

## Ruffed grouse

### General information

The ruffed grouse is a relatively large gamebird that occurs across southern Canada, the more northern latitudes of North America, and down the Appalachian range. Ruffed grouse are found in a variety of deciduous forest types as well as mixed deciduous-conifer forest, but are particularly closely associated with aspen, especially young stands with relatively dense structure. Male ruffed grouse attract females during the mating season in spring by standing on downed logs, usually in dense cover, and flapping their wings to their breast, which causes a low drumming sound. This activity is called drumming. Ruffed grouse populations are decreasing across their range where forest management has been limited.

### Habitat requirements

**Diet:** buds, hard and soft mast, insects and other invertebrates, and leaves of forbs

**Water:** necessary water obtained from diet

**Cover:** 6- to 20-year-old stands are required for cover provided by the dense stems; mature forest in close proximity to young stands may be used for feeding on acorns and other hard mast; a variety of forest types and age classes are used for nesting

### Wildlife management practices

**Control Nonnative Invasive Vegetation:** when nonnative vegetation reduces habitat quality for ruffed grouse; Japanese stiltgrass can be especially problematic in many forests, and tall fescue and orchardgrass are problematic in forest openings and along woods roads

**Edge Feathering:** to enhance cover and food resources around fields

**Forest Management:** *Forest Regeneration (Clearcut, Shelterwood, Group Selection)* within mature forest will stimulate regeneration that will provide optimum cover within 6 years; *Forest Stand Improvement* practices can be used to stimulate desirable structure and stem density and enable crowns of desirable trees to grow and produce additional mast; where drumming logs are limiting, non-mast-producing trees >18" in diameter can be felled to provide drumming logs

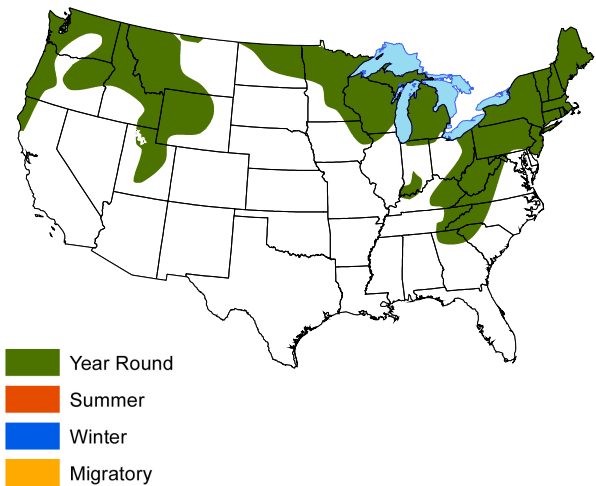
**Livestock Management:** livestock should be excluded from areas managed for ruffed grouse

**Plant Shrubs:** where additional soft mast is needed and to develop thickets and shrub cover in openings

**Plant Trees:** in relatively large openings where planting is



Bill Marchel



necessary and where mast-producing trees are limiting  
**Set-back Succession:** *Prescribed Fire* can be used to maintain and rejuvenate dense stem cover and enhance herbaceous cover important for brooding cover, particularly in aspen stands; *Chainsawing* can be used to remove trees and increase stem density in the forest understory

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

**Wildlife or Fish Survey:** drumming counts are most often used to estimate population trends; autonomous recording units (ARUs) may be used to detect species occurrence

## Sage thrasher

### General information

Sage thrashers are found mostly in shrub-dominated valleys and plains of the western U.S. They prefer sagebrush and generally are dependent on large patches and expanses of sagebrush during the breeding season. Sage thrashers usually nest within sagebrush or other shrubs close to the ground. Nests are constructed of twigs and lined with fine grasses and hair. Clutch size is 1-5 eggs. Sage thrashers forage for insects on the ground and usually run on the ground when disturbed, rather than flying.

### Habitat requirements:

**Diet:** spiders, crickets, caterpillars, beetles, and grasshoppers; some soft mast from deciduous shrubs also are eaten

**Water:** necessary water is obtained from the diet

**Cover:** sagebrush required for nesting and escape cover; nest constructed of twigs and grass

### Wildlife management practices

**Control Nonnative Invasive Vegetation:** when nonnative invasive vegetation begins to reduce habitat quality for sage thrashers

**Plant Shrubs:** where shrub cover is less than 60 percent

**Set-back Succession:** *Chaining, Drum-chopping, Chainsawing, and Herbicide Applications* can be used to maintain low shrub growth

**Wildlife or Fish Survey:** point counts and autonomous recording units (ARUs) may be used to detect species occurrence and monitor population trends



Dave Menke



## Scaled quail

### General information

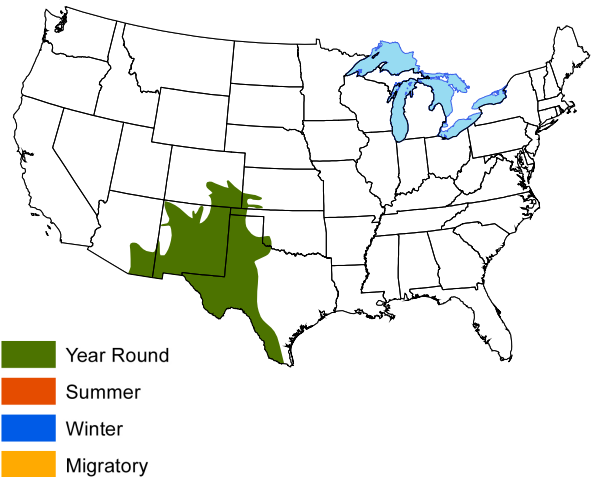
Scaled quail are found in arid grasslands with a shrub, cactus, and yucca component in the southwestern U.S. Sparse herbaceous cover characterizes the arid environment in most years. However, areas with abundant cover have higher scaled quail densities. A variety of shrub species provide important escape and loafing cover, though scaled quail will avoid areas where shrubs exist in high densities. Proper grazing management is an important component in maintaining habitat for scaled quail. They nest on the ground, usually under relatively dense, low-growing shrub or grass cover



Greg Lavaty

### Habitat requirements

**Diet:** various seeds of forbs and shrubs are major components of diet; insects are readily consumed and are critical for chick survival; green herbaceous material and soft mast of various native plants also are consumed  
**Water:** necessary water may be obtained from diet; however, free-standing water from ponds, tanks, and streams may increase survival during drought years  
**Cover:** brushy cover (shrubs or cacti) overhead with an open structure at ground level is critical, particularly for nesting; scattered patches of shrub and cactus with a good cover of native warm-season grasses and forbs provide excellent cover



### Wildlife management practices

**Control Nonnative Invasive Vegetation:** when nonnative invasive vegetation begins to reduce habitat quality for scaled quail; cheat grass and other bromes, weeping and Lehman lovegrass, and Old World bluestems are various plants that may be problematic  
**Field Borders:** to increase usable space around crop fields  
**Leave Crop Unharvested:** to provide additional food source through winter  
**Livestock Management:** should not allow overgrazing to limit herbaceous cover  
**Plant Native Grasses and Forbs:** where nesting and brood cover is lacking and planting is necessary  
**Plant Shrubs:** where there is less than 60 percent shrub cover  
**Set-back Succession:** Prescribed Fire may increase herbaceous cover needed for food and cover; Chaining, Drum-chopping, and Disking can be used to reduce or thin shrub cover if needed and if increased herbaceous groundcover is needed  
**Soil Conservation Agriculture:** to provide waste grain  
**Water Developments for Wildlife:** guzzlers and dugouts can provide supplemental water, especially in drought years

**Decrease Harvest:** may be necessary if populations are declining and data suggest mortality from hunting is additive or limiting population growth  
**Wildlife or Fish Survey:** aerial or ground transects are used to estimate population trends

## Sharp-tailed grouse

### General information

Sharp-tailed grouse are gamebirds of the northern Great Plains. Ideal habitat contains about two-thirds native grassland interspersed with shrubs, cropland, and scattered trees. Sharp-tailed grouse require bare or grassy ridges and natural rises that offer good visibility for breeding displays. Sharp-tailed grouse gather on these sites in the spring where males dance in front of the females to attract a mate. These areas are called “dancing grounds.” It is important to maintain areas of thick grass and shrub cover within several miles of dancing grounds.

