularly use natural cavities in trees, especially in winter.

Habitat requirements

Diet: a variety of hard mast, acorns, seeds, tree buds and flowers, mushrooms, soft mast, eggs, and corn

Water: necessary water generally is obtained through diet, but freestanding water may be used in late summer

Cover: mature hardwood and pine forest, small openings, woodlands, and savannas; nest in tree cavities or build a nest of twigs and leaves

Wildlife management practices

Control Nonnative Invasive Vegetation: when nonnative invasive vegetation begins to reduce habitat quality for eastern fox squirrels; kudzu, nonnative sod grasses, cogongrass, bush honeysuckles, and Japanese stiltgrass may be particularly problematic in some areas

Edge Feathering: can enhance forest structure and increase food availability in forested areas surrounding fields

Forest Management: *Forest Regeneration (Single-tree Selection, Group Selection)* may improve forest or woodland structure and increase food availability; *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) so squirrels can glean waste grain from the field; especially important during years of poor mast production

Livestock Management: should prevent overgrazing, especially in savannas and woodlands where grazing is allowed; livestock should be excluded from riparian areas, especially in open landscapes where tree cover is limited to riparian areas

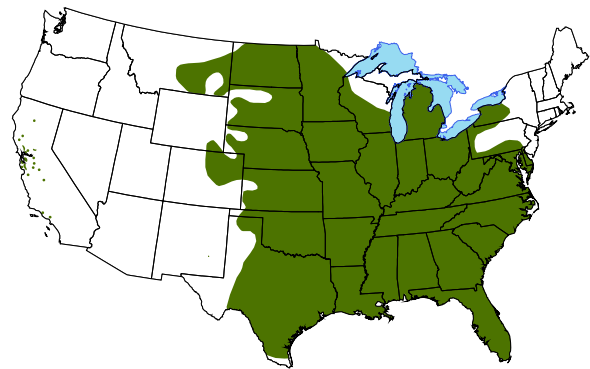
Plant Food Plots: grain food plots, especially corn, can provide an important food source, during winters with poor mast availability

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

Set-back Succession: *Prescribed Fire* is required to maintain savannas and woodlands; *Prescribed Fire* and *Disking* are used to maintain relatively small early successional openings; *Herbicide Applications* can



Joe Fischer



be used to reduce unwanted tree cover or woody encroachment; *Chainsawing* and *Dozer-clearing* can be used to create small openings

Soil Conservation Agriculture: eliminate tilling cornfields in the fall to provide additional food

Water Developments for Wildlife: small ponds may be dug where water may be limiting within 1/4 mile

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

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

Wildlife Damage Management: exclusion from buildings, trapping, or shooting may be necessary if damage is occurring

Wildlife or Fish Survey: observational surveys are most often used to estimate population trends

Raccoon

General information

Raccoons are very common throughout most of the U.S., except in certain parts of the Rocky Mountains, Nevada, Utah, and Arizona. Raccoons are found in a variety of vegetation types, but are usually most abundant near riparian areas and wetlands. They also are found in urban areas. Raccoons den in hollow trees, in burrows under stumps or brush piles, or in chimneys, attics, and crawl spaces of houses and buildings. They are omnivorous and eat a wide variety of foods. Raccoons can become pests in urban areas and in wetlands (depredating waterfowl nests). Raccoons also have been identified as major predators on gamebird nests and young gamebirds.

Habitat requirements

Diet: crayfish, birds, eggs, small mammals, insects, lizards, snakes, worms, fish, carrion, grains, seeds, hard and soft mast, and foods prepared for human and pet consumption

Water: require water frequently during warm seasons

Cover: riparian areas, bottomland hardwoods, and along other wetlands; natural tree cavities are used for denning and daytime loafing; raccoons also den in ground burrows under stumps, brush piles, junk piles, old abandoned buildings, and rocky cliffs and ledges

Wildlife management practices

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

Create Snags: where denning sites are limited

Edge Feathering: to increase usable space for prey around fields

Field Borders: to increase usable space for prey around fields

Forest Management: *Forest Regeneration (Clearcut, Shelterwood, Seed-tree, Group Selection, Single-tree Selection)* and *Forest Stand Improvement* can stimulate soft mast production and cover for prey

Leave Crop Unharvested: especially cornfields adjacent to bottomland hardwoods and riparian areas

