

Wildlife Species

This chapter contains information on species featured in each of the ecoregions. Species are grouped by Birds, Mammals, Reptiles, Amphibians, and Fish. Species are listed alphabetically within each group. A general description, habitat requirements, and possible wildlife management practices are provided for each species. Wildlife management practices for a particular species may vary among ecoregions, so not all of the wildlife management practices listed for a species may be applicable for that species in all ecoregions. Refer to the WMP charts within a particular ecoregion to determine which practices are appropriate for species included in that ecoregion.

The species descriptions contain all the information needed about a particular species for the WHEP contest. However, additional reading should be encouraged for participants that want more detailed information. Field guides to North American wildlife and fish are good sources for information and pictures of the species listed. There also are many Web sites available for wildlife species identification by sight and sound.

Information from this section will be used in the Wildlife Challenge at the National Invitational. Participants should be familiar with the information presented within the species accounts for those species included within the ecoregions used at the Invitational.

It is important to understand that when assessing habitat for a particular wildlife species and considering various WMPs for recommendation, current conditions should be evaluated. That is, WMPs should be recommended based on the current habitat conditions within the year. Also, it is important to realize the benefit of a WMP may not be realized soon. For example, trees or shrubs planted for mast may not provide cover or bear fruit for several years.

Index to Wildlife Species

Note: Refer to this list for the correct spelling and capitalization of species for Activity I (Wildlife Challenge).

Birds (86)

American bittern	golden-cheeked warbler	prairie falcon
American black duck	golden-fronted woodpecker	prothonotary warbler
American kestrel	golden-winged warbler	pyrrhuloxia
American robin	grasshopper sparrow	red-cockaded woodpecker
American wigeon	great horned owl	red-eyed vireo
American woodcock	greater prairie-chicken	red-tailed hawk
barred owl	greater roadrunner	redhead
black-backed woodpecker	greater sage-grouse	ring-necked pheasant
black-bellied whistling duck	hairy woodpecker	rock pigeon
black-capped chickadee	house finch	ruby-throated hummingbird
black-throated sparrow	house sparrow	ruffed grouse
blue-winged teal	house wren	sage thrasher
Brewer's sparrow	ladder-backed woodpecker	scaled quail
broad-winged hawk	lark bunting	sharp-tailed grouse
brown thrasher	Lawrence's goldfinch	song sparrow
California quail	loggerhead shrike	sooty grouse
California thrasher	long-billed thrasher	southwest willow flycatcher
Canada goose	mallard	spotted sandpiper
common nighthawk	marbled murrelet	spotted towhee
crested caracara	mountain bluebird	Virginia rail
crissal thrasher	mourning dove	western bluebird
dickcissel	northern bobwhite	western kingbird
dusky grouse	northern flicker	white-tailed ptarmigan
eastern bluebird	northern goshawk	white-winged dove
eastern meadowlark	northern harrier	wild turkey
European starling	northern pintail	Wilson's snipe
ferruginous hawk	Nuttall's woodpecker	wood duck
Gambel's quail	ovenbird	yellow-rumped warbler
golden eagle	peregrine falcon	

Mammals (34)

American beaver
American marten
big brown bat
black bear
black-tailed jackrabbit
black-tailed prairie dog
bobcat
Brazilian free-tailed bat
collared peccary
Columbian black-tailed deer
common muskrat
coyote

desert cottontail
eastern cottontail
eastern fox squirrel
eastern gray squirrel
elk
fisher
gray fox
Indiana bat
mink
moose
mountain cottontail
mountain lion

New England cottontail
pronghorn
raccoon
red fox
red squirrel
river otter
Rocky Mountain mule deer
snowshoe hare
white-tailed deer
wild pig

Reptiles (9)

eastern box turtle
eastern indigo snake
eastern snapping turtle

Gila monster
gopher tortoise
plains hog-nosed snake

Texas horned lizard
timber rattlesnake
western diamond-backed rattlesnake

Amphibians (7)

American bullfrog
crawfish frog
Monterey salamander
northern red-legged frog

rough-skinned newt
tiger salamander
wood frog

Fish (6)

bluegill
channel catfish
Coho salmon

cutthroat trout
largemouth bass
rainbow trout

Range map keys for wildlife species

Range map key for birds:

 Year Round
 Summer
 Winter
 Winter
 Migratory

*Range map key for mammals,
reptiles, and amphibians:*

 Year Round

Range map key for fish:

 Native Range
 Introduced Range

Birds

American bittern

General information

The American bittern is a medium-sized heron typically found in dense emergent vegetation in moderately shallow freshwater wetlands. This migratory bird may be found near the coasts during winter. It is rarely seen except when flying. It moves slowly through vegetation stalking food and is well camouflaged with brown and white streaks. American bitterns occasionally use adjacent upland grasslands for nesting and foraging. Larger semi-permanent wetland complexes are favored over small, isolated wetlands.

Habitat requirements

Diet: fish, amphibians, snakes, insects, and crustaceans

Water: obtained from food

Cover: dense emergent wetland vegetation, such as reeds, cattails, or sedges; nest is built in dense cover a few inches above shallow water; water depth should be maintained at less than 2 inches throughout the year

Wildlife management practices

Control Nonnative Invasive Vegetation: is necessary when nonnative invasive vegetation begins to outcompete native vegetation, limit food abundance, or alter the hydrology of a wetland favoring dryer land.

Livestock Management: livestock should be excluded from wetlands managed for bitterns

Repair Spillway/Levee: if not functioning properly

Set-back Succession: *Periodic Prescribed Fire, Disking,* and *Herbicides* may be used to maintain appropriate vegetation structure. However, disturbance should be infrequent (2-5 years) because bitterns prefer dense cover.

Water Control Structures: should be installed when wetlands do not have control structures to maintain appropriate water depths. Drawdowns can be conducted to favor appropriate vegetation. Drawdowns should be conducted slowly and after the breeding season (mid-August or later).

Water Developments for Wildlife: shallow wetlands can be constructed if habitat is not present

Wildlife or Fish Survey: bitterns are typically surveyed by listening for calls. Also, ropes can be dragged across the vegetation between two or more observers to flush the birds.



Sallie Gentry



American black duck

General information

The American black duck is a large dabbling duck similar in size to mallards, ranging from 19 to 25 inches in length. They resemble the female mallard in color, though their plumage appears darker. The male and female black duck are similar in appearance. They have orange legs and feet and violet wing patches. The male black duck has a yellow to green bill, whereas hens have olive bills. Black ducks interbreed regularly and extensively with mallards. American black ducks frequent forested wetlands, tidewater areas, and coastal marshes of the eastern United States. They feed in a variety of shallow wetlands and agricultural fields. Their nests are built of vegetation and lined with down, found most often on the ground along edges of heavy cover, and generally close to water.

Habitat requirements

Diet: aquatic plants, invertebrates, waste corn, and grain are primary diet items

Water: obtains water through diet

Cover: forested and emergent wetlands for loafing; they also will feed in flooded grain fields

Wildlife management practices

Control Nonnative Invasive Vegetation: when nonnative invasive vegetation begins to degrade loafing or foraging cover in wetlands or nesting cover in uplands

Leave Crop Unharvested: to provide a winter food source

Livestock Management: livestock should be excluded from wetlands managed for waterfowl

Plant Food Plots: shallowly flooded grain plots can provide a beneficial food source for migrating and wintering black ducks

Plant Native Grasses and Forbs: where nesting cover is lacking

Repair Spillway/Levee: if not functioning properly

Set-back Succession: *Prescribed Fire* to rejuvenate vegetation in nesting areas and to maintain proper water and vegetation interspersions in wetlands

Tillage Management: eliminating fall tillage can provide waste grain in the winter

Water Control Structure: control water level in wetlands managed for waterfowl

Water Developments for Wildlife: shallow impoundments can be important for migrating and wintering waterfowl; flooding grain fields and planting food plots in winter makes food more available



Wildlife or Fish Survey: black ducks are secretive and are often in woody emergent wetlands where accurate surveys are difficult. Nonetheless, flush counts and aerial surveys are most often used to estimate black duck populations.

American kestrel

General information

The American kestrel is a common, widespread, small raptor resembling the size and shape of a mourning dove. The males are a colorful slate-blue on the top of the head and on the wings, with a reddish colored back and tail. Females have reddish brown wings, but both sexes have characteristic black slashes on the sides of their face. They can be found in a variety of open environments, including deserts and grasslands. Often spotted perching on power lines or other tall structures searching for prey, they swiftly move their tail to keep balanced in the wind. Because of their small size, American kestrels are preyed upon by larger raptors, such as northern goshawks and red-tailed hawks, and even snakes. They nest in cavities (often old woodpecker cavities or natural tree hollows) with loose material on the floor and have been noted to readily use man-made nesting boxes. Males search out and sometimes even defend a cavity, and later present it to a potential mate. Clutches usually contain 4 to 5 eggs. Chicks are altricial, meaning they are helpless for a couple weeks after hatching and must be fed and cared for. The American kestrel is declining in some areas of North America, including the Pacific Coast and Florida, where it is listed as threatened. The decline in these areas can be attributed to poor habitat quality with a lack of nesting cavities, early successional cover, and food resources.

Habitat requirements

Diet: primarily insects and small mammals associated with open areas

Water: obtain necessary water from diet and do not need water for drinking

Cover: nest in tree cavities and other sites including holes in cliffs, canyon walls, and artificial nest boxes

Wildlife management practices

Control Nonnative Invasive Vegetation: when nonnative invasive vegetation competes with native plant species and reduces habitat quality for kestrels or their prey

Create Snags: where needed for perches and increase potential nest cavities

Field Borders: to increase cover for prey around row crop fields

Livestock Management: to prevent overgrazing and maintain sufficient cover for prey and maintain early succession vegetation with scattered shrub cover

Nesting Structures: can be used where a lack of natural nesting cavities is limiting the population; nest boxes can be placed on fence posts in open areas, and even on the back of road-side signs in open landscapes



Robert Burton



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

Plant Shrubs: in large open areas where shrub cover is limiting

Plant Trees: where trees are lacking for future perching sites and cavities for nesting

Set-back Succession: *Prescribed Fire, Chaining, Drum-chopping, and Herbicide Applications* can maintain shrub cover and stimulate herbaceous cover; *Dozer-clearing* and *Root-plowing* can be used to convert forest to early succession

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

Wildlife or Fish Survey: observation counts, point counts, and nest box usage rates may be used to estimate trends in populations

American robin

General information

American robins use a wide assortment of vegetation types, from mowed grassy areas to forested areas. In urban areas, robins use large open areas and nearby trees and shrubs. Parks, golf courses, and lawns in residential areas are attractive to robins. They are found throughout North America, though they may migrate out of northern latitudes during winters with sustained cold and snow. Robins build a nest of grass and mud on a tree or shrub limb, but will occasionally nest on building ledges. Robins spend considerable time on the ground feeding on earthworms, but also will perch on branches to eat berries, fruit, and insects.