### Habitat requirements

**Diet:** young grouse eat insects and small seeds; adults eat a variety of leaves, buds, seeds, and grains; buds of shrubs and small trees are most important during winter

**Water:** necessary water is obtained from diet

**Cover:** nests are on the ground in grass or sparse shrub cover; thick shrubs and tall herbaceous vegetation is required for winter cover; tall dense vegetation associated with wetland edges also is used for winter cover

### Wildlife management practices

**Control Nonnative Invasive Vegetation:** when nonnative invasive vegetation begins to reduce habitat quality for sharp-tailed grouse

**Field Borders:** to increase usable space around crop fields

**Leave Crop Unharvested:** to provide additional food source through winter; alfalfa, sunflowers, and grain sorghum are often used

**Livestock Management:** should maintain a diverse structure throughout the grassland; some dense grassland areas should be maintained to provide nesting cover; more sparse areas containing forbs and insects should be adjacent to nesting areas for brood cover; on sandy soils, both of these conditions may be present together; proper stocking rate is critical; delay grazing on portions of grasslands to provide tall undisturbed cover during the primary nesting season (May-June)

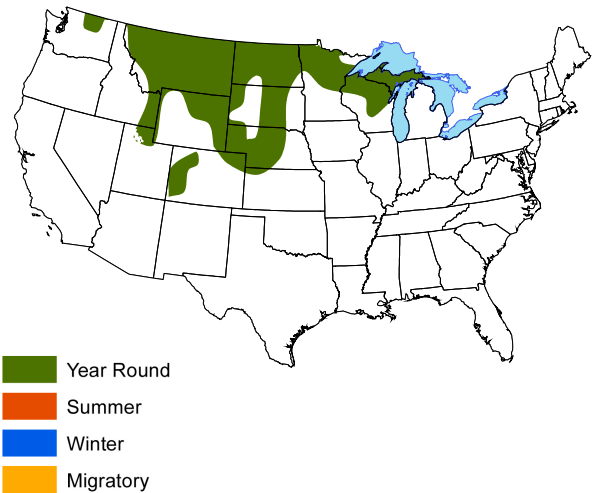
**Plant Food Plots:** food plots containing alfalfa or sunflowers may be planted where winter foods may be limiting or to enhance hunting opportunities

**Plant Native Grasses and Forbs:** where high-quality native grassland habitat does not comprise at least 60 percent of the area; should be recommended only on sites where planting is necessary to establish native grass cover

**Plant Shrubs:** small groups of shrubs may be planted in natural draws and idle land areas where cover and winter



Richard Baetsen



food may be limiting; woody cover should not be planted on upland sites that historically did not support woody cover

**Set-back Succession:** *Prescribed Fire* is recommended to increase grassland vigor, which will increase availability of insects and seeds; *Chainsawing* and *Herbicide Applications* can be used to remove trees

**Soil Conservation Agriculture:** grain stubble should be left through winter to provide a food source; stubble height of 6 inches or more is preferred

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

**Wildlife or Fish Survey:** observational surveys, especially on dancing grounds in the spring, are used to estimate population trends

## Song sparrow

### General information

Song sparrows are familiar and relatively common and inhabit all of the U.S., but will migrate from extreme northern areas during the colder months of the year. Song sparrows typically use shrubby areas interspersed with herbaceous openings and forest, especially along riparian areas. Song sparrows often nest along forest edges. The nest is made of grass and leaves and in the shape of a cup. Nests are often placed on the ground under a shrub or in thick herbaceous cover. Song sparrows primarily feed on the ground and eat seed, insects, and fruit.

### Habitat requirements

**Diet:** weed seeds, insects, soft mast

**Water:** freestanding water is required frequently during the warm seasons

**Cover:** thick shrubs and herbaceous cover for nesting, loafing, and escape

### Wildlife management practices

**Control Nonnative Invasive Vegetation:** when nonnative invasive vegetation begins to compete with native vegetation and degrade habitat for song sparrows

**Forest Management:** *Forest Stand Improvement* practices can stimulate increased brushy cover where lacking

**Plant Native Grasses and Forbs:** where lacking and necessary to provide cover for nesting

**Plant Shrubs:** to provide soft mast where there is little soft mast available

**Set-back Succession:** *Chainsawing* can create additional brushy cover; *Prescribed Fire* can be used to maintain shrubby cover; *Mowing* may be used to maintain foraging and loafing cover for song sparrows in **Urban** areas

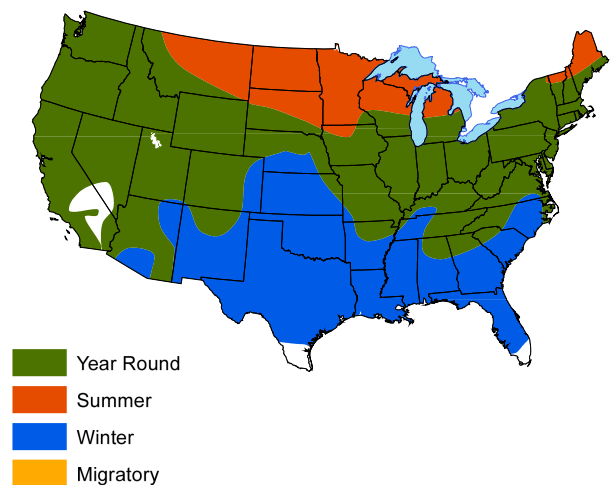
**Water Development for Wildlife:** drinking water may be provided in birdbaths or pans of water

**Wildlife or Fish Survey:** point counts and autonomous recording units (ARUs) may be used to detect species occurrence and monitor population trends

**Artificial Feeders:** for use in **Urban** areas; millets and sunflower seeds are favorites



Lee Karney



## Sooty grouse

### General information

The sooty grouse is a relatively large grouse that occurs predominantly in coastal mountainous areas from northern California north through British Columbia. Sooty grouse are found in coniferous forest with scattered small herbaceous openings and shrub cover. Sooty grouse roost in forest edges near shrub vegetation where they forage. Their nests are usually on the ground, often under shrubs or near fallen logs. Sooty grouse typically forage on the ground spring through fall, but may spend most of their time foraging on buds and needles in trees during winter. Males often vocalize with a deep booming call that can be difficult to locate while perched in trees.