Livestock Management: livestock should be excluded from riparian areas and other wetlands; this may include development of livestock watering facilities in uplands to discourage congregation in and overuse of riparian areas

Plant Food Plots: annual grain food plots, especially corn, may be planted where food is limiting and where an increase in raccoon population is desired (this situation is exceptionally rare)

Plant Shrubs: where soft mast is lacking and to provide corridors across large open areas

Plant Trees: in riparian areas and adjacent to wetlands where few trees are present to maintain riparian corridors; maintain approximately 50 percent deciduous forest cover; also in large open areas where there are few



Dave Menke



trees

Repair Spillway/Levee: if not functioning properly

Set-back Succession: *Prescribed Fire* is recommended to rejuvenate old decadent wetland vegetation; *Prescribed Fire* and *Disking* can maintain herbaceous openings; *Prescribed Fire*, *Herbicide Applications*, and *Chaining* are recommended to rejuvenate decadent shrub cover

Soil Conservation Agriculture: eliminate fall tillage of grain crop residue adjacent to cover to make waste grain available as an additional food source

Water Control Structures: should be installed in existing dikes, dams, or levees if not present, and if needed, to control water levels and provide water less than 2 feet deep and stimulate emergent vegetation and enhance habitat for prey

Water Developments for Wildlife: shallow impoundments can provide a water source and additional habitat for various prey species

Decrease Harvest: if hunting pressure is limiting population growth where an increase is desired (this situation is rare)

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

Wildlife Damage Management: is often necessary when raccoons get into garbage cans, occupy residences or buildings, or prey upon poultry; exclusion is cost-effective; cultural modification, such as using wildlife-proof trash cans, is effective; trap and kill is most effective for problem raccoons

Wildlife or Fish Survey: track counts, camera surveys, and trapper harvest data may be used to monitor population trends

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, and mushrooms; in the northern parts of the range, coniferous browse is important in winter; annual grains, such as wheat, oats, and rye, are eaten as well as young sprouts of a few perennial grasses in late 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

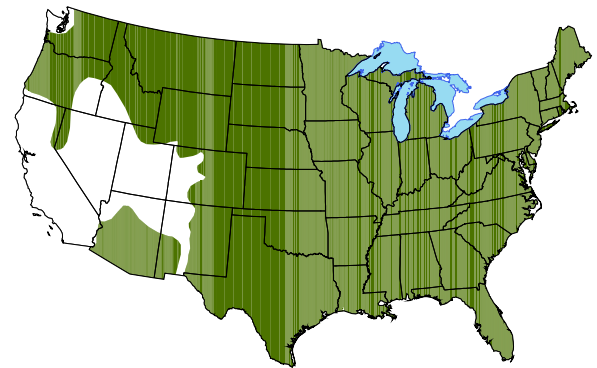
Edge Feathering: to increase forage availability around fields and enhance fawning cover

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

Forest Management: *Forest Regeneration (Clearcut,*



Steve Hillebrand



Shelterwood, Seed-tree, Group Selection) will provide increased browse, soft mast production, and dense 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

Soil Conservation Agriculture: 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

Wild pig

General information

Wild pigs (also called feral hogs) were first introduced into what is now the United States at Tampa Bay, Florida by the explorer Hernando De Soto in 1539. In addition, early settlers throughout the southeastern United States also raised domesticated swine, some of which escaped and became feral, leading to their establishment throughout the South and California. Today, 36 states have wild pig populations estimated between 5 and 8 million nationwide. Many of these populations became established because of indiscriminate and illegal stockings for hunting purposes. As an invasive nonnative species, wild pigs cause ecological damage via their rooting behavior and competition for food and space with a number of native wildlife species and predate upon many small amphibian and reptile species. Wild pigs also cause considerable agricultural damage to crops, pastures, livestock, and environmental damage to riparian areas, often resulting in water quality degradation as a result of their rooting and wallowing behavior.