Lee Karney

Habitat requirements

Diet: insects and worms during spring and summer; soft mast from shrubs and trees in winter; seldom use artificial feeders

Water: require water daily in warm seasons; obtain water from low-lying areas, ponds, and rain-filled gutters

Cover: shrubs, evergreen trees, and deciduous trees used for nesting and escape; evergreen trees often used for early nests



Wildlife management practices

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

Plant Shrubs: where soft mast is lacking; examples might include dogwoods, hollies, golden currant, and winterberry

Plant Trees: both deciduous and evergreen; where nesting sites may be limiting

Set-back Succession: *Prescribed Fire, Disking, and Mowing* can be used to set-back succession and provide suitable structure for robins; *Mowing* may be used to maintain foraging and loafing cover for robins in **Urban** areas

Water Developments for Wildlife: birdbaths and pans of water can be provided in urban areas; do not place water in areas where cats can catch the birds; cats should be removed

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

American wigeon

General information

The American wigeon is a medium-sized dabbling duck. It is easily distinguished from other dabbling ducks by its round head, short neck, and small bill. The American wigeon's body ranges from 17 to 23 inches long. The male (drake) has a mask of green feathers around its eyes and a cream-colored cap that runs from its bill to the crown of its head. This cap gives this bird its other common name, baldpate, which means bald head. Drakes also can be identified in flight by a large white shoulder patch on each wing. Hens have primarily gray and brown plumage. Both sexes have bluish-gray black tipped bills and gray legs and feet. The American wigeon has a very distinctive call with the drake producing a three-note whistle and the hens a low growl quack. They nest in areas of tall grass or shrubs, often far from water. The nest is constructed on the ground in a depression lined with grasses and down.

Habitat requirements

Diet: mostly aquatic plants and a few insects, and mollusks

Water: obtains water through diet

Cover: shallow freshwater wetlands, ponds, marshes, and rivers

Wildlife management practices

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

Livestock Management: livestock should be excluded from wetlands managed for waterfowl

Plant Native Grasses and Forbs: where nesting cover is limited

Plant Shrubs: where nesting cover is limited

Repair Spillway/Levee: if not functioning properly

Set-back Succession: *Prescribed Fire* can be used to rejuvenate vegetation in nesting areas and to maintain proper water and vegetation interspersions in wetlands

Tillage Management: eliminate fall tillage to encourage vegetation in agricultural fields for grazing opportunities

Water Control Structures: to control water level in wetlands managed for waterfowl

Water Developments for Wildlife: shallow impoundments can be important for migrating and wintering waterfowl; flooding grain fields and planting food plots in winter makes food more available

Wildlife or Fish Survey: flush counts and aerial surveys are used to estimate populations in fall and winter



Donna Dewhurst



American woodcock

General information

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

Habitat requirements

Diet: invertebrates (earthworms represent 60 percent of diet)

Water: obtained through diet

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

Wildlife management practices

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

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

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

Livestock Management: exclude livestock from areas managed for American woodcock

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

Plant Trees: where there is a lack of forest cover

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

Wildlife or Fish Survey: surveys on singing grounds can



Richard Baetsen



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

Barred owl

General information

Barred owls are found in mature forests, often near water, throughout eastern North America and the Pacific Northwest. They roost on limbs and cavities during the day. They nest in cavities of large trees and snags, and will readily use man-made nesting structures for nesting and roosting. They also may nest on old platform nests built by other owls, hawks, crows, and squirrels. They hunt primarily at night, scanning for prey with keen vision and hearing and flying silently from tall perches. Their hooting call of “*Who cooks for you? Who cooks for you all?*” can be heard all year and is a common night sound where they occur. Barred owl populations have increased and spread since the mid-1960s.



Mark Musselman

Habitat requirements

Diet: primarily small mammals, birds, amphibians, reptiles, fish, and invertebrates.

Water: requirements largely unknown. They likely obtain their water needs from the foods they consume.

Cover: mature forests with an abundance of relatively large trees and cavities, often near water. They also may use artificial cavities (nest boxes) when placed in mature forests where these birds are found.

Wildlife management practices

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

Create Snags: where cavities are lacking for adequate reproduction

Forest Management: *Forest Regeneration (Shelterwood)* harvests can result in a more open, park-like forest resulting in a more open understory to favor prey

Livestock Management: livestock should be excluded from forests to maintain understory for prey

Nesting Structures: nest boxes may be installed in areas where nesting cavities are limiting barred owls. However, a lack of natural cavities is uncommon in mature forests that represent habitat for barred owls.

Plant Trees: in large open areas to create future habitat

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

Wildlife Damage Management: barred owls can prey upon small pets and domestic poultry. Exclusion practices should be used to discourage damage.

Wildlife or Fish Survey: call counts are used to monitor populations



Black-backed woodpecker

General information

Black-backed woodpeckers are primarily found in recently burned forests, specifically coniferous forests, where they eat bark beetles and other wood-boring beetles. Abundance of black-backed woodpeckers declines with time since fire. Habitat generally remains for 7-8 years post fire.

Habitat requirements

Diet: bark beetles and wood-boring beetles in recently burned, old-growth coniferous forests

Water: water is obtained from food

Cover: nest in the sapwood of relatively hard, dead trees with little decay that have been recently burned with high concentrations of beetle larvae.

Wildlife management practices

Control Nonnative Invasive Vegetation: when nonnative invasive species begin to reduce habitat quality for black-backed woodpeckers

Plant Trees: in areas where forest regeneration is not occurring, trees may be planted to provide future habitat for the black-backed woodpecker. However, it will be many decades before these trees are of sufficient size to provide habitat for this woodpecker.

Set-back Succession: relatively intense *Prescribed Fire* in old-growth coniferous forests is necessary for the occurrence of black-backed woodpeckers. However, logging post-fire significantly decreases their occurrence.

Wildlife or Fish Survey: point counts can be conducted to listen for the distinctive drumming of the black-backed woodpeckers during the mating season



Glen Tepke



Black-bellied whistling duck

General information

The black-bellied whistling duck is a medium-sized duck that ranges in body length from 19 to 22 inches. The males and females look alike. They have a long red bill, long gray head with a gray face and long pink legs. The belly and tail are black, and the body, back of neck and cap are chestnut brown. The black-bellied whistling duck has a distinctive white wing bar that is unique among whistling ducks. Their call is a high-pitched, soft wheezy whistle of four to six notes, accented on the second or third syllable. Black-bellied whistling ducks are primarily cavity nesters and will use nesting boxes, but may nest on the ground if no cavities are present. The black-bellied whistling duck is unique among ducks in that they exhibit a strong bond between pairs, often staying together for many years. This duck is mainly non-migratory with only birds living in the extreme northern portion of their range moving south in winter.

Habitat requirements

Diet: aquatic plants, grass, grain, insects, and mollusks

Water: obtains water through diet

Cover: tree-lined bodies of water, prefer shallow freshwater ponds, lakes, marshes, cultivated fields, and reservoirs with plentiful vegetation; prefer to nest in tree cavities

Wildlife management practices

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

Create Snags: to provide potential cavity nesting sites

Leave Crop Unharvested: to provide grain food source

Livestock Management: livestock should be excluded from wetlands managed for waterfowl to maintain water quality and prevent sedimentation

Nesting Structures: nest boxes should be erected where there is a lack of nesting cavities

Plant Food Plots: grain plots can provide food source

Plant Trees: trees planted adjacent to wetlands can provide perching and nest cavity opportunities

Repair Spillway/Levee: if not functioning properly

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

Water Control Structures: should be installed if not present to control water level in wetlands managed for waterfowl

Water Developments for Wildlife: shallow impoundments can be important for migrating and wintering waterfowl; flooding grain fields and planting



Robert Burton



food plots in winter makes food more available

Decrease Harvest: although black-bellied whistling ducks are considered migratory waterfowl, many local populations do not migrate and thus, landowners can influence populations; harvest may be decreased when local populations is declining, habitat quality is good, and data suggest mortality rate from hunting is additive

Wildlife or Fish Survey: flush counts and aerial surveys are used in fall and winter to estimate populations; nest box usage in summer can provide an index to population

Black-capped chickadee

General information

Black-capped chickadees occur throughout the upper two-thirds of the U.S. They are found in shrublands and forests. They nest in cavities in dead or hollow trees. Black-capped chickadees eat insects and spiders from the branches and bark of trees and shrubs. They also will visit bird feeders. They are often seen on the edges of forested areas.

Habitat requirements

Diet: ants, caterpillars and spiders from branches, leaves and bark of trees and shrubs; also seeds from bird feeders and soft mast from shrubs

Water: obtain necessary water from snow and surface water

Cover: nest in cavities, usually in a dead or hollow tree; they can excavate a cavity only in soft wood or rotted wood and will use woodpecker holes, natural cavities, and man-made boxes; thick shrub and tree canopies provide necessary cover

Wildlife management practices

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

Create Snags: trees may be killed where nesting cavities are limited to stimulate creation of additional cavities

Forest Management: *Forest Stand Improvement* practices can improve understory structure by increasing shrub cover within a stand when canopy cover exceeds 80 percent

Livestock Management: should prevent livestock from degrading shrub cover

Nesting Structures: can be provided in areas where nesting cavities are limiting

Plant Shrubs: in large open areas to provide shrub cover

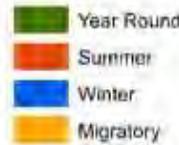
Plant Trees: where additional forest cover is needed

Set-back Succession: *Prescribed Fire* can maintain shrubby areas and thick understory cover in woods

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



Donna Dewhurst



Black-throated sparrow

General information

Black-throated sparrows are associated with shrublands, specifically sparsely vegetated desert shrubland, including mesquite, cacti, chaparral, and juniper in the southwest U.S. Their diet is mainly seeds and insects. Black-throated sparrows nest near the ground in small shrubs.