### Habitat requirements

**Diet:** soft mast, buds, seeds, forbs, and insects from spring to fall; needles of coniferous trees may be eaten in winter

**Water:** necessary water obtained from dew and diet

**Cover:** nest on the ground near forest edges, often under shrubs or next to fallen logs

### Wildlife management practices

**Control Nonnative Invasive Vegetation:** when nonnative invasive vegetation begins to reduce habitat quality for sooty grouse

**Forest Management:** *Forest Regeneration (Group Selection, Single-tree Selection)* will increase herbaceous groundcover for foraging near nesting and roosting areas; *Forest Stand Improvement* can be used in stands not ready for regeneration to enhance herbaceous groundcover

**Livestock Management:** livestock should be excluded from areas where sooty grouse may be nesting mid-April through mid-June

**Plant Native Grasses and Forbs:** where herbaceous cover is lacking in forest openings and planting is necessary

**Plant Shrubs:** to provide soft mast and buds where needed

**Plant Trees:** coniferous trees may be planted to provide a winter food source where needed

**Set-back Succession:** *Chainsawing* and *Prescribed Fire* can be used to maintain herbaceous groundcover and improve cover for nesting; *Herbicide Applications* can reduce woody encroachment in small herbaceous openings

**Decrease Harvest:** when surveys show a decline in the local population and data suggest mortality from hunting is additive or limiting population growth



Glen Tepke



**Wildlife or Fish Survey:** call counts, point counts, and autonomous recording units (ARUs) may be used to detect species occurrence and monitor population trends

# Southwest willow flycatcher

## General information

The Southwest willow flycatcher is a neotropical migrant that breeds in riparian areas of the arid southwestern United States and northwestern Mexico and winters in the rain forests of Mexico, Central America, and northern South America. This subspecies of the willow flycatcher is a federally listed threatened species because of habitat degradation and brood-rearing parasitism by brown-headed cowbirds. Habitat loss is caused by changes in the flood and fire regime (from water diversion and groundwater pumping, impoundments, and stream channelization), aesthetic mowing, and unmanaged livestock grazing. Riparian corridors with dense patches of trees (such as willows and cottonwoods) and shrubby vegetation (such as buttonbush and blackberry) with interspersed openings are preferred. This type of cover is found near rivers, swamps, lakes, and reservoirs. Nests are typically built low at the outer edge of shrubs, usually near water.



Jim Rorabaugh

## Habitat requirements

**Diet:** insects

**Water:** obtained through diet

**Cover:** vegetation 3-15 feet tall, including relatively tall herbaceous plants, shrubs, and trees; nests are made of bark and grass

## Wildlife management practices

**Conservation Easement:** can protect critical habitat for this declining subspecies of willow flycatcher

**Control Nonnative Invasive Vegetation:** when nonnative invasive vegetation begins to reduce habitat quality for southwest willow flycatchers

**Livestock Management:** livestock should be excluded from riparian areas when managing for southwest willow flycatchers; overgrazing removes vegetation at the height necessary for nesting and may reduce shrub cover

**Plant Shrubs:** along riparian areas where there is a lack of shrub cover for nesting

**Plant Trees:** along riparian areas where cover is lacking

**Set-back Succession:** *Chainsawing, Prescribed Fire, or Herbicide Applications* may be necessary if the tree canopy in the riparian zone is minimizing sunlight and preventing a desirable herbaceous understory and midstory

**Wildlife or Fish Survey:** point counts and autonomous recording units (ARUs) may be used to detect species occurrence and monitor population trends



# Spotted sandpiper

## General information

Spotted sandpipers are medium-sized shorebirds that occur all across North America. During the breeding season, they have pale breasts with brown spots, hence the name. They are found in very shallow water areas and along mudflats where they search for freshwater invertebrates and other foods. They are active foragers and walk in meandering paths, darting for prey. Nests are placed in a small depression on the ground, often under a canopy of vegetation, and lined with fine grasses. Spotted sandpipers exhibit an unusual breeding strategy where the female establishes and defends her territory and may breed with several males. The male incubates the eggs and takes care of the nestlings.

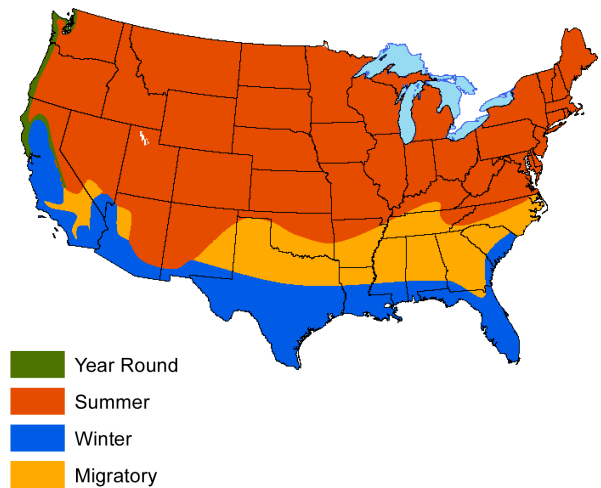


## Habitat requirements

- Diet:** flies and their aquatic larvae (midges), grasshoppers, beetles, worms, snails, small crustaceans
- Water:** acquire necessary water while foraging and from diet
- Cover:** shallow, freshwater wetlands and mudflats; sometimes dense herbaceous vegetation for nesting

## Wildlife management practices

- Control Nonnative Invasive Vegetation:** when nonnative invasive vegetation begins to reduce habitat quality for spotted sandpipers
- Livestock Management:** should not allow overgrazing to limit herbaceous vegetation that is used for nesting; livestock may be excluded from areas managed for spotted sandpipers
- Plant Native Warm-Season Grasses:** where groundcover is lacking and planting is necessary
- Repair Spillway/Levee:** if not functioning properly
- Set-back Succession:** *Prescribed Fire* is recommended to rejuvenate herbaceous groundcover around wetlands for nesting cover
- Water Developments for Wildlife:** small impoundments and ponds may be constructed if habitat is limiting; water control structures allow the water level to be manipulated and provide shallow water areas and mudflats for foraging
- Wildlife or Fish Survey:** observation counts are used to estimate population trends



# Spotted towhee

## General information

Spotted towhees are relatively large songbirds that occur in the western U.S. They are fairly widespread and abundant and found in dense shrub cover, typical of woodland edges, shrub thickets, chaparral, canyon drainages, and old-fields. Nests are made of leaves, twigs, strips of bark, and grasses, and usually placed on the ground among the shrub cover against a log, clump of grass, or base of a shrub for further concealment. Nests contain 2-6 eggs. Spotted towhees may have 1-3 broods per year. Spotted towhees forage on the ground among leaf litter, where they hop and scratch for invertebrates and various seed. Spotted towhees are sensitive to habitat loss, thriving in disturbed areas where agricultural and residential developments are minimal.