Habitat requirements

Diet: wild pigs are perhaps the perfect example of an omnivore; approximately 85 percent of their diet is vegetation, but they also prey upon small animals and often scavenge animal carcasses; they especially prefer crops, such as corn and peanuts, and aggressively out-compete native wildlife species for hard and soft mast whenever those food items are available

Water: wild pigs must have access to free-standing water for drinking and thermoregulation

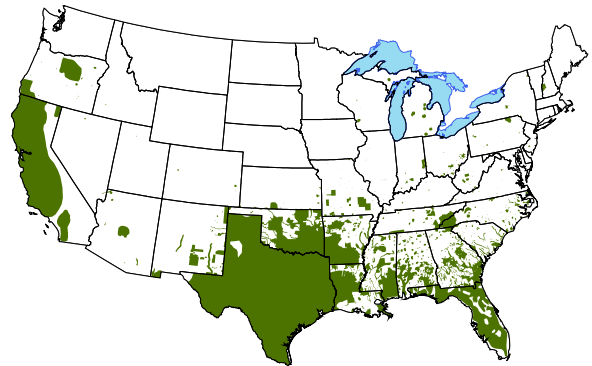
Cover: wild pigs seek dense cover, such as heavy understory or thick shrubs and grasslands, near or in riparian areas that reduce opportunity for human contact; pig family groups (called sounders) often use streams, rivers, streams, and associated wetlands as travel corridors to move as they seek food sources

Wildlife management practices

Increase Harvest: the wild pig is an invasive nonnative species that competes with native wildlife for food and, in some instances, preys directly upon many small vertebrate species, including birds, mammals, reptiles, and amphibians; whenever wild pigs are observed or their sign is documented, control methods, such as trapping, snaring, shooting, and dogging, should be used with an ultimate goal of eradication



Billy Higginbotham



Wildlife Damage Management: may be necessary if wild pigs negatively impact crops, forages, or livestock; fencing high-value crops and other areas may be used as a non-lethal method for reducing wild pig damage, but it does not decrease the population

Wildlife or Fish Survey: camera surveys, track counts, and evidence of rooting are used to estimate population trends

Reptiles

American alligator

General information

The American alligator occurs along the Atlantic coast from the Florida Everglades to North Carolina and along the Gulf Coast as far west as Texas and into Oklahoma and Arkansas. Alligators are dark gray to almost black with rows of bony scutes that armor the back with a cream-colored underside. Eyes are green to brown with vertical pupils. They have a large, broad, U-shaped snout and an overbite that conceals the bottom row of conical-shaped teeth. Alligators have short legs and webbed feet with sharp claws they use to dig “gator holes” that benefit a variety of wildlife species, especially during periods of drought. Male alligators average 11 feet in length, whereas females average 8 feet. Mating occurs in May/June and nesting peaks June/July. Alligators nest near permanent water and construct a dome-shaped nest that is a mound of soil and plant material. The female digs a conical chamber in the center of the mound and deposits 20-60 eggs. Several layers of mixed mud and vegetation are added on top of the egg chamber. Sunlight and decomposition of the nesting material keeps the eggs at an almost constant temperature. The temperature of the developing eggs determines the sex of offspring. Females are produced at the coolest and warmest temperatures, whereas males are produced around 89.6°F. Temperature variation inside the nest can produce both sexes. Incubation averages 65 days. Juvenile alligators will often remain together in a group called a pod for 2-3 years. The female provides parental care and may protect young for more than one year. Alligators may be hunted in all southeastern states. However, harvest is determined and closely monitored by state wildlife agencies typically through quota permits and reporting. Therefore, Increase Harvest and Decrease Harvest are not WMP options. Wildlife Damage Management may be recommended where alligators are overabundant or a nuisance.

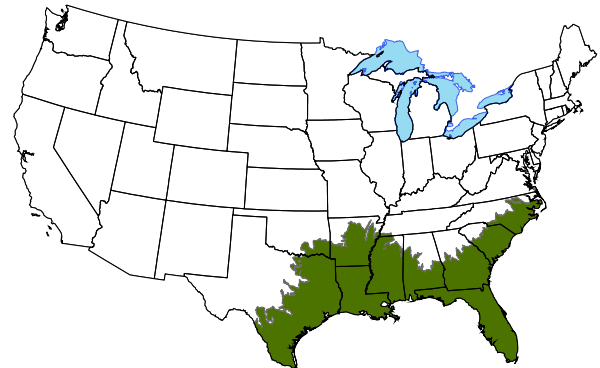
Habitat requirements

Diet: invertebrates, such as insects, crustaceans, and snails, fish, frogs, snakes, turtles, crabs, birds, mammals, and carrion