Habitat requirements

Diet: insects, seeds and green herbaceous vegetation

Water: require water frequently during dry and cool seasons, especially when green herbaceous vegetation and insects are not available

Cover: nests are made from small twigs, grass, and stems placed in small shrubs near the ground; shrubs and cacti are used for hiding cover

Wildlife management practices

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

Livestock Management: should prevent overgrazing within shrub cover

Set-back Succession: *Prescribed Fire, Chaining, and Drum-chopping* can be used to rejuvenate shrublands when they become overgrown and limit herbaceous groundcover

Water Developments for Wildlife: can be beneficial where water is limiting

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



James W. Arterburn



Blue-winged teal

General information

The blue-winged teal is a relatively small dabbling duck associated with ephemeral wetlands, inland marshes, lakes and ponds. They inhabit shorelines more than open water and primarily nest within a few hundred feet of wetlands in the prairie pothole ecoregion of the northern Great Plains. Nests are found primarily in dense grassland cover. Hayfields sometimes will be used for nesting if adequate grass stubble remains. Blue-winged teal are surface feeders and prefer to feed on mud flats or in shallow water where floating and shallowly submerged vegetation is available, along with abundant small aquatic animal life. Shallow wetlands with both emergent vegetation and open water are required for brooding cover. During spring and fall migration, shallow wetlands and flooded fields are used for loafing and feeding. Blue-winged teal begin fall migration before any other waterfowl. They winter along the Gulf Coast in the Deep South and in Central and South America.

Habitat requirements

Diet: aquatic vegetation, seeds and aquatic insects; feeding primarily confined to wetlands

Water: relatively shallow wetlands required for brood rearing, feeding, and loafing

Cover: dense native grass cover used for nesting; brooding cover consists of a mix of open water and emergent vegetation

Wildlife management practices

Control Nonnative Invasive Vegetation: when nonnative invasive vegetation begins to compete with native vegetation and degrade habitat quality

Leave Crop Unharvested: to provide additional food if the grain can be shallowly flooded

Livestock Management: livestock should be excluded from nesting areas and from wetlands managed for waterfowl

Plant Food Plots: can provide additional food resources during migration and winter if the area is shallowly flooded when the ducks arrive

Plant Native Grasses and Forbs: for nesting cover where suitable cover is lacking

Repair Spillway/Levee: if not functioning properly

Set-back Succession: *Prescribed Fire, Disking, and Herbicide Applications* can be used to maintain wetlands and associated upland nesting cover in the desired structure and composition

Tillage Management: delaying cropland tillage, especially wheat, in spring may allow nesting in standing stubble



Dave Menke



Water Control Structures: if none present to allow managers to manipulate water levels in wetlands as needed

Water Developments for Wildlife: flooded fields provide important areas for teal during migration; constructing small dikes for temporary flooding provides shallow sheet-water teal prefer for feeding and loafing

Wildlife or Fish Survey: flush counts can provide estimates of nesting teal

Brewer's sparrow

General information

Brewer's sparrows are found in the Great Basin south to southern California and New Mexico and in the northern Rocky Mountains of the Yukon and British Columbia. Their habitat contains sagebrush in the Great Basin and alpine meadows in the Rocky Mountains. They are associated with relatively large areas of shrubland; shrub-dominated areas less than one-half acre are not usually used.

Habitat requirements

Diet: a variety of insects and spiders from leaves and branches of shrubs; seeds of forbs and grasses

Water: necessary water is obtained from diet, but will use other water sources when available

Cover: dense sagebrush 20 inches to 30 inches tall for nesting and escape; amount and height of shrub cover is important

Wildlife management practices

Control Nonnative Invasive Vegetation: when nonnative invasive vegetation begins to compete with native vegetation and degrade habitat quality

Livestock Management: grazing regimes should promote shrub growth

Plant Shrubs: in large open areas where shrub cover is limiting

Set-back Succession: *Herbicide Applications* may be used to adjust species composition of the plant community

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



Dave Menke



Broad-winged hawk

General information

Broad-winged hawks use mixed upland hardwood forest and woodlands (oaks, hickories, maples, beech) and mixed conifer-hardwoods. Broad-winged hawks are normally solitary and inconspicuous. They hunt within the forest near small openings in the canopy.

Habitat requirements

Diet: rodents and other small mammals (such as mice, chipmunks, squirrels, shrews, moles) but also snakes, lizards, caterpillars, grasshoppers, beetles, crickets, crawdads, and some small birds

Water: obtain necessary water from diet

Cover: nest among tall trees in the woods with openings and water nearby; will sometimes nest in old crow, hawk, or squirrel nests; they hunt throughout the forest, especially where small canopy gaps occur

Wildlife management practices

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

Forest Management: *Group Selection* harvest and *Forest Stand Improvement* should encourage understory development and enhance habitat for a variety of prey species

Livestock Management: should exclude cattle from forested areas to retain an understory that provides cover for a variety of small prey mammals

Plant Shrubs: in areas where tree cover is lacking, such as large open fields

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

Set-back Succession: *Prescribed Fire* may be used to maintain diverse understory structure in forests with broken canopies that allow sufficient sunlight

Water Developments for Wildlife: will enhance habitat for a variety of prey species

Wildlife or Fish Survey: observation surveys are commonly used to estimate population trends



Greg Lavaty



Brown thrasher

General information

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

Habitat requirements

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

Water: water requirements are not known

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

Wildlife management practices

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

Edge Feathering: will enhance habitat around the edge of fields

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

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

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

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

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

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



Dan Sudia



California quail

General information

California quail are found most commonly in chaparral, sagebrush, and oak savannas and woodlands. They require shrubby cover for roosting, escape cover, loafing, and foraging. Ideal California quail habitat is a mixture of shrub cover well interspersed with annual and perennial forbs and grasses. Adult California quail eat mostly seeds, leaves, and flowers from grasses, shrubs, and trees. The diet of juveniles, however, consists largely of invertebrates.

Habitat requirements

Diet: about 70 percent of diet consists of seeds and green foliage from forbs and grasses, particularly annual grasses; diet supplemented with soft mast and seeds from a variety of shrubs; juveniles less than 3 weeks old eat insects; by 12 weeks of age, diet is same as adults

Water: obtain necessary water through diet except during periods of heat and drought when freestanding water is required for drinking

Cover: require cover near feeding areas or habitat quality declines dramatically; shrubby cover used for roosting, escape cover, and loafing; nest on the ground in grasses and forbs

Wildlife management practices

Control Nonnative Invasive Vegetation: when nonnative invasive vegetation begins to compete with native vegetation and reduce habitat quality; nonnative sod grasses are particularly problematic

Edge Feathering: will provide escape cover and increased foods

Field Borders: to increase usable space around crop fields

Leave Crop Unharvested: to provide additional food through fall and winter, especially grain crops

Livestock Management: proper grazing can be used to maintain adequate groundcover for nesting and forage, and prevent livestock from destroying cover near water sources

Plant Food Plots: grain will be eaten by quail when available

Plant Native Grasses and Forbs: to improve nesting cover and food availability in areas where groundcover is lacking or needs to be improved

Plant Shrubs: in relatively large open areas where shrub cover is lacking

Plant Trees: where woody cover is lacking, species such as oaks may be planted



Gary Kramer



Set-back Succession: Prescribed Fire and Disking are recommended to maintain herbaceous cover and enhance food plants; Prescribed Fire, Chaining, Drum-chopping, and Herbicide Applications can maintain and rejuvenate shrubby areas

Tillage Management: eliminate fall tillage to provide waste grain

Water Developments for Wildlife: guzzlers, catchment ponds, windmills, and spring developments can be beneficial to California quail where water may be limiting

Decrease Harvest: may be necessary when surveys show a decline in the local population and current data suggest mortality from hunting harvest is additive or limiting population growth

Wildlife or Fish Survey: call counts and flush counts may be used to estimate population density

California thrasher

General information

California thrashers are found in shrubby chaparral cover in the Mediterranean ecoregion. The shrub cover they use requires fire for maintenance, but thrashers are not typically found in recently burned areas until desirable shrub structure develops following fire.

Habitat requirements

Diet: spiders, beetles, Jerusalem crickets, and other insects may constitute more than 90 percent of diet during breeding season; during the rest of the year, a variety of seeds and hard and soft mast from shrubs are eaten

Water: exact water requirements are unknown, but because California thrashers occur throughout arid ecoregions, it is unlikely they require freestanding water; they will, however, drink freestanding water when available

Cover: dense shrubby cover is required for nesting

Wildlife management practices

Control Nonnative Invasive Vegetation: when nonnative invasive vegetation begins to compete with native vegetation and habitat quality begins to decline

Forest Management: *Forest Regeneration*, particularly *Clearcut*, *Shelterwood*, and *Seed-Tree*, provides dense shrub cover for nesting and foraging

Livestock Management: should prevent livestock from damaging or limiting shrub cover

Plant Shrubs: in relatively large open areas where shrub cover is lacking

Set-back Succession: *Prescribed Fire*, *Drum-chopping*, and *Chaining* can maintain and rejuvenate shrub cover

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



Glen Tepke



Canada goose

General information

The breeding range of the Canada goose extends across the northern half of the U.S. across Canada and Alaska. Although an increasing number of Canada geese winter in Canada, the majority fly south to southern areas of the U.S. and Mexico. Many southern areas of the U.S. have year-round resident populations of Canada geese, which is not reflected on the map below. Canada geese nest and rear young in wetlands with relatively sparse to dense emergent aquatic vegetation. Riparian areas and wetlands containing 20 percent tall emergent aquatic vegetation and 80 percent open water are usually preferred areas for Canada geese.