## Habitat requirements

**Diet:** ants, beetles, caterpillars, crickets, grasshoppers, moths, wasps, millipedes, spiders dominate the diet; in winter, various seeds, acorns, soft mast, and grains (oats, wheat, corn) are more prevalent

**Water:** necessary water is obtained from the diet

**Cover:** shrub cover is used for loafing, foraging, nesting, and escape

## Wildlife management practices

**Control Nonnative Invasive Vegetation:** when nonnative invasive vegetation begins to reduce habitat quality for spotted towhees

**Edge Feathering:** can increase usable space where woods meet fields

**Forest Management:** *Forest Regeneration (Clearcut)* will create brushy cover for 5 to 10 years; *Forest Stand Improvement* (heavy thinning) can stimulate brushy understory growth

**Livestock Management:** livestock should be excluded from areas managed for spotted towhee

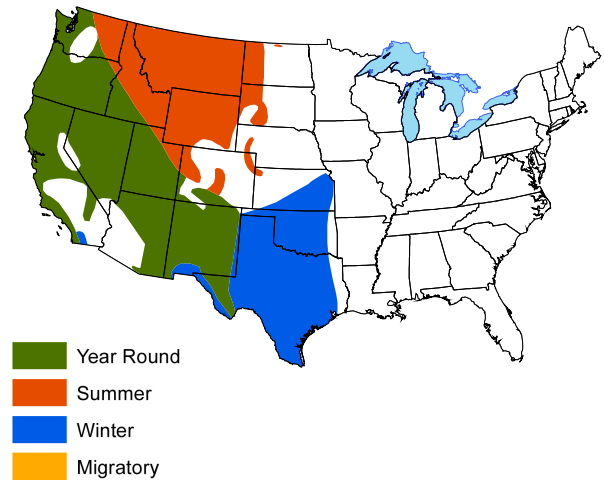
**Plant Shrubs:** in large open areas to provide habitat

**Set-back Succession:** *Prescribed Fire*, *Chaining*, and *Drum-chopping* can be used to promote dense resprouting shrubs; *Chainsawing* and *Herbicide Applications* can be used to reduce tree cover and stimulate increased shrub cover and stem density

**Wildlife or Fish Survey:** point counts and autonomous recording units (ARUs) may be used to detect species occurrence and monitor population trends



Dave Menke



## Virginia rail

### General information

The Virginia rail is a gamebird of freshwater marshes, but occasionally occurs in saltwater marshes. It prefers to stay hidden in moderately dense emergent vegetation and is more often heard than seen. If wetland vegetation becomes too thick, Virginia rails will not be as abundant. Virginia rails may be found in wetlands of all sizes, but prefer hemi-marsh, which is represented by scattered patches of emergent vegetation with small openings of open water at about a 50:50 ratio. Periodic water level manipulation should be used to favor annual wetland plants and avoid a monoculture of perennial wetland vegetation. Shallow water depths (generally less than 1 foot) are required. Virginia rails will flee quickly on the ground through vegetation if approached and will fly rarely. They typically inhabit shallow water areas and can swim under water if attacked. Virginia rails are migratory and can travel great distances. The Virginia rail is known to build dummy nests around the vicinity of their actual nests.

### Habitat requirements

**Diet:** insects, aquatic invertebrates, snails, small fish, and small amphibians; some seeds and plant material in fall and winter

**Water:** obtained from food

**Cover:** moderately dense wetland vegetation, such as cattails, sedges, rushes, smartweeds, and other plants are used for cover; nests are woven into vegetation over shallow water and may have a canopy over them

### Wildlife management practices

**Control Nonnative Invasive Vegetation:** when nonnative invasive vegetation begins to limit open water or otherwise reduce habitat quality for Virginia rail

**Livestock Management:** livestock should be excluded from wetlands managed for Virginia rail

**Repair Spillway/Levee:** if not functioning properly

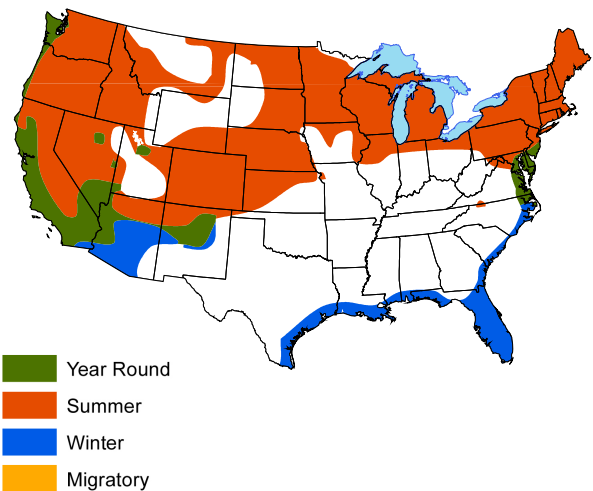
**Set-back Succession:** *Prescribed Fire*, *Disking*, and *Herbicide Applications* may be used in wetlands dominated by very dense perennial vegetation to encourage a hemi-marsh consisting of openings and annual plants; *Chainsawing* and *Herbicide Applications* may be used to reduce tree cover and create more open marsh

**Water Developments for Wildlife:** shallow impoundments can be constructed to provide habitat; water control structures allow periodic water drawdowns to maintain a hemi-marsh with shallow water

**Wildlife or Fish Survey:** Call counts and autonomous recording units (ARUs) are most often used to estimate



Dave Menke



population trends; playing a tape of their call increases the chance of hearing rails; also, ropes can be dragged across vegetation between two or more observers to flush birds during observation counts

## Western bluebird

### General information

Western bluebirds occur in portions of the western U.S. and southwestern U.S. and Mexico. They tend to use more wooded areas than eastern or mountain bluebirds. Western bluebirds are usually found in open woodlands, especially ponderosa and pinon pine-juniper. Open deciduous forest, particularly aspen that has been burned, where cavity trees are plentiful, are commonly used. Wooded riparian areas in arid environments also attract western bluebirds. Like other bluebirds, insects dominate the diet during spring and summer, and various fruits are most prevalent during fall and winter. Western bluebirds nest in cavities, especially old woodpecker cavities, as well as nest boxes. Clutches consist of 2-8 eggs. Western bluebirds may have 1-3 broods per year.



Michael Woodruff

### Habitat requirements

**Diet:** invertebrates, especially grasshoppers, crickets, beetles, and spiders; various fruits, such as chokecherry, elderberry, grape, raspberry, sumac, serviceberry, and poison oak, in fall and winter

**Water:** necessary water obtained from diet

**Cover:** woodlands; nest in cavities of trees and fence posts

### Wildlife management practices

**Control Nonnative Invasive Vegetation:** when nonnative invasive vegetation begins to compete with native vegetation and reduces habitat quality for western bluebirds

**Edge Feathering:** to increase foraging opportunities, perching sites, and potential cavity trees (if trees are killed and left standing) around fields

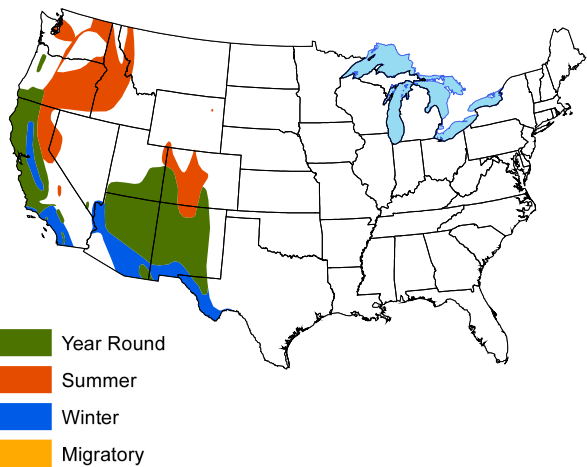
**Field Borders:** to increase foraging opportunities around crop fields