Water: alligators are more aquatic than terrestrial; they occur in marshes, swamps, streams, rivers, lakes, ponds, impoundments, and canals. Although primarily a freshwater species, alligators occasionally move into both brackish and saltwater environments for periods of time



Cindy Larson



Wildlife management practices

Repair Spillway/Levee: if not functioning properly

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

Water Developments for Wildlife: impoundments and ponds may be constructed if habitat is limiting

Wildlife Damage Management: necessary when alligators have become overabundant or exhibit nuisance behavior such as lack of fear and interest in human activity

Wildlife or Fish Survey: spotlight surveys are used to estimate populations and track size classes. 3 Size Classes: 1-4ft Small; 4-9ft Medium; Over 9ft Large

Eastern snapping turtle

General information

The eastern snapping turtle is found across much of the U.S. east of the Rocky Mountains. It occurs in most permanent bodies of water, but prefers soft mud-bottomed ponds, lakes, and slow streams with dense vegetation. It is one of the more aquatic freshwater turtles and spends most of its time lying on the bottom of deep pools or buried in the mud in shallow water with only its eyes and nostrils breaking the surface of the water. The primary nesting season is May-June with the female digging a hole and laying about 30 eggs. Eastern snapping turtles are omnivorous and will consume relatively large invertebrate and small vertebrate prey. If approached, snapping turtles will turn to face the potential predator, lunge forward, and strike quickly with powerful beaked jaws. Eastern snapping turtles grow slowly, but can attain very large sizes (>50 lbs.) They have heavy muscular legs and are often harvested for human consumption.

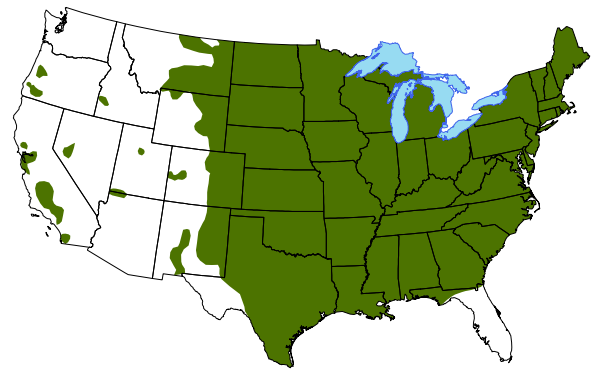


Habitat requirements

Diet: insects, crayfish, clams, earthworms, fish, frogs, toads, salamanders, snakes, small turtles, birds, and small mammals; also consumes various aquatic plant species

Water: requires permanent bodies of water; obtains water from food

Cover: permanent water bodies with muddy bottoms and thick vegetation; hides underwater beneath submerged stumps, roots, brush, and buried in the mud



Wildlife management practices

Livestock Management: livestock should be excluded from riparian areas and other wetlands; this may include development of livestock watering facilities in uplands to discourage congregation in and overuse of riparian areas

Repair Spillway/Levee: if not functioning properly **Water Control Structure:** should be installed in existing levee or dam if one is not present to manipulate water levels as needed

Water Development for Wildlife: ponds and impoundments may be built when permanent bodies of water are not available

Decrease Harvest: may be necessary when harvest pressure limits population growth

Increase Harvest: where populations can sustain additional harvest pressure and if the turtles are limiting other desirable species

Wildlife Damage Management: may be necessary if turtles are found in fish hatcheries

Wildlife or Fish Survey: hoop net traps are used to estimate population trends

Amphibians

American bullfrog

General information

American Bullfrogs are relatively large frogs that inhabit permanent bodies of standing or slow-moving water. The American bullfrog's native range extends from the Atlantic Coast to eastern Colorado and eastern Mexico, and from southern Colorado to northeastern Mexico. Bullfrogs are not native west of the Rocky Mountains, but have been successfully introduced in many areas. Bullfrog tadpoles require two years to metamorphose. They prefer shorelines with dense vegetation adjacent to shallow open water dominated by floating and submerged aquatic vegetation. All habitat requirements are usually found in and around a single pond.