Habitat requirements

Diet: variety of forbs and grasses, grains, and some aquatic insects

Water: relatively open water wetlands, ponds, and lakes are used for brood rearing, feeding, and loafing

Cover: nest in a variety of places, such as mats of bulrushes, tops of muskrat houses, and most of all, in relatively thick cover on islands, usually within 200 feet of the water's edge

Wildlife management practices

Control Nonnative Invasive Vegetation: applies to both uplands and wetlands; nonnative invasive vegetation can degrade nesting cover in uplands and make wetlands unattractive to Canada geese

Leave Crop Unharvested: to provide additional food during winter

Livestock Management: proper grazing can maintain lush vegetation for foraging Canada geese; restricting livestock grazing from areas where geese may nest can increase nesting success

Plant Food Plots: both forage (green growing wheat) and grain (corn) food plots can provide additional food where food is limited

Plant Native Grasses and Forbs: to provide nesting cover where limiting

Repair Spillway/Levee: if not functioning properly

Set-back Succession: *Prescribed Fire* and *Herbicide Applications* set back succession in cattail-choked wetlands and stimulate lush vegetation in uplands where geese may feed; *Chainsawing* and *Dozer-clearing* can create more early succession for nesting cover near wetlands

Tillage Management: fall tillage in grain crops can be delayed until spring to provide supplemental food source



Ryan Hagerly



Water Control Structures: allow water level manipulation to maintain 80 percent open water and 20 percent emergent vegetation

Water Developments for Wildlife: can be used to temporarily flood fields for feeding and raising broods

Wildlife Damage Management: may be needed where Canada geese damage lawns, golf courses, and crop fields, and other areas in cities and suburban areas

Wildlife or Fish Survey: broods counts and visual surveys can provide estimates of goose abundance

Common nighthawk

General information

Common nighthawks are found throughout the U.S. during summer, but migrate to South America during winter. Common nighthawks are found in grasslands, open woodlands, cities, and towns. In cities and towns, they are often seen flying over city parks and other open areas in late evening and early morning. Common nighthawks nest on bare soil or gravel areas common in fields or on rooftops. They use open fields for foraging. They are nocturnal and feed “on-the-wing” on flying insects.

Habitat requirements

Diet: flying insects, including flying ants, mosquitoes, moths, and June bugs

Water: obtain ample water from diet, but water sources attract insects, which provide food for nighthawks

Cover: riparian areas, ridge tops, flat rooftops, and other places with numerous sand and gravel areas are favorite nesting locations

Wildlife management practices

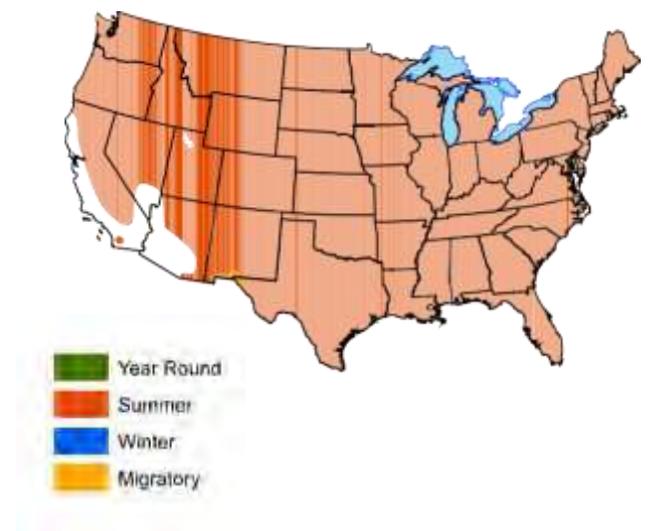
Livestock Management: grazing regimes that maintain open herbaceous areas provide foraging sites for common nighthawks

Set-back Succession: *Prescribed Fire*, *Disking*, and *Mowing* can maintain early successional areas for foraging; *Disking* and *Herbicide Applications* can promote bare ground for nesting; *Chainsawing*, *Dozer-clearing*, and *Root-plowing* can convert wooded areas to open, early successional areas; *Mowing* may be used to maintain foraging and loafing cover for common nighthawks in **Urban** areas

Wildlife or Fish Survey: observation counts can be used to estimate trends in populations



Gary Kramer



Crested caracara

General information

The crested caracara is a falcon sometimes referred to as the “Mexican eagle,” as it is Mexico’s national bird. They are often seen with vultures, eating carrion in open country, such as grasslands, pastures, croplands, and semi-deserts. Crested caracaras may prefer open areas, but are often adjacent to shrublands or areas with trees. Caracaras have long, featherless, and yellow legs. The body is mostly black, a black cap on its head with a small crest, red skin on the face, and a white and black tail. Their wide wingspan is used for soaring and for flying low while hunting for prey or carrion. They nest in trees and have clutch sizes of 1 to 4 eggs. They breed from January to September and fledge from mid-March to early May. They nest in trees or shrubs with average heights around 19 feet. Breeding pairs will defend their territory year-round and may even re-use or re-build a nest from the previous year. Both sexes contribute to building the nest out of sticks and finer vegetation. The female typically lays 2 eggs and both parents care for the fledglings. At one time, crested caracaras were declining, but currently the population is stable or slightly increasing. Florida is the only state that currently has the crested caracara listed as threatened and Texas has the largest breeding population. There is future concern for the species as more and more of its habitat is being developed for human or agricultural use.

Habitat requirements

Diet: mostly carrion, but also insects, small vertebrates (fish, reptiles, amphibians, birds, and mammals), and eggs

Water: freestanding water is used, but watering sites are not typically limiting because of the crested caracara’s ability to fly long distances and some water needs may be met through the diet

Cover: open grasslands for hunting/scavenging; nests in trees or shrubs, often in the top of cabbage palms

Wildlife management practices

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

Livestock Management: grazing pressure should be reduced when overgrazing begins to degrade habitat for prey

Plant Shrubs: where trees and shrubs are lacking to provide nesting cover

Plant Trees: where trees are lacking to provide nesting cover



Robert Burton



Set-back Succession: Disking, Prescribed Fire, Herbicide Applications, and Mowing are options for maintaining grasslands and early successional areas; Prescribed Fire, Herbicide Applications, Chaining and Root-plowing are used to reduce shrub cover and stimulate more herbaceous groundcover

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

Crissal thrasher

General information

Crissal thrashers are found in the southwestern ecoregion of the U.S. south to Mexico. They prefer dense, low shrub cover in desert, foothill, and riparian areas. Crissal thrashers nest in shrubs 2 to 8 feet above ground. Nest is constructed of twigs.

Habitat requirements

Diet: forage on the ground and eat a variety of insects, spiders, seeds, and soft mast

Water: freestanding water is essential and needed daily

Cover: thick shrub cover for nesting and loafing

Wildlife management practices

Control Nonnative Invasive Vegetation: when nonnative invasive species begin to reduce habitat quality for crissal thrashers

Livestock Management: should restrict overgrazing and ensure shrub cover is present to provide food and cover; this is particularly important in riparian areas where thick shrub cover is found adjacent to drainage ways (arroyos); livestock water facilities should be placed in upland areas to discourage congregation of livestock and over-use in riparian areas

Plant Shrubs: especially around agricultural and riparian areas where needed

Set-back Succession: *Chaining* and *Drum-chopping* can rejuvenate shrub cover where it has grown too tall

Water Developments for Wildlife: catchment ponds, windmills, spring developments, and guzzlers can benefit crissal thrashers

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



Greg Lavaty



Dickcissel

General information

Dickcissels are songbirds that occur primarily in native grasslands and savanna in the central one-third of the U.S. Relatively large open areas of grasses, forbs, and scattered shrubs are favored. Dickcissels use agricultural areas heavily during winter in Central America where they may form huge flocks. Nests are placed above ground in tall grasses, forbs, or shrubs.

Habitat requirements

Diet: insects and grass seeds are eaten year-round; agricultural crops are eaten more during migration and on wintering grounds

Water: water obtained from food

Cover: early successional areas with a mixture of grasses and forbs and scattered shrubs; grain fields frequented during winter

Wildlife management practices:

Control Nonnative Invasive Vegetation: when nonnative invasive species begin to compete with native vegetation and reduce habitat quality for dickcissel

Delay Crop Harvest: delayed hay harvest in areas with insufficient native grassland will allow initial nests to hatch and hatchlings to leave nests prior to harvest

Field Borders: to increase usable space around crop fields

Leave Crop Unharvested: will provide additional food during migration

Livestock Management: should prevent overgrazing to maintain a minimum grass/forb height of 12 – 18 inches

Plant Native Grasses and Forbs: in relatively large open areas where there is insufficient groundcover; forb component is important

Set-back Succession: *Prescribed Fire* is recommended to maintain grasslands and other early successional areas; *Herbicide Applications* may be used to kill undesirable plants and adjust species composition in early successional areas; *Chainsawing*, *Dozer-clearing*, and *Root-plowing* may be used to reduce forested cover and increase early successional cover

Tillage Management: may provide additional food during migration

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



James W. Arterburn



Dusky grouse

General information

Dusky grouse occur predominantly in mountainous areas in the western U.S. and Canada. They require forested cover, interspersed with herbaceous openings and shrub cover. Their nests are usually on the ground, often under shrubs or near fallen logs. Dusky grouse roost in forest edges near shrub vegetation where they forage.

Habitat requirements

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

Water: obtain necessary water from dew and diet

Cover: nest on the ground near forest edges, often under shrubs or next to fallen logs; roost and loaf in trees

Wildlife management practices

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

Edge Feathering: will increase nesting and foraging cover where woods are adjacent to openings

Field Borders: (in some ecoregions) may increase nesting and foraging cover if shrub cover is allowed to develop

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

Livestock Management: should prevent areas from being grazed where dusky grouse nest

Plant Native Grasses and Forbs: particularly in agricultural fields going out of production

Plant Shrubs: to provide soft mast, buds, and nesting cover, especially near forest edges where lacking

Plant Trees: in relatively large open areas, coniferous trees may be planted to provide cover and a winter food source where needed

Set-back Succession: *Prescribed Fire*, *Chainsawing*, and *Herbicide Applications* can maintain herbaceous openings and shrub cover

Decrease Harvest: may be necessary when mortality from hunting harvest is additive or limiting population growth surveys show a decline in the local population

Wildlife or Fish Survey: call counts can be used to monitor dusky grouse populations



Todd Black



Eastern bluebird

General information

Eastern bluebirds are found across the eastern U.S. They use herbaceous openings, savannas, pastures, parks, backyards, edges of hayfields and cropfields, and other early successional communities well-interspersed with trees and shrubs, for perching, foraging and nesting (where cavities are available). Large open areas without interspersed hedgerows, fencerows, and scattered trees may not receive as much use by bluebirds as those areas with more structural diversity. Bluebirds forage in open areas, but typically near trees, shrubs, or a fence that provide perches. Insects dominate the diet during spring and summer, whereas various fruits are most prevalent during fall and winter. Eastern bluebirds nest in cavities, especially old woodpecker cavities, as well as nest boxes. Clutches are normally 3-6 eggs. Eastern bluebirds may have 1-3 broods per year. Nest box programs have had a major impact in restoring eastern bluebird populations.