**Forest Management:** *Forest Regeneration (Seed Tree, Shelterwood)* may be used to enhance habitat in pine forests for a few years, especially if coupled with *Prescribed Fire*; *Forest Stand Improvement* may be used to enhance habitat by reducing tree density in pine forests and woodlands; where snags with cavities are limiting, softwood species >6" in diameter can be killed via girdling and spraying to provide perches and potential cavities for nesting

**Livestock Management:** livestock must be excluded from recently planted trees and shrubs

**Nesting Structures:** should be erected where a scarcity of natural cavities may be limiting the population; nest boxes should be approximately 5 feet high with an entrance hole 1½ inches in diameter; nest boxes should be placed no closer than 80 yards apart to limit territorial fighting among males

**Plant Native Grasses and Forbs:** where groundcover is



lacking and planting is necessary

**Plant Shrubs:** in large open areas where perching sites or winter foods may be limiting

**Plant Trees:** in large open areas where perching sites are limiting; may provide potential nest sites in distant future

**Set-back Succession:** *Prescribed Fire* is recommended to improve woodland structure and maintain herbaceous openings for western bluebirds; *Herbicide Applications* may be used to reduce tree density; *Chaining* and *Drum-chopping* can be used to reduce shrub cover where necessary; *Chainsawing* can be used to convert forested areas to open woodlands; *Root-plowing* may be used to reduce shrub density and promote herbaceous openings; *Mowing* may be used to maintain foraging and loafing cover for mountain bluebirds in **Urban** areas

**Wildlife or Fish Survey:** point counts and autonomous recording units (ARUs) may be used to detect species occurrence and monitor population trends; nest boxes should be checked to monitor use and nest success

## Western kingbird

### General information

Western kingbirds are large flycatchers that are readily seen throughout the western U.S. They have gray heads, yellow bellies, white throats, and a square-tipped tail. They are found in grasslands, pastures, cultivated fields, desert shrub areas, savannas, and urban areas. Scattered trees and shrubs are used for nesting cover, and human activity often improves habitat because trees and structures provide potential nest sites. Western kingbirds winter in southern Mexico and Central America.

### Habitat requirements

**Diet:** more than 90 percent of the diet consists of insects; soft mast from various plants is occasionally eaten

**Water:** water requirements unknown

**Cover:** trees and shrubs for nesting and perching; nests also may be placed on buildings, windmills, utility poles, and antennas; herbaceous openings for foraging

### Wildlife management practices

**Control Nonnative Invasive Vegetation:** when nonnative invasive vegetation is beginning to reduce habitat quality for western kingbirds

**Edge Feathering:** to increase nesting cover around fields

**Field Borders:** to increase prey abundance around crop fields

**Plant Native Grasses and Forbs:** in areas where herbaceous openings are limiting and planting is necessary

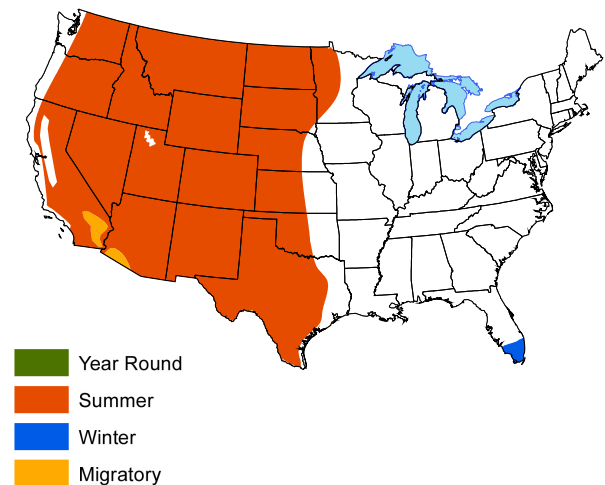
**Plant Shrubs:** in open areas where nesting cover is limiting

**Set-back Succession:** *Prescribed Fire* and *Disking* can be used to maintain herbaceous openings; *Chainsawing* and *Root-plowing* can be used to create herbaceous openings where limiting

**Wildlife or Fish Survey:** point counts and autonomous recording units (ARUs) may be used to detect species occurrence and monitor population trends



Gary Kramer



# White-tailed ptarmigan

## General information

The white-tailed ptarmigan is the smallest grouse in North America. It occurs in alpine regions where their distribution and abundance is relatively consistent over time because their range is very remote and largely undisturbed. They inhabit alpine ridges and meadows approximately 2,000 feet above timberline during spring and summer. Males vigorously defend their breeding territory from other males with “scream flights” to intimidate rivals. Rock bases are preferred nesting cover because of warmer temperatures for incubation and openness for quick escape from predators. Low-growing willow and mosses are used as cover as well. In winter, white-tailed ptarmigan are found at slightly lower elevations within a few miles of summer ranges and closer to the timberline where willows are more abundant. Willows are critical for cover and food, especially during winter. Alpine ecosystems take a long time to recover when disturbed. Therefore, preventing disturbance can be critical for white-tailed ptarmigan habitat management.

## Habitat requirements

**Diet:** buds, twigs, catkins, fruits, seeds, flowers, stems, leaves, and insects are common in spring and summer; buds and twigs of willows are most common in fall and winter

**Water:** largely unknown, though they have been observed drinking water and eating snow

**Cover:** rocks or clumps of vegetation around rocks are most often used for nesting because of increased warmth and protection from inclement weather; high, rocky, windswept ridges with interspersed herbaceous vegetation are used for brooding; in winter, areas near the treeline up to almost the summering range where there is an abundance of willow (food) and soft snow (roosting cover) for concealment with their white winter plumage

## Wildlife management practices

**Control Nonnative Invasive Vegetation:** when nonnative invasive vegetation begins to encroach and reduce habitat quality for white-tailed ptarmigan

**Livestock Management:** should prevent livestock grazing where ptarmigan occur

**Plant Shrubs:** willows may be planted for food and cover where they are lacking, especially near the treeline below alpine areas



Greg Lavaty



**Decrease Harvest:** may be necessary if the local population is declining at the current harvest level and data suggest mortality from hunting is additive or limiting population growth

**Wildlife or Fish Survey:** scream call counts are the only known survey technique, but they are limited because of the remote locations and small range of effectiveness; autonomous recording units (ARUs) may be effective in detecting species occurrence in remote areas

## White-winged dove

### General information

White-winged doves are generally found near the southern borders of the United States. They use agriculture and open areas for feeding and dense shrubs and trees for nesting and loafing. They also are found in urban and riparian areas. White-winged doves are light brown with a black mark on the cheek and a white band on the edge of their wing, for which they are named. They build nests, comprised mainly of twigs, in trees where they will lay only 1 or 2 eggs. Both the male and female will produce crop milk to feed their young, often eating snails or bone to increase calcium content. They often roost, forage, or migrate as flocks.