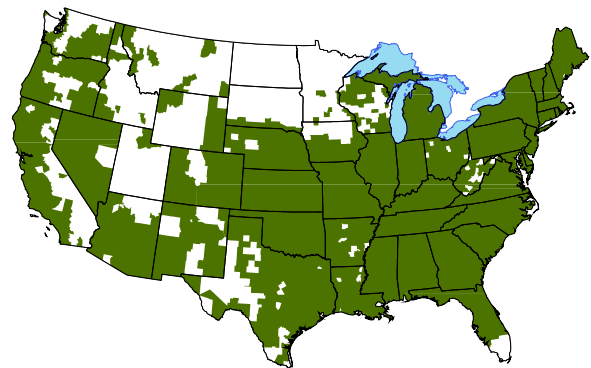
Bill Buchanan

Habitat requirements

Diet: insects, crayfish, other frogs, reptiles, snails, fish, and occasionally small mammals and birds

Water: stable water levels are necessary for hibernation and egg development; water levels should be maintained at a constant level

Cover: dense, emergent aquatic and upland herbaceous vegetation adjacent to water for hiding and foraging



Wildlife management practices

Livestock Management: livestock should be excluded from ponds managed for bullfrog; livestock watering facilities should be developed away from pond

Repair Spillway/Levee: if not functioning properly

Water Control Structures: should be installed if none are present in existing dams and levees so water depth can be managed as appropriate

Water Developments for Wildlife: ponds and shallow impoundments can be provided where habitat for bullfrogs is absent or insufficient for desired population

Decrease Harvest: if current hunting pressure is causing population to decline and population growth is desired

Increase Harvest: where populations can sustain additional harvest pressure for hunting recreation

Wildlife or Fish Survey: call counts are used to estimate population trends

Channel catfish

General information

Channel catfish are warmwater fish native to the Gulf coast states and the Mississippi River valley, but they have been introduced to most regions of the United States. They have smooth skin (no scales), a deeply forked tail, and sharp dorsal (top) and pectoral (side) fins that can inflict a nasty cut if the fish is handled improperly. They also have barbels (often called “whiskers”) around the mouth. Coloration depends largely on water clarity—they are drab green to blue on the back, shading to white on the belly, but they can appear almost black in clear waters, and yellowish in muddy waters. Young channel catfish have irregular spots on their sides that disappear as they mature. Channel catfish average 2 – 3 pounds, but may grow to 50 pounds. In the presence of largemouth bass and bluegill, predation is heavy upon the catfish eggs and young (called fry). In small impoundments managed for multiple fish species, stocking fingerling channel catfish is the best way to maintain a population. Channel catfish is the most widely cultured (farmed) warmwater fish species in the United States. Each year, several hundred million pounds are raised and harvested as food in grocery stores and restaurants. It is also widely sought by anglers on public and private waters for its recreational value as well as its fantastic flavor.

Habitat requirements

Diet: young catfish feed mostly on aquatic insects; adults eat crawfish, aquatic insects, plant material including algae, snails, small fish, and even seeds; commercially prepared rations have been formulated and are used to feed channel catfish in aquaculture (fish farming) operations as well as in farm ponds and other impoundments

Water: obtained from their aquatic environment and food; reservoirs, lakes and ponds; moderately to swift-flowing streams and rivers with gravel, sand, or muddy bottoms; seldom inhabits water with abundant submerged aquatic vegetation

Cover: females typically lay eggs in dark holes or under logs or rocks

Wildlife management practices

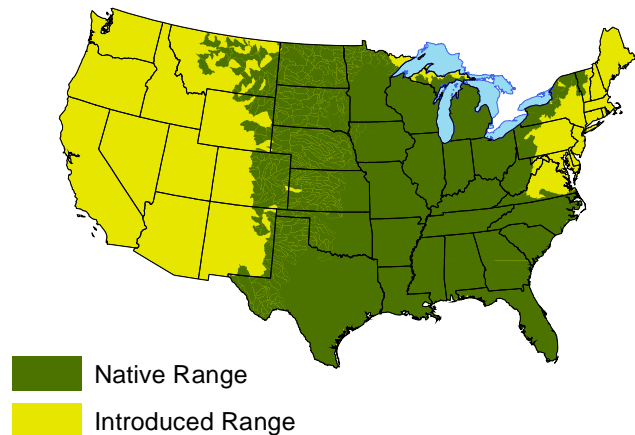
Livestock Management: livestock should either be excluded from fish ponds or only allowed access to a small part of the fish pond; livestock watering facilities should be developed away from the fish pond

Repair Spillway/Levee: if not functioning properly

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



Texas Parks and Wildlife



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 channel catfish 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 too few are present; channel catfish seldom spawn successfully in the presence of large mouth bass and bluegill because of predation upon eggs and fry--therefore periodic restocking is required when channel catfish numbers drop below desired levels