Habitat requirements

Diet: insects, especially grasshoppers, crickets, adult beetles and larvae, as well as other invertebrates, such as spiders; various fruits, such as black cherry, sumac, blueberry, blackberry, blackgum, hollies, dogwoods, pokeweed, and hackberry

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

Cover: 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 eastern bluebirds

Create Snags: where cavities are limited to provide potential nest sites and perching sites in open areas (not in forests because eastern bluebirds do not use forests)

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

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



Dave Menke



Plant Native Grasses and Forbs: to aid in establishing herbaceous groundcover where planting is necessary; forb component is important to attract insects

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

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

Set-back Succession: *Prescribed Fire, Disking, Herbicide Applications, Mowing, Chaining, and Drum-chopping* can be used to maintain and rejuvenate early successional areas and prevent them from becoming dominated by young trees and shrubs; *Chainsawing and Root-plowing* can be used to convert forested areas to savannas and early successional communities; *Mowing* may be used to maintain foraging and loafing cover for eastern bluebirds in **Urban** areas

Wildlife or Fish Survey: point counts can be used to monitor bluebird populations; nest boxes should be checked to monitor use and nest success

Eastern meadowlark

General information

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

Habitat requirements

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

Water: obtained in diet

Cover: grasslands at least 6 acres in size

Wildlife management practices

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

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

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

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



James W. Arterburn



meadowlark habitat to ensure optimum grass coverage and structure

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

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

European starling

General information

European starlings are found throughout North America. They were introduced to the U.S. from Europe and are considered pests. They commonly cause damage to crops and in urban areas. They exclude native species from cavities and deplete food resources for native wildlife. As a consequence, wildlife damage management is necessary to reduce starling populations and exclude them from areas where they are causing damage. Starlings prefer older suburban and urban residential areas with large trees and shrubs interspersed with open areas, but also are abundant in agricultural areas. Starlings are cavity nesters and nest in large trees or old buildings. Starlings feed on the ground and eat a variety of insects, seeds, grain, and soft mast. Practices to attract or benefit starlings should not occur in any situation.

Habitat requirements

Diet: insects, soft mast, seeds, earthworms, grain, human garbage, and even dog and cat food

Water: require freestanding water during warm seasons

Cover: nest in tree cavities, old buildings

Wildlife management practices

Wildlife Damage Management: exclusion practices to prevent access to buildings and other areas where they are not wanted; food, water, and cover available to starlings around buildings should be removed; various harassment practices may be effective; trap and euthanasia are appropriate to reduce starling populations

Wildlife or Fish Survey: observation counts, point counts, and wildlife damage management questionnaires are used to monitor starling populations



Thomas G. Barnes



Ferruginous hawk

General information

The ferruginous hawk is the largest hawk in North America. There are 2 common color phases of ferruginous hawks. Some display a light phase with mostly white heads, rufous shoulders, backs, and legs, and pale underparts. Dark-phased individuals are dark brown with a whitish tail and wing tips. Ferruginous hawks' legs are feathered to the toes. Ferruginous hawks are found in open country. They nest in trees, usually along riparian areas or on steep slopes. They primarily prey upon small mammals.

Habitat requirements

Diet: rabbits, ground squirrels, prairie dogs

Water: necessary water obtained from diet

Cover: open plains and shrublands; nest in trees

Wildlife management practices

Control Nonnative Invasive Vegetation: when nonnative invasive vegetation begins to reduce habitat quality for ferruginous hawks or their prey

Livestock Management: when overgrazing begins to degrade habitat for prey

Plant Native Grasses and Forbs: where groundcover is limited and planting is necessary

Plant Trees: along riparian areas where trees are not present to create nest sites

Set-back Succession: *Prescribed Fire* and *Herbicide Applications* can be used to maintain early successional communities that support prey; *Chaining*, *Root-raking*, and *Drum-chopping* may be used to set-back succession in areas dominated by shrubs where more open space is needed

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

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



John Cholor



Gambel's quail

General information

Gambel's quail are upland gamebirds found in arid regions of Arizona, New Mexico, southern Colorado, Utah, southern Nevada and California. Gambel's quail are usually found in brushy and thorny vegetation with scattered grasses and forbs, typical of southwestern deserts. Gambel's quail are also found along the edge of agricultural fields, especially those adjacent to arroyos and irrigation ditches. Dense shrubs and cacti intermingled with small open areas also are used. The amount of late winter and early spring precipitation largely determines the quality and quantity of spring foods. In essence, more rain equals more quail.

Habitat requirements

Diet: succulent green plants; seeds of forbs (especially legumes), grasses, shrubs and trees; saguaro, cholla and prickly pear cacti fruits; a variety of soft mast and insects

Water: require freestanding water during warm seasons if succulent green plants are not available for food; will usually not travel more than one-third mile for water

Cover: nest in the thickest shrub and/or herbaceous vegetation available; roost in tall shrubs and trees, such as mesquite, scruboak, desert hackberry, cholla, one-seed juniper, littleleaf sumac, catclaw acacia, and various yuccas; shrubs provide important cover for loafing during the day

Wildlife management practices

Control Nonnative Invasive Vegetation: when nonnative invasive vegetation begins to reduce habitat quality for Gambel's quail

Leave Crop Unharvested: to provide additional food resource in fall/winter

Livestock Management: over much of the area where Gambel's quail are found, there are few wildlife management practices considered practical for improving food other than proper livestock grazing management; grazing management is important to ensure enough residual herbaceous vegetation is available for nesting cover

Plant Food Plots: grain plots can provide additional food and cover; best when located next to high-quality cover

Plant Shrubs: where shrubby cover is lacking

Water Developments for Wildlife: guzzlers, catchment ponds, windmills, and spring developments can be beneficial where water is limiting

Decrease Harvest: may be necessary when surveys show a decline in the local population and mortality from hunting harvest is additive or limiting population growth



Gary Kramer



Wildlife or Fish Survey: call counts and flush counts are used to estimate trends in Gambel's quail populations

Golden eagle

General information

The golden eagle is one of the largest birds of prey in North America. Its agility and speed coupled with a strong beak and talons allow it to capture a variety of prey items and fiercely protect its kills from other, often larger predators. In North America, golden eagle occurs almost exclusively in the western half of the United States, primarily in the mountain and inter-mountain regions from Canada southward into Mexico. They occupy tundra, shrublands, grasslands, coniferous forests, farmlands, and riparian areas along rivers and streams. Adults are dark brown with gold feathers on the back of their head and neck. Adults weigh 7 to 13 pounds with a wingspan of 6 ½ to 7 feet. Females are about one-third larger than males. They prefer partially open country, especially open lands adjacent to rough terrain, such as hills, mountains, and cliffs. A pair of adult golden eagles can be monogamous (stay together as a pair) for several years and in some cases remain together for life. Golden eagles are protected by federal legislation. It is against the law to harass, harm, pursue, trap, or capture them. Only the United States Department of Interior can grant exceptions for killing golden eagles (for specific purposes, such as scientific studies, Native American religious ceremonies, and livestock depredation).



Dave Menke

Habitat requirements

Diet: birds and small mammals, including jackrabbits, cottontails, prairie dogs, and ground squirrels; sometimes larger animals, such as deer and pronghorns and occasionally livestock (especially lambs, kid goats, and calves), are attacked and consumed

Water: water requirements are met through consumption of prey

Cover: roost and nest in large, tall trees, rock formations in mountainous regions and on tall cliffs; they may use the same nest for several years, adding additional structure (such as sticks, limbs) every year

Wildlife management practices

Conservation Easement: may protect habitat for golden eagle and prey, especially where urban development is encroaching

Control Nonnative Invasive Vegetation: when nonnative invasive species begin to degrade habitat for prey

Livestock Management: when overgrazing begins to degrade habitat for prey

Set-back Succession: *Prescribed Fire* and *Herbicide Applications* can be used to maintain early successional communities that support prey



Wildlife Damage Management: livestock depredation permits may be issued in severe cases with control activities carried out by federal agency personnel

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

Golden-cheeked warbler

General information

The golden-cheeked warbler has been listed as a federally endangered species since May 1990. It is a songbird about 5 inches long and is mainly black with a bright yellow face divided by a black eye stripe. Golden-cheeked warblers are found exclusively in central Texas during the breeding season. They nest in mature Ashe juniper (commonly referred to as “cedar”) and oak woodlands. Nests contain 3 to 4 eggs and are made of shredded Ashe juniper bark (usually from mature trees that are 20+ years old) and spider webs. Nesting is more successful within mature forest stands of 250 acres or more.

Mating pairs are monogamous and a male will typically defend a territory of about 10 acres. By July, these birds migrate south to southern Mexico, Honduras, Nicaragua, and Guatemala to spend the winter. Urbanization and agricultural practices have reduced the amount of tall juniper and oak woodlands golden-cheeked warblers rely on for nesting cover. In addition, the development of large man-made lakes has caused flooding in areas traditionally used by these warblers. Nest parasitism by brown-headed cowbirds also contributes to a decrease in reproductive success, but the extent is unknown. Within Texas, the golden-cheeked warbler traditionally inhabited more than 40 counties, but this area has shrunk to 25 counties or fewer. The largest contiguous habitat is maintained on Fort Hood by the U.S. Army.

Habitat requirements

Diet: primarily feed upon insects and spiders on trees; caterpillars (moth larvae) are an important food source for young warblers

Water: although usually found near creeks or intermittent streams, water requirements are met through the diet

Cover: mature (17-20 feet) Ashe juniper for nesting and oak woodlands for foraging insect larvae in the canopy; mixed deciduous and evergreen forest, often dominated by pines during winter

Wildlife management practices

Conservation Easement: can protect critical habitat from development

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

Forest Management: in pure stands of juniper, selective thinning is a *Forest Stand Improvement* practice that can be useful for encourage oak regeneration

Plant Trees: Ashe juniper and oak may be planted in suitable areas where trees are lacking



Steve Maslowski



Set-back Succession: *Herbicide Applications* may be used to prevent encroachment of undesirable woody species or to remove some trees in solid juniper stands; *Chainsawing* may be used when converting areas to Ashe juniper and oak woodlands

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

Golden-fronted woodpecker

General information

Golden-fronted woodpeckers occur in central Texas, into southwest Oklahoma, and the Texas panhandle. They are most commonly found in mesquite woodlands, but also occur in cottonwood, willow, and cypress riparian areas, as well as mixed oak-juniper-mesquite woodlands. Golden-fronted woodpeckers also take advantage of urban sprawl, using fence posts, utility poles, and various ornamental tree species.