### Habitat requirements

**Diet:** a variety of grass and forb seeds (such as spurge, bristlegass, saguaro cactus, and brasil), waste grain from cropland and livestock feedlots; small areas of bare ground are beneficial for obtaining grit (small gravel) to help digest food

**Water:** free-standing water is required daily

**Cover:** tall shrubs and trees for nesting and loafing; nests are made of twigs placed on branches of shrubs or trees; nests may also be placed on the ground

### Wildlife management practices

**Control Nonnative Invasive Vegetation:** when nonnative invasive vegetation begins to compete with native vegetation and reduce habitat quality for white-winged doves

**Leave Crop Unharvested:** will provide additional food from a variety of small grain crops, such as millets, grain sorghum, wheat, and oats

**Livestock Management:** should prevent overgrazing forbs, which will reduce food availability for white-winged doves

**Plant Food Plots:** where additional food, specifically grain, is needed

**Plant Native Grasses and Forbs:** forbs may be planted in areas where food is limiting and planting is feasible

**Plant Shrubs:** in large open areas where nesting sites are limited

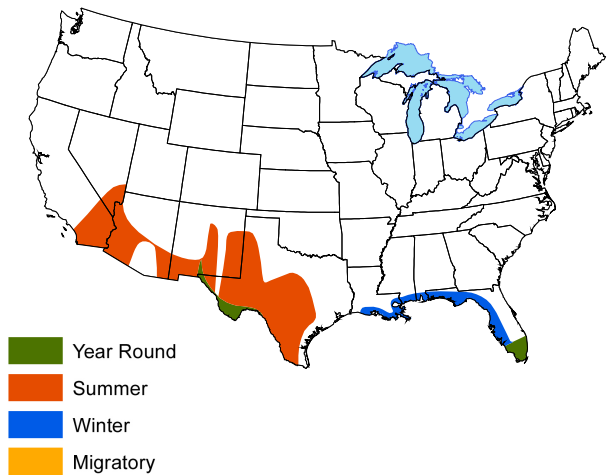
**Plant Trees:** especially along riparian areas where nesting cover is limiting

**Set-back Succession:** *Prescribed Fire* can be used to enhance seed availability; *Disking* and *Herbicide Applications* can provide bare ground; *Chainsawing*, *Chaining*, *Drum-chopping*, and *Root-plowing* can be used to reduce shrub cover and provide increased bare ground and forb production

**Soil Conservation Agriculture:** eliminate tillage in the fall



Gray Kramer



to allow access to waste grain

**Water Developments for Wildlife:** where water is limiting, small ponds, guzzlers, or windmills can provide free-standing water

**Wildlife or Fish Survey:** observational surveys, point counts, and autonomous recording units (ARUs) may be used to detect species occurrence and monitor 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. Wild turkeys nest in a wide variety of vegetation types from forests to fields, but herbaceous vegetation tall enough to conceal the nesting hen is often selected and may lead to increased nest success. 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

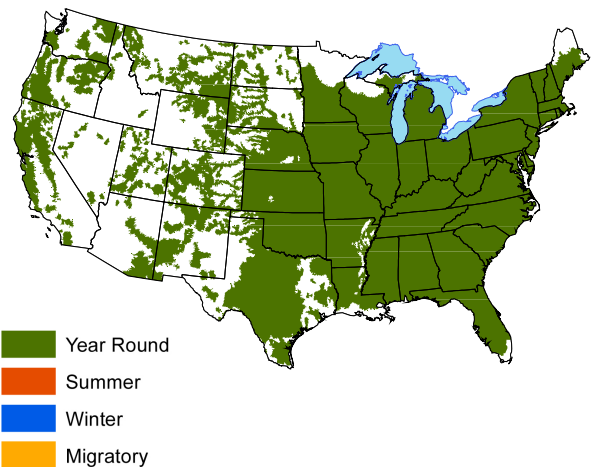
**Diet:** extremely varied; hard mast, especially acorns and beechnuts in the fall and winter; soft mast, such as blackberries, mulberries, and black cherry; insects and other invertebrates, including spiders and snails, are especially important for young poults and hens prior to nesting; miscellaneous 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:** forests, woodlands, and early successional plant communities for nesting; areas with herbaceous cover that does not limit poult movement or restrict visibility of the hen for brooding; 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

**Do Not Feed Wildlife:** supplemental feed elevates risk of disease associated with fungal toxins

**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

**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; autonomous recording units (ARUs) may be used to detect species occurrence, especially by detecting gobbles

## Wilson's snipe

### General information

Named after ornithologist Alexander Wilson, the Wilson's snipe is a ground-dwelling, migratory shorebird of North, Central, and South America that uses a variety of wetlands and riparian areas, especially where mudflats or sandbars are present. They breed, nest, and raise their broods during summer in their northern range and migrate to their southern range in the fall and winter. There are resident populations in the Pacific northwestern United States. High-quality Wilson's snipe habitat will have a marshy area with low herbaceous vegetation, and sparse shrubs, with a mudflat or sandbar nearby. Nests are constructed of grass bowls placed on the ground in herbaceous vegetation near water.

### Habitat requirements

**Diet:** invertebrates (insects and larvae)

**Water:** obtained through diet

**Cover:** bogs, fens, swamps, and marshy, vegetated edges of ponds, rivers, and streams are used for courtship and nesting; areas with moist soil or mud for insect probing (such as wet fields, marshy edges of water bodies, and exposed muddy banks or sandbars) are used for foraging

### Wildlife management practices

**Control Nonnative Invasive Vegetation:** may be necessary if nonnative plants are degrading habitat

**Livestock Management:** should not allow overgrazing to limit herbaceous vegetation adjacent to wetlands that is used for nesting; livestock access to wetlands should be restricted

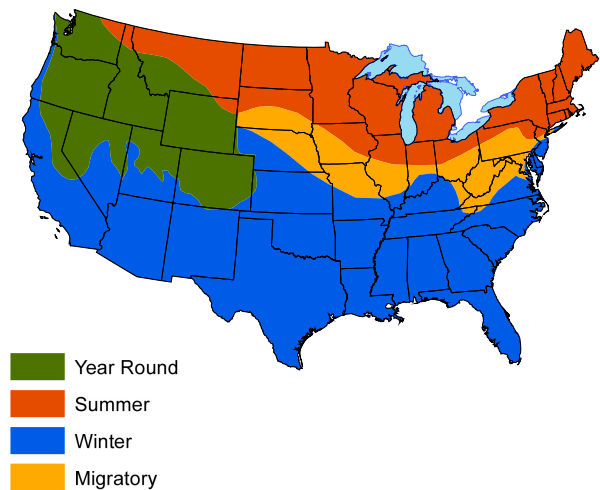
**Set-back Succession:** *Disking* and *Herbicide Applications* can provide bare ground; *Prescribed Fire* can maintain herbaceous groundcover; *Chaining* can reduce excessive shrub cover; *Chainsawing*, *Dozer-clearing*, *Root-plowing*, and *Herbicide Applications* may be used to remove trees and create wetland openings

**Water Developments for Wildlife:** shallow impoundments should be created where topography allows, providing increased feeding areas for snipe; water control structures allow manipulation of water levels, expose mudflats, and encourage aquatic vegetation

**Wildlife or Fish Survey:** flush counts, hunter harvest data, and breeding bird survey data are used to estimate population trends



David Ward



## 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

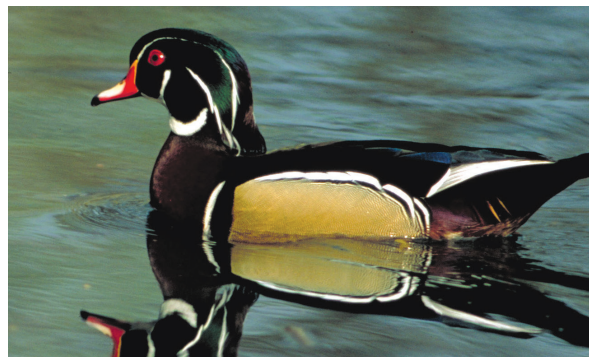
**Control Nonnative Invasive Vegetation:** when nonnative invasive vegetation begins to reduce habitat quality for wood ducks; this is applicable in wetlands as well as adjacent uplands where wood ducks may be foraging