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

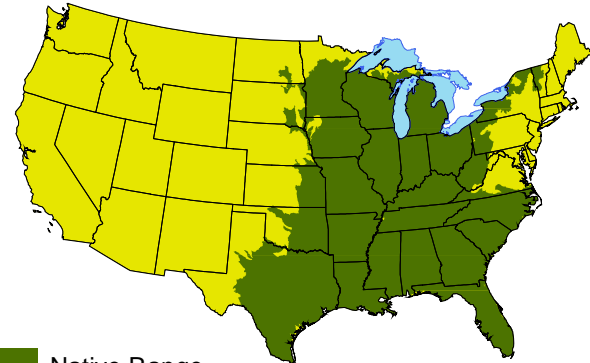
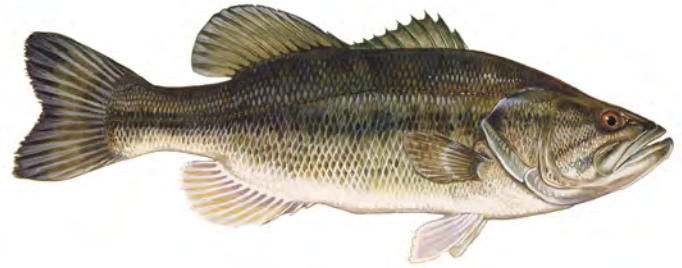
Wildlife or Fish Survey: fishing records, seining, and electro-shocking are used to survey largemouth bass populations

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 particle



■ Native Range
■ Introduced Range

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

Invertebrates

American bumble bee

General information

The American bumble bee is a long-tongued bee native to most of North America. Queens range from 2.1 to 2.5 centimeters, workers are 1.4 to 1.8 centimeters, and males are 1.6 to 2.2 cm. Eyes are set high on the face and body hair is short and even. Queens and workers have a black face and head and a yellow-to-black thorax and abdomen. Wings have a distinct black band. A colony is comprised of a queen, workers, males, and new queens (50-150 individuals). A fertilized queen from the previous season overwinters in deadwood or underground. She selects a nest site on or under the ground and constructs a nest lined with plant material. The queen collects nectar and pollen to feed her first brood, which consists of all workers (females). The workers then take over foraging duties while the queen remains at the nest. Both males and queens are produced later in the season. Young queens leave the nest site and mate with males in the fall. Only fertilized queens overwinter. The American bumble bee is an important pollinator that occurs in early successional vegetation, such as grasslands, savannas, and farm fields. Optimum habitat conditions provide a variety of flowering plants during all periods of the growing season.

Habitat requirements

Diet: nectar and pollen from a variety of flowering plants

Water: require free-standing water and use it at the hive to regulate the temperature of the hive, feed young bees, and dilute stored honey

Cover: undisturbed early successional ecosystems rich in flowering plants

Wildlife management practices

Conservation Easement: to protect relatively large, contiguous areas of early successional plant communities

Control Nonnative Invasive Vegetation: when nonnative vegetation begins to compete with native vegetation and reduce habitat quality for American bumble bee; sod grasses on upland sites and frequent mowing are particularly problematic

Edge Feathering: reduce tree cover adjacent to fields and encourage an herbaceous understory

Field Borders: designated to provide native herbaceous cover around crop fields and hayfields

Livestock Management: grazing should be managed to



B. Merle Shepard



maintain a diverse vegetation structure and promote and allow flowering

Plant Native Grasses and Forbs: where native grassland cover is limiting and planting is necessary, such as reclaimed mineland or when information is provided to indicate planting is necessary

Set-back Succession: Prescribed fire should be used to rejuvenate and maintain grasslands and herbaceous wetlands when conditions permit; Chaining and Drum-chopping can be used to reduce woody cover and encourage more herbaceous groundcover; Chainsawing, Dozer-clearing, and Root-plowing can be used to convert forest and extensive shrubland to more open grassland and early successional vegetation; Herbicide Applications can be used to reduce shrub and tree cover and encourage more early successional vegetation

Wildlife or Fish Survey: Survey where preferred flowers are present. Sweep nets, bee bowls, malaise traps, and vane traps can be used to survey this species. However, due to species declines and federal status, no-kill survey methods are preferred.