Habitat requirements

Diet: an omnivore that eats large numbers of grasshoppers, as well as corn, acorns, wild fruits, and berries

Water: obtains water from food

Cover: nests in mesquite woodlands as well as utility poles, fence posts, and ornamental tree species; nests generally constructed near the ground up to about 30 feet; golden-fronted woodpeckers build cavities and will use existing cavities

Wildlife management practices

Control Nonnative Invasive Vegetation: when nonnative invasive vegetation is competing with native vegetation and reducing habitat quality

Create Snags: in areas lacking sufficient snags, for both foraging and nesting

Plant Trees: in large open areas lacking sufficient woody cover to create future habitat

Set-back Succession: *Prescribed Fire* and *Herbicide Applications* can be used to create scattered snags for foraging and nesting

Wildlife Damage Management: woodpeckers occasionally damage wooden homes, fences, and other structures. Harassment techniques may be used to limit damage.

Wildlife or Fish Survey: point counts can be conducted to listen for the distinctive drumming or for vocalizations during the mating season



Thomas G. Barnes



Golden-winged warbler

General information

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

Habitat requirements

Diet: insects

Water: necessary water obtained from diet

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

Wildlife management practices

Conservation Easement: can protect critical habitat from development

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

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

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

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



Laurie Smaglick Johnson



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

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

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

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

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

Grasshopper sparrow

General information

Grasshopper sparrows are migratory songbirds that prefer grasslands that may contain scattered shrubs and bare ground interspersed throughout the area. Areas with more than 35 percent shrubby cover constitute poor habitat for grasshopper sparrows. Nests are well concealed on the ground with overhanging grasses and a side entrance. Nests are constructed of dead grass leaves in the shape of a cup and contain 3-6 eggs. Grasshopper sparrows forage on the ground, making bare ground within native grass cover important for mobility and searching for prey (grasshoppers). Grasshopper sparrows are found throughout the Great Plains, Midwest, and Mid-South during the breeding season. They winter in the Deep South, Mexico, and Caribbean. Grasshopper sparrows are declining throughout their range because of habitat loss and fragmentation of once-contiguous grasslands. Grasshopper sparrows are aptly named with their insect-like song and a diet dominated by grasshoppers.



James W. Arterburn



Habitat requirements

Diet: diet shifts dramatically through the year; in spring and summer (breeding season) insects comprise 60 percent of the diet; not surprisingly, given the bird's name, grasshoppers account for 30 to 40 percent of the diet during this time; during fall and winter, diet shifts to 70 percent seeds

Water: water requirements are unknown but probably obtained through diet

Cover: Perennial grasses and forbs are used for escape and nesting cover; nest on the ground, usually in overhanging native warm-season grasses

Wildlife management practices

Conservation Easement: can protect critical habitat from development

Control Nonnative Invasive Vegetation: although grasshopper sparrows may successfully nest in a variety of grassland types, sod grasses, such as tall fescue and bermudagrass, may limit mobility and bare ground. Nonnative invasive vegetation should be controlled when it begins to compete with native vegetation and degrade habitat.

Delay Crop Harvest: delay mowing/harvesting hay in spring to help ensure successful nesting

Livestock Management: is crucial to prevent overgrazing; overall average grass height should not be grazed below 18 inches

Plant Native Grasses and Forbs: where necessary to provide habitat, especially when converting agricultural fields previously row-cropped and wooded areas to grassland

Set-back Succession: *Prescribed Fire* can enhance habitat by rejuvenating grasslands, controlling woody cover, and creating patches of bare ground; *Herbicide Applications* may be used to control unwanted encroachment of woody species; *Chainsawing, Dozer-clearing, and Root-plowing* can be used to convert wooded areas to grassland

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

Great horned owl

General information

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

Habitat requirements

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

Water: water obtained from diet

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

Wildlife management practices

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

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

Edge Feathering: to increase usable space for prey around fields

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

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

Livestock Management: where overgrazing may be limiting cover for prey

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

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



Dave Menke



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

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

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

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

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

Greater prairie-chicken

General information

Greater prairie-chickens require very large tracts of native rangeland containing diverse grass and forb communities free of tall vertical structures (including trees). They prefer flat to gently rolling terrain with some cropland, which can provide seasonal foods. Less than 25 percent of the landscape should be composed of crops. Low areas with dense vegetation of grasses, forbs, and low-growing shrubs are used for roosting year-round. Prairie-chickens require sites with short vegetation that offer good visibility for breeding displays. They gather on these sites in the spring, and the males display in front of females to win a mate. These areas are called “booming grounds.”

Habitat requirements

Diet: seeds, grains, insects and herbaceous greens; during the first few weeks after hatching, the young eat insects

Water: water is obtained from diet

Cover: thick, tall grass cover is used for nesting and winter cover; if not periodically disturbed, grasses often become too thick and are less valuable for nesting cover

Wildlife management practices

Conservation Easement: can protect critical habitat from development

Control Nonnative Invasive Vegetation: sod grasses and other nonnative invasive vegetation should be controlled when habitat quality begins to decline

Delay Crop Harvest: time crop harvest so nests will not be disturbed

Field Borders: to increase usable space around row crop fields

Leave Crop Unharvested: unharvested grain can provide a supplemental food source for prairie-chickens

Livestock Management: should ensure the entire prairie or grassland is not uniform in structure or plant composition; areas of dense nesting cover adjacent to insect-rich areas with forbs are ideal; some areas should be left ungrazed during the nesting season (May through June)

Plant Food Plots: grain food plots can provide a supplemental food source for prairie-chickens, especially when native foods may be lacking

Plant Native Grasses and Forbs: needed where large expanses of high-quality grassland are not available and planting is necessary

Set-back Succession: fire is an essential aspect of prairie ecology and must be applied to the landscape for long-term stability of prairie-chickens; *Prescribed Fire* every 3 to 5 years improves plant vigor and reduces excessive buildup of old vegetation in areas not grazed; *Chaining*,



Dave Menke



Prescribed Fire, and *Herbicide Applications* can revert shrubland to grassland; *Chainsawing* can be used to remove trees

Tillage Management: to leave grain stubble in fall where croplands are adjacent to grasslands

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

Wildlife or Fish Survey: observation counts on booming grounds are commonly used to estimate trends in prairie-chicken populations

Greater roadrunner

General information

The greater roadrunner is a long-legged bird, 20 to 24 inches in length, with a wingspan of 17 to 24 inches. Adults have a bushy crest on their heads and a long, thick, dark bill. They are called roadrunners because of their habit of running down the road and darting to safety within brush and trees adjacent to the road. They can run up to 20 mph to chase down prey. They will beat larger captured prey items against the ground or a rock to kill them. Although they are capable of flying, roadrunners spend most of their time on the ground. Threats to roadrunners include predation by feral cats, urbanization, and habitat loss.

Habitat requirements

Diet: omnivorous; principal food items include insects, fruits, and seeds, but small reptiles, mammals and birds, bird eggs, and carrion is also eaten; some quail hunters believe roadrunners kill and eat recently hatched quail chicks, but that has never been documented

Water: water is largely obtained from diet, but roadrunners will drink freestanding water if available

Cover: arid deserts to semi-arid shrubby areas; open or disturbed areas adjacent to shrubland; in the eastern portion of their range, roadrunners inhabit dry sandy upland sites with patches of bare ground interspersed with low-growing shrubs and trees.

Wildlife management practices

Control Nonnative Invasive Vegetation: when invasive nonnative grasses and shrubs begin to compete with native plant cover and degrade habitat

Forest Management: in the eastern forested portion of the greater roadrunner's range, *Forest Stand Improvement* can encourage shrub cover can enhance cover and support food where understory vegetation has been shaded out

Plant Shrubs: low-growing shrubs can provide cover and food where lacking

Set-back Succession: *Prescribed Fire, Disking, Herbicide Applications, Chainsawing, Chaining, and Drum-chopping* can be used to renovate or maintain shrubby cover when trees begin to dominate or where additional bare ground is needed

Wildlife or Fish Survey: roadside counts are used to estimate roadrunner populations



Robert Burton



Greater sage-grouse

General information

The greater sage-grouse is a ground-dwelling gamebird of the American West that uses very large tracts of sagebrush-dominated rangeland. Sage-grouse populations have declined over many areas as a result of habitat loss and fragmentation related to land conversion, energy development, conifer encroachment, and invasive species (particularly cheat grass). Sage-grouse currently occur throughout much of the **Intermountain** ecoregion. A diverse plant community of native grasses, forbs, and especially sagebrush are critical for sage-grouse. Male sage-grouse display and compete for females on leks, which are small open areas surrounded by sagebrush. The USDA-NRCS included greater sage-grouse in its Working Lands For Wildlife initiative.

Habitat requirements

Diet: spring and summer – insects and green forbs; late fall and winter – sagebrush

Water: water requirements are obtained through diet, but sage-grouse will use free-standing water if available

Cover: nests are constructed on the ground, often under sagebrush; sagebrush is critical for thermal and escape cover during winter

Wildlife management practices

Conservation Easement: can protect critical habitat from development

Control Nonnative Invasive Vegetation: when nonnative invasive species begin to compete with the native plant community and reduce habitat for sage-grouse

Livestock Management: grazing should be prescribed at a level that maintains an adequate grass and forb component for nesting and brood-rearing cover. Improper grazing can increase the sagebrush canopy to the point there is inadequate understory and shift the plant community to species of lesser value, which removes important cover for sage-grouse and decreases forage for livestock.

Plant Shrubs: in areas with less than 15 percent sagebrush cover that are used for nesting or winter cover

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

Wildlife or Fish Survey: lek counts are conducted to monitor populations and evaluate management effectiveness, especially since sage-grouse are in decline.