**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; where cavity trees are limiting, non-mast-producing trees >12" in diameter may be killed via girdling and spraying to provide potential cavities for nesting

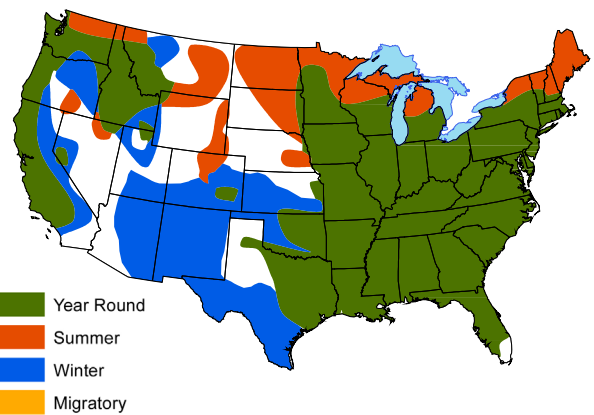
**Leave Crop Unharvested:** especially corn, to provide high-energy food source during fall and winter; this is especially important in fields that can be flooded and those adjacent to a water source used by wood ducks

**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



Thomas G. Barnes



population; nest boxes for wood ducks should be at least 100 yards apart and should not be placed within sight of 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 Developments for Wildlife:** shallow impoundments should be created where topography allows, providing increased feeding and nesting space for wood ducks; water control structures allow the water level to be manipulated to influence vegetation and food availability

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

## Yellow-rumped warbler

### General information

Yellow-rumped warblers are relatively large warblers found throughout the U.S., Canada, and Mexico. They breed throughout southern Canada, the western U.S., the Great Lakes region, and the northeastern U.S. in coniferous and mixed coniferous-deciduous forests and woodlands. They winter throughout the southern U.S. using open areas, especially shrub cover with plentiful soft mast. Yellow-rumped warblers eat insects gleaned from the branches and bark of trees and shrubs, and also may catch insects on-the-fly.

### Habitat requirements

**Diet:** ants, caterpillars, beetles, grasshoppers, craneflies, and spiders in spring and summer; various seeds and fruit during winter, such as bayberry, wax myrtle, juniper, poison ivy, greenbrier, grapes, Virginia creeper, and dogwoods

**Water:** necessary water obtained from diet, but free-standing water is used when available

**Cover:** coniferous or mixed forest and woodland during nesting season; occasionally nest in shrubs; nest is made of twigs, bark strippings, and weed stems and placed on small branches 5 to 50 feet above the ground; brushy thickets are used for feeding, loafing, and escape during winter

### Wildlife management practices

**Control Nonnative Invasive Vegetation:** when nonnative invasive vegetation begins to reduce habitat quality for yellow-rumped warblers

**Forest Management:** *Forest Stand Improvement* can improve forest structure for nesting and foraging

**Livestock Management:** should not allow overgrazing in wintering areas; livestock should be excluded from forested areas used for nesting

**Plant Shrubs:** where shrub cover is lacking in winter range

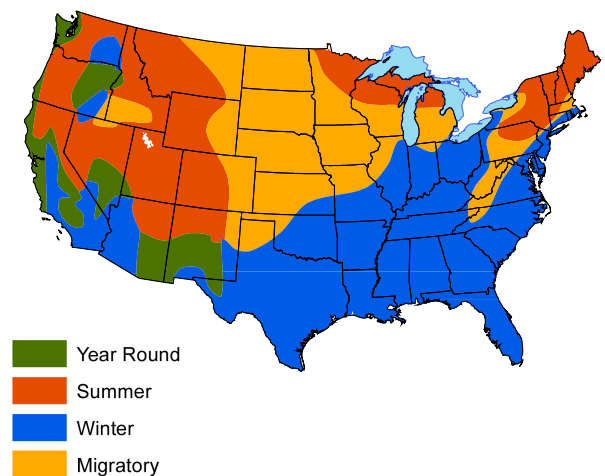
**Plant Trees:** where forest cover is limiting during the nesting season

**Set-back Succession:** *Prescribed Fire* and *Herbicide Applications* can be used to maintain open areas with scattered shrub cover in wintering areas

**Wildlife or Fish Survey:** point counts and autonomous recording units (ARUs) may be used to detect species occurrence and monitor population trends



Frank Miles



# Mammals

## American beaver

### General information

Beavers occur throughout most of North America. They are found in various wetlands that have permanent water with a variety of shrubs and trees adjacent to the water. Beavers build dams from tree branches, shrubs, and mud to form ponds that stabilize water levels, slow water movement, and provide shelter beneath the ice in winter. Beavers also build lodges from sticks and mud and dig burrows in banks of streams and rivers. Beavers eat the inner bark of shrubs and trees and store cuttings in caches (piles of branches) for use during winter. The ecological benefits provided by beavers cannot be overstated. Beavers are responsible for creating habitat for many species of birds, mammals, reptiles, amphibians, fish, and invertebrates. Without beavers, the distribution and abundance of many freshwater wetland-associated species would decline dramatically. Unfortunately, beavers were once such a valuable fur resource that trapping led to their extirpation in many parts of their former range. Today, beavers have rebounded with help from wildlife agency regulations and a lack of available fur market. In some areas, beavers have become a nuisance, as they cut down trees and dam ditches and streams in undesirable places. Their dams often flood crops, destabilize road edges, and kill trees. When beavers construct dams in places that cause problems, removal of the beaver is usually the best solution. If the dam is destroyed and the beavers remain, they will build the dam again.

### Habitat requirements

**Diet:** primarily bark from shrubs and trees; also some forbs and grasses

**Water:** prefer slow moving or still water at least 5 feet deep (to allow movement under water)

**Cover:** bottomland riparian areas that can be dammed to provide still water with sufficient depth

### Wildlife management practices

**Control Nonnative Invasive Vegetation:** when nonnative invasive vegetation begins to reduce habitat quality for American beaver

**Livestock Management:** should prevent livestock access to riparian areas and other wetlands where beaver is a focal species to prevent foraging on shrubs and young trees; this may include developing livestock watering facilities in upland areas beaver may use and maintain good water quality

**Plant Shrubs:** where beavers are desired, but not present, deciduous shrubs may be planted along riparian areas



Steve Hersey



where there are few trees or shrubs to make the area more attractive to beavers

**Plant Trees:** where beavers are desired but not present, deciduous trees may be planted along riparian areas where there are few trees or shrubs to make the area more attractive to beavers

**Decrease Harvest:** may be necessary where an increased beaver population is desired and trapping pressure has limited growth

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

**Water Developments for Wildlife:** a Clemson Beaver Pond Leveler or similar device can be installed in beaver dams to maintain water levels if needed

**Wildlife Damage Management:** should be implemented where beavers are causing problems for landowners, such as flooding timber, crops, roads, and other areas

**Wildlife or Fish Survey:** presence and extent of beaver activity (dams, evidence of cutting shrubs and trees) and trapper harvest data are used to estimate population trends over time

## American marten

### General information

Martens are found primarily in mature coniferous or deciduous-coniferous forest of the upper Great Lakes, Rocky Mountains, and the mountains of the Pacific region and New England. Martens are carnivorous. They give birth and raise young in dens of hollow trees, stumps or rock crevices.