Monarch butterfly

General information

The monarch butterfly is one of the most popular species of insects in the world with its striking orange and black markings and incredible long-distance migration. It goes through a 4-stage life cycle: egg, caterpillar (larva), chrysalis (pupa), and adult. Monarchs are host specific, meaning they only lay eggs on various species of milkweed plants. Since monarch caterpillars feed exclusively on milkweed leaves, they sequester toxins poisonous to most would-be predators. Adults feed on nectar from a variety of flowering plants. Monarch caterpillars have yellow, black, and white stripes and reach lengths up to 2 inches with a 3-to-4-inch wingspan. The monarch butterfly is migratory and ranges from the northern plains of the United States and Canada, south to Mexico. Important wintering areas include the oyamel fir forests in central Mexico and forested areas in coastal California where monarchs use all parts of the trees. The species has been divided into two populations separated by the Rocky Mountains to improve conservation efforts. The eastern population completes its northward migration from Mexico through successive generations. Most adults only live for about a month. The last generation that hatches in late summer, however, can live 6-9 months and undergoes a spectacular fall migration. After overwintering in the mountains of Mexico, the last generation begins its journey north in March, goes through reproduction, then dies soon thereafter. The northward migration is continued by their offspring. The smaller western population ranges as far north as British Columbia during summer and overwinters as far south as coastal southern California.

Habitat requirements

Diet: larvae feed on various species of milkweed plants; adults feed on nectar from a variety of flowering plants and may also eat fruit, such as persimmon, pawpaw, and wild strawberry

Water: cannot land on water to drink, but may sip moisture from saturated soil

Cover: large, undisturbed early successional communities rich in flowering plants and especially an abundance of milkweeds; mountain forests for roosting during winter

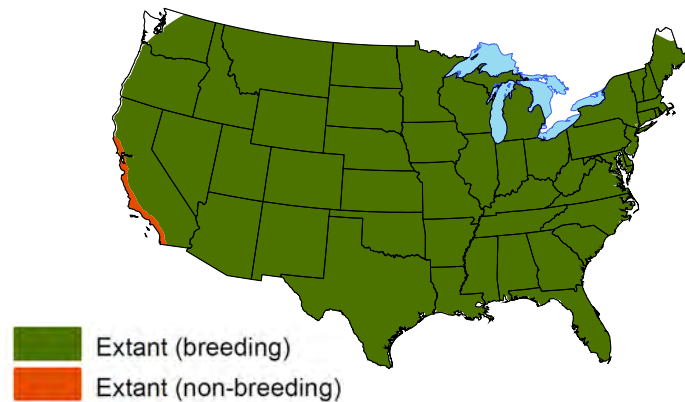
Wildlife management practices

Conservation Easement: to protect and manage large, contiguous early successional plant communities and wintering grounds

Control Nonnative Invasive Vegetation: when nonnative



Tom Koerner, USFWS



vegetation inhibits native plant abundance and reduces abundance of native milkweeds; coverage of nonnative sod grasses on upland sites and frequent mowing are particularly problematic

Delay Crop Harvest: avoid mowing patches of milkweed if possible when cutting hay since milkweed is toxic to cattle and horses and an important host plant for monarch butterflies

Edge Feathering: reduce tree cover adjacent to fields and encourage an herbaceous understory

Field Borders: to provide native herbaceous cover around crop fields and hayfields

Livestock Management: grazing should be managed to maintain a diverse vegetation structure and promote and allow flowering

Plant Native Grasses and Forbs: where native grassland cover is limiting and planting is necessary, such as reclaimed mineland; milkweeds should be part of the species mix; information may be provided to indicate if planting is necessary

Set-back Succession: Prescribed fire should be used to rejuvenate and maintain grasslands and herbaceous wetlands when conditions permit; Chaining and Drum-

chopping can be used to reduce woody cover and encourage more herbaceous groundcover; Chainsawing, Dozer-clearing, and Root-plowing can be used to convert forest and extensive shrubland to more open grassland and early successional vegetation; Herbicide Applications can be used to reduce shrub and tree cover and encourage more flowering plants

Wildlife or Fish Survey: Participate in the Monarch Larva Monitoring Project, the Monarch Watch, the Journey North, the North American Butterfly Association Butterfly Counts, and other standardized butterfly surveys.