Stephen Ting



Special: identify and mark fences where sage-grouse collisions are likely, such as near leks (open areas surrounded by sagebrush for courtship displays) to reduce accidental mortality caused by fence strikes. Sage-grouse typically use the same leks every spring. Leks are maintained in herbaceous groundcover for long periods of time because of gravelly or wet soils or because of feeding and watering activities of livestock.

Hairy woodpecker

General information

Hairy woodpeckers are medium-sized woodpeckers with a bill almost as long as their head. They forage primarily on tree trunks, but also on stumps, snags, downed logs, and on the ground. Hairy woodpeckers are most commonly found in mature forest, but also may frequent younger developing forests, wooded riparian areas, woodlands, backyards, and parks. They nest in cavities, which are usually in dead trees or in dead limbs of live trees. Nests contain 3-6 eggs.

Habitat requirements

Diet: insects such as ants, beetle larvae, caterpillars, and adult beetles; diet is supplemented with hard and soft mast, as well as various seeds, including sunflower seeds

Water: obtained from diet

Cover: cavity nesters; holes are excavated in mature and dying trees and snags; management efforts should focus on maintaining or creating areas with large mature and dying trees, especially in open areas; within wooded areas, at least one large snag per acre should be available

Wildlife management practices

Control Nonnative Invasive Species: when nonnative invasive species begin to negatively impact tree regeneration or reduce the ability of hairy woodpeckers from foraging along tree trunks

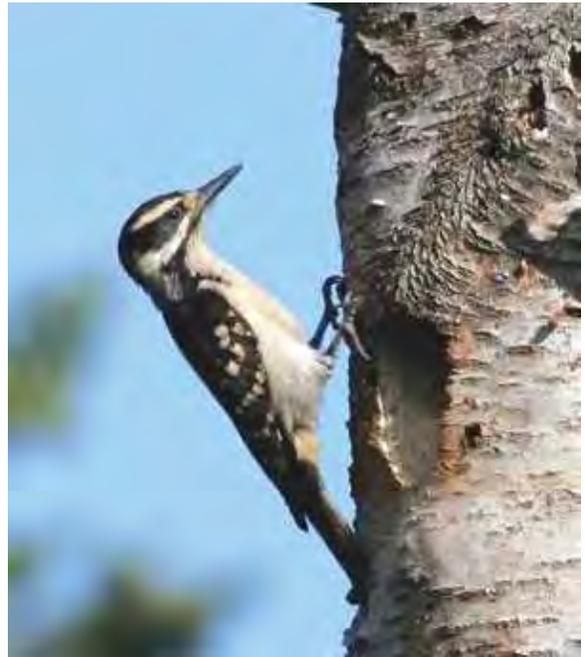
Create Snags: for a food source and potential nest cavities where snag availability is limiting

Livestock Management: livestock either should be excluded from forests and riparian areas or managed so that grazing pressure is not limiting tree regeneration

Plant Trees: especially softwood deciduous trees where trees are lacking for potential nesting cavities

Wildlife Damage Management: when woodpeckers are causing damage to human structures

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



Donna Dewhurst



House finch

General information

House finches are native to the western U.S., but were introduced in the eastern U.S. in 1940. Since, they have spread throughout the eastern U.S. and have become one of the most common birds in the U.S. They are found in a wide variety of urban, suburban, and agricultural areas that have trees, shrubs, and some herbaceous openings. They also are found in canyons and semi-arid regions in the western part of the country. House finches nest in a variety of locations and make a nest from weed stems, small branches, and leaves. House finches are vegetarians and eat a variety of seeds, soft mast, and buds, both from the ground and in trees.



Gary Kramer

Habitat requirements

Diet: soft mast, buds, and weed seeds; in the warm season, house finches eat some insects

Water: free-standing water is needed daily in the warm season

Cover: nest 5 feet to 7 feet aboveground on low branches of trees, branches of bushes, in natural cavities, old holes excavated by woodpeckers, and any projection or ledge they can find on houses and buildings

Wildlife management practices

Plant Native Grasses and Forbs: to provide forb seed in rural areas where forbs are lacking

Plant Shrubs: for nesting and hiding cover adjacent to open areas where shrubs are lacking

Plant Trees: for nesting cover in areas where trees are lacking

Set-back Succession: Mowing may be used to maintain foraging and loafing cover for house finches in **Urban** areas

Water Developments for Wildlife: birdbaths and pans of water can be provided, or a low area in the yard can be filled with water; do not place water in areas where cats can catch birds; cats should be removed

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

Artificial Feeders: may be used to attract finches in **Urban** areas; millet and sunflower seeds are favorites



House sparrow

General information

House sparrows are found throughout the U.S. They are an introduced species from England (they are also called English sparrows) and are found throughout the U.S., and are very common in urban areas. House sparrows also are very common in and around buildings in agricultural areas where grain is available. Because they are a nuisance, management objectives are often needed to reduce the quality and quantity of food and cover. *Wildlife Damage Management* is often needed and commonly implemented. House sparrows are cavity nesters and will frequently occupy buildings and houses to nest within the eaves or other areas with a cavity or opening. House sparrows feed on the ground and in woody vegetation for seeds, insects, and soft mast. House sparrows outcompete bluebirds for cavity nesting space and compete with several other native birds for food and space.

Habitat requirements

Diet: variety of insects, soft mast, buds, forbs, weed seeds, and waste grain

Water: free-standing water is required daily in warm seasons

Cover: nest in natural cavities, low branches of trees, and bushes 5 feet to 7 feet aboveground, and on any projection or ledge they can find on buildings or other structures

Wildlife management practices

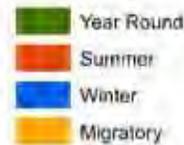
House sparrow populations often grow to levels where they cause wildlife damage or will cause detrimental conditions for native wildlife by out competing native species for habitat requirements; therefore, wildlife damage management most likely will be necessary in all situations, especially in suburban/urban and agricultural areas. Habitat management to attract house sparrows should never occur.

Wildlife Damage Management: trap and euthanasia are often appropriate to reduce house sparrow populations; exclusion practices may prevent house sparrows from accessing an area; remove food, water, and cover available to house sparrows; various harassment practices may be effective

Wildlife or Fish Survey: observation counts, call counts, and questionnaires related to wildlife damage management are useful in estimating trends in populations



James W. Arterburn



House wren

General information

House wrens are found throughout the U.S. during the breeding season, and migrate to the Deep South during winter months. In **Urban** areas, house wrens prefer older residential areas with large shrubs and trees. House wrens also are found in forests with herbaceous openings at higher elevations, as well as in aspen stands. House wrens nest in a variety of elevated cavities, as high as 30 feet aboveground. They forage both on the ground and aboveground.

Habitat requirements

Diet: spiders, grasshoppers, crickets, beetles, caterpillars, ants, bees, ticks, earthworms, and millipedes; artificial feeders are usually not used

Water: necessary water is obtained from the diet

Cover: nest in natural cavities in trees old buildings and other structures

Wildlife management practices

Control Nonnative Invasive Vegetation: when nonnative species begin to compete with native vegetation and degrade habitat for house wrens

Nesting Structures: nest boxes may be provided where adequate nesting sites are lacking; boxes should be placed high on a tree trunk or under the eaves of a house; the hole should be < 1.5 inches in diameter to prevent house sparrows and starlings from entering and excluding house wrens; for specifics on nest box design and placement, visit your local Extension office or state wildlife agency website

Plant Shrubs: where lacking for cover while feeding and for nesting

Plant Trees: where trees are lacking for cover and nesting

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



Dave Menke



Ladder-backed woodpecker

General information

Ladder-backed woodpeckers are small woodpeckers of the southwestern U.S. and Mexico. They get their name from the black and white barring on their backs that resemble a ladder. Ladder-backed woodpeckers are found in wooded canyons, cottonwood groves, pine and pine oak woodlands, and desert grasslands and shrublands dominated by mesquite throughout the southwestern U.S. south to British Honduras. They also are found in riparian areas and other areas with trees. In the Hot Desert and Prairie Brushland ecoregions, they use areas with large mesquite, palo verde, agave, cholla cactus, and yuccas. They are sometimes called the cactus woodpecker as they commonly nest in various cacti where they occur.

Habitat requirements

Diet: insects including ants, beetle larvae, caterpillars, and cotton worms found on small trees, shrubs, and various cacti

Water: necessary water obtained from diet

Cover: nest in cavities in trees, shrubs, and stalks of agave and yucca cactus

Wildlife management practices

Control Nonnative Invasive Vegetation: when nonnative invasive species begin to compete with native vegetation and degrade habitat for ladder-backed woodpeckers

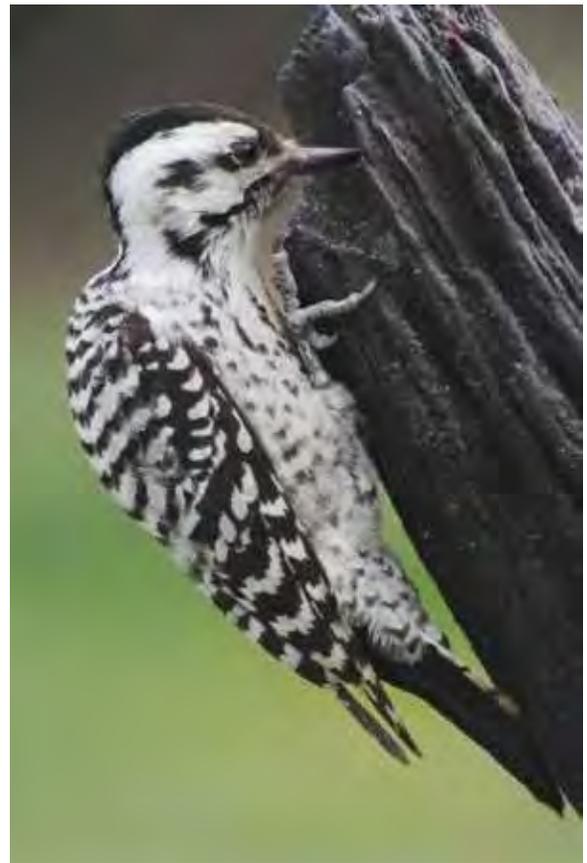
Create Snags: to increase potential nesting sites where limiting

Livestock Management: grazing management should maintain vigor of existing trees; in riparian areas, grazing in spring and summer when herbaceous vegetation is actively growing results in less use of woody vegetation than at other times of year; grazing management in dry regions often includes development of livestock watering facilities in upland areas to discourage over-use of riparian areas

Plant Trees: in riparian areas for cover and a future food source where trees are lacking

Wildlife Damage Management: when woodpeckers are causing damage to human structures

Wildlife or Fish Survey: point counts may be used to monitor populations



Robert Burton



Lark bunting

General information

Lark buntings are found in the Great Plains and the arid Southwest. They prefer shortgrass prairies during the breeding season, but also are found in mixed grass prairies. They nest on the ground, usually under a shrub. Nests contain 2-6 eggs. Lark buntings feed on the ground in open areas, and avoid foraging under cover. Lark buntings migrate into the southern Great Plains and Mexico during winter where they frequent grasslands, deserts, shrublands, and cultivated fields.

Habitat requirements

Diet: insects are the primary item in the diet, but seeds, soft mast, and grain are consumed as well, especially during winter

Water: necessary water is obtained from food

Cover: adequate grass cover is necessary, particularly during the nesting season

Wildlife management practices

Control Nonnative Invasive Vegetation: when nonnative vegetation begins to compete with native vegetation and reduce habitat quality for lark buntings; sod grasses are problematic because they can limit mobility of lark buntings while foraging

Delay Crop Harvest: delaying hay harvest until after nesting season can increase nesting success

Livestock Management: grazing should be managed so that adequate nesting cover is available

Plant Native Grasses and Forbs: may be necessary to restore native cover where native grasslands have been converted to nonnative species

Set-back Succession: *Prescribed Fire* is critical for maintaining native prairie for this and many other grassland birds; *Chainsawing* may be used to clear trees; *Herbicide Applications* may be used to kill trees; *Prescribed Fire*, *Chaining*, *Root-plowing*, and *Drum-chopping* may be used to set-back shrub cover and stimulate herbaceous groundcover

Wildlife or Fish Survey: point counts are used to monitor populations



James W. Arterburn



Lawrence's goldfinch

General information

Lawrence's goldfinch is a small and rather uncommon finch that spends the breeding season in the oak woodlands of California and Baja California and winters in southern Arizona and northern Mexico. Thus, unlike most other migratory birds, it migrates east and west, rather than north and south, between seasons. It is a nomadic species within seasons, moving about from place to place, with little predictability or loyalty in which location it will spend the breeding season from year to year. Erratic movements of the species make it difficult to monitor. Its nomadic nature is considered a response to water and food availability, which is largely seed of native annual plants that the goldfinch glean while perching on the plant. They nest about mid-way up trees; nests contain 3-6 eggs.



Glen Tepke

Habitat requirements

Diet: seeds of annual plants, such as fiddleneck, chamise, red-stem filaree, shepherd's-purse, and peppergrass

Water: freestanding water is required; Lawrence's goldfinch may drink from creeks, water tanks, dripping faucets

Cover: blue oak savannas, digger pine-oak woodlands, wooded riparian areas

Wildlife management practices

Conservation Easement: can protect critical habitat for this declining species

Control Nonnative Invasive Vegetation: when nonnative invasive species compete with native vegetation and reduce habitat quality for Lawrence's goldfinch

Forest Management: *Forest Stand Improvement* can promote open-canopy conditions where closed-canopy conditions occur

Plant Trees: in large open areas where oak woodlands are lacking

Set-back Succession: *Disking* can promote annual plants for foraging; *Prescribed Fire* should be used to maintain and promote oak woodlands and savannas; *Herbicide Applications* may be used to reduce tree density where needed

Tillage Management: will allow annual forbs to remain standing through winter for foraging

Water Developments for Wildlife: may be useful where freestanding water is limiting

Wildlife or Fish Survey: point counts may be used in an effort to monitor population trends



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-plowing* 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

Long-billed thrasher

General information

The long-billed thrasher is only found in southern Texas and eastern Mexico where it prefers dense, brushy areas, such as riparian woodlands and mesquite thickets. Long-billed thrashers construct nests in big trees within thick brush, making nests difficult to find. Nests resemble a big cup made of thorny twigs. Long-billed thrashers are grayish brown on top with white below, characteristically streaked with black dashes. As the name implies, it has a longer bill than its close relative, the brown thrasher, which can be found in the same ecoregion. Interestingly, there are other thrashers with even longer bills. The long bill is used to forage or “thrash” in leaf litter on the ground for insects, spiders, snails, or berries. Although the long-billed thrasher is not threatened, parts of south Texas have seen a decline over the last century as a result of clearing brush for agriculture. Long-billed thrashers are most commonly seen along the Rio Grande River and have been noted to move to the more northern areas of south Texas during winter.

Habitat requirements

Diet: insects and berries, but also spiders and snails

Water: water needs are likely met through their diet

Cover: areas of dense brush; nest in larger trees within areas of dense, thorny brush

Wildlife management practices

Control Nonnative Invasive Vegetation: when nonnative invasive vegetation begins to reduce habitat quality for long-billed thrasher

Field Borders: of primarily shrubs can provide nesting and escape cover in areas lacking patches of dense brush

Plant Shrubs: in open areas where shrub cover is limiting and planting is necessary for shrub establishment

Plant Trees: can provide nesting structures where taller trees are lacking

Water Developments for Wildlife: water sources could be developed to provide free water, especially during winter months

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



Robert Burton



Mallard

General information

The mallard is a migratory waterfowl with one of the most extensive breeding ranges of any duck in North America, extending across the northern one-third of the U.S., and up to the Bering Sea. Mallards winter south of Canada, throughout the U.S. and south to Central America. Mallards nest in tall grasses and forbs or in shrubby cover. They need open water with associated emergent aquatic vegetation to raise young. They may be found in any type of wetland with standing water and also use various upland vegetation types for foraging, especially harvested grain fields. Mallards are dabbling ducks, which means they feed at or near the surface of the water by filtering food items, such as invertebrates, seeds, and other plant material. Dabbling ducks are often seen tipping upside down in the water to reach food at the bottom of a wetland. Unlike diving ducks, they feed in much shallower water and do not dive to obtain food. Mallards have become a nuisance in some areas, particularly urban and suburban parks with ponds where they are fed. Mallards may breed with domestic ducks and with other wild duck species, especially the American black duck.



Donna Dewhurst



Habitat requirements

Diet: aquatic plants, insects and other invertebrates, hard mast (especially acorns), grains and other seed are primary components in the diet; ducklings eat mostly aquatic insects

Water: see cover requirements below

Cover: nest in grass and forbs and sometimes in shrub cover, preferably within one-half mile of a wetland that provides open water with some emergent aquatic vegetation; brooding cover is open water with considerable emergent aquatic vegetation for protection from predators; ideally, wetlands have a minimum of 50 percent open water and 10 to 20 percent emergent vegetation; in wintering areas, mallards often loaf on more open water, such as warm-water sloughs, streams, rivers, and flooded fields

Wildlife management practices

Control Nonnative Invasive Vegetation: when nonnative invasive species, such as purple loosestrife, water hyacinth, parrotfeather, hydrilla, and reed canarygrass, begin to reduce habitat quality for mallards

Delay Crop Harvest: (in some ecoregions) hay and crop harvest adjacent to wetlands should be conducted after nesting season

Forest Management: (in some ecoregions) *Forest Stand Improvement* can favor mast-producing species, especially oaks, in bottomland hardwoods that can be flooded to increase mast production

Leave Crop Unharvested: unharvested grains, such as corn, to provide a winter food source; this does not apply

to hay forages or soybeans

Livestock Management: livestock should be excluded from nesting areas

Plant Food Plots: shallowly flooded grain plots can provide an important food source for migrating and wintering mallards

Plant Native Grasses and Forbs: (in some ecoregions) where nesting cover is limiting and planting is necessary to increase coverage of native grasses and forbs

Repair Spillway/Levee: if not functioning properly
Set-back Succession: *Prescribed Fire* should be used to rejuvenate dense vegetation in nesting areas and to increase or maintain proper water and vegetation interspersions in emergent wetlands that become dry in summer; *Disking* emergent wetlands and fields that will be flooded later will stimulate annual grasses and forbs that are important food plants; *Herbicide Applications* can be used to control unwanted woody species; *Chainsawing* can be used to create openings in bottomland forests that can be flooded

Tillage Management: eliminating fall tillage can provide waste grain in the winter

Water Control Structures: should be used to control water level in wetlands managed for mallards and other wildlife

Water Developments for Wildlife: shallow impoundments can be used to flood grain fields and bottomland hardwoods in winter to provide a valuable food source and loafing areas

Wildlife or Fish Survey: aerial surveys are commonly used to estimate trends in the mallard population

Marbled murrelet

General information

The marbled murrelet is a small seabird that spends most of its life within a few miles of the coastline in the Pacific Northwest. Marbled murrelets nest in large expanses of old-growth (180 years old or more) coniferous forests. Nests are located on horizontal branches in large coniferous trees up to 50 miles from the coast. The nest is not concealed, but merely positioned in a depression of moss on the limb. Marbled murrelets have low reproductive potential as a female produces only one egg per nesting attempt. The females and the males share incubation duties. Historically, logging old-growth coastal coniferous forests eliminated large tracts of nesting cover for marbled murrelets. As old growth forests have become more fragmented, nest predation is thought to have increased, primarily from ravens and jays. The murrelet also is at risk from coastal oil spills and depletion of forage fish stocks.

Habitat requirements

Diet: small fish, such as anchovies, herring, and smelt, from the ocean within 1-2 miles of the coastline; small crustaceans also are eaten occasionally

Water: obtains most water from food

Cover: open ocean for most of the year; when threatened, murrelets dive or fly to avoid capture; horizontal limbs on large conifer trees for nesting

Wildlife management practices

Conservation Easement: can protect critical habitat for this declining species

Control Nonnative Invasive Vegetation: if nonnative invasive vegetation is reducing habitat quality for marbled murrelet

Forest Management: long timber rotations that favor old growth forest should be prescribed; *Forest Stand Improvement*, such as selective thinning that increases growth rates of remaining trees, can be used when a forest stand is not of sufficient age and structure for nesting cover

Plant Trees: conifers can be planted in areas that are not forested, but have the potential to provide future nesting cover

Set-back Succession