### Habitat requirements

**Diet:** primarily voles, snowshoe hares, ruffed grouse, and squirrels; also opportunistically eat eggs, amphibians, soft mast, and carrion

**Water:** necessary water obtained from diet

**Cover:** mature conifer forests, but also mixed hardwood forests; dens in hollow logs, stump holes, and rock crevices

### Wildlife management practices

**Control Nonnative Invasive Vegetation:** when nonnative invasive vegetation begins to reduce habitat quality for American marten

**Forest Management:** *Forest Regeneration (Single-tree Selection, Group Selection)* and *Forest Stand Improvement* can diversify understory structure and composition and increase abundance of prey; snags should be retained for prey

**Plant Trees:** where additional forest cover is needed

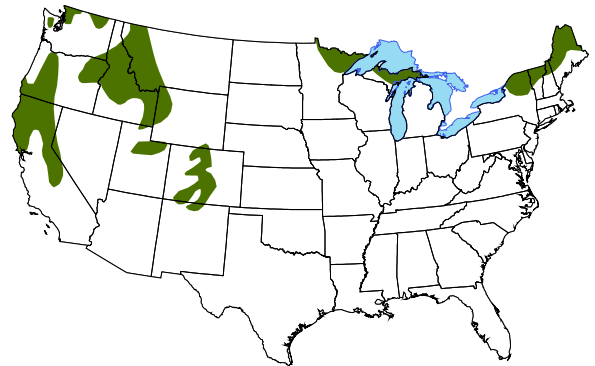
**Decrease Harvest:** may be necessary when trapping pressure is limiting population

**Increase Harvest:** where populations can sustain additional trapping pressure

**Wildlife or Fish Survey:** track counts, trapper harvest data, and trail cameras can be used to estimate population trends over time



USFWS



## Big brown bat

### General information

Big brown bats are one of 46 bat species in North America. They inhabit nearly all of the U.S., except south Florida and south-central Texas. They use a variety of vegetation types, from farmland to mature deciduous forest. Big brown bats are common in urban areas, including cities, parks, and suburban neighborhoods. They frequently use buildings and houses for daytime summer roosts and sometimes as winter hibernacula, but most hibernate in caves. Big brown bats are insectivores. Lactating females will eat their weight in insects daily. Males and females may roost individually or in small numbers, but males and females usually roost separately. Females may roost together in a maternal colony when pups are born and nursing. Females usually give birth to one or two pups, often in a hollow tree or attic. Big brown bats, as well as all other bat species, are nocturnal and are the only mammals capable of flying. Big brown bats will drink “on-the-wing” by dipping their lower jaw into a water source. Big brown bats hibernate in the winter in northern latitudes. Therefore, they do not actively feed during winter months, but instead rely on stored fat reserves.

### Habitat requirements

**Diet:** night-flying insects, especially beetles

**Water:** free-standing water is required daily when they are active

**Cover:** buildings and hollow trees are often used for daytime roosts; bat houses also may be used for daytime roosting; caves, mines and buildings are used for hibernation

### Wildlife management practices

**Nesting Structures:** may provide additional roost sites if natural roost sites are limiting in Urban areas

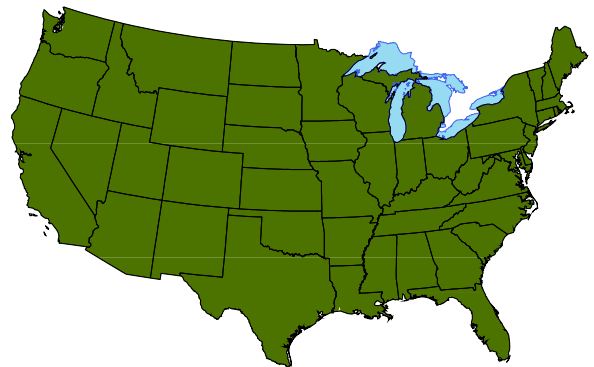
**Plant Trees:** in large open areas where few trees are present to promote future old trees that may provide roost sites

**Set-back Succession:** *Chainsawing, Dozer-clearing, Root-plowing, Herbicide Applications, and Prescribed Fire* (in rural areas) can be used to maintain more than 50 percent open areas for foraging; mowing may be used in **Urban** areas to maintain openings

**Water Developments for Wildlife:** where available open water is not available, small ponds and shallow impoundments may be constructed for drinking and



Don Pfitzer



to attract insects; water developments should be constructed with nothing above the water (such as fencing or bracing) so bats have an unobstructed flight path

**Wildlife Damage Management:** may be necessary when roosting or hibernating in areas occupied by humans

**Wildlife or Fish Survey:** observation counts and autonomous recording units (ARUs) are used to estimate population trends



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*, *Root-plowing*, and *Chainsawing* can be used to increase early succession

**Soil Conservation Agriculture:** 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

# Black-tailed jackrabbit

## General information

The black-tailed jackrabbit is a large, long-eared hare that lives in open, arid grasslands and brushland in the west. They prefer open pastures, even those that have been grazed, rather than thick brush for the increased visibility that helps them avoid predators. This jackrabbit has brownish fur peppered with black. Its hind feet are as large as its ears and used to run fast, up to 36 mph, to elude predators, such as hawks, coyotes, and bobcats. The large ears help regulate body heat by increasing or decreasing the blood flow through the ears. Black-tailed jackrabbits are mostly seen in the late evening hours and stay out at night to forage when they would be less likely to face predation. During the day, black-tailed jackrabbits rest in hollows made in the ground at the base of shrubs or in tall grass for shade. They mate year-round and produce 1 to 4 litters per year with up to 8 young per litter. They do not typically make a nest. Black-tailed jackrabbits eat a wide range of vegetation depending on what is available. A concentration of these jackrabbits may overgraze parts of a property and is considered a pest in many places. Their population can be affected by a reduction in forage as a result of brush encroachment and development.



Ryan Hagerty

## Habitat requirements

**Diet:** forage crops, twigs, cactus, mesquite, grasses, and forbs

**Water:** obtained from the foods they eat

**Cover:** open grasslands for foraging; shrubs and tall grasses for burrow cover

## Wildlife management practices

**Control Nonnative Invasive Vegetation:** when nonnative invasive vegetation begins to reduce habitat quality for black-tailed jackrabbits

**Livestock Management:** should provide adequate forage for jackrabbits where black-tailed jackrabbit is a focal species

**Plant Shrubs:** can provide cover where trees and shrubs are lacking

**Set-back Succession:** *Prescribed Fire, Chaining, Drum-chopping, and Root-plowing* can be used to reduce shrub cover where necessary

**Decrease Harvest:** may be necessary if harvest has been excessive and an increase in the black-tailed jackrabbit population is desired

**Increase Harvest:** where population can withstand additional harvest for recreational hunting or when population needs to be lowered



**Wildlife Damage Management:** is necessary when jackrabbits reduce forage available for livestock

**Wildlife or Fish Survey:** observation counts are used to monitor population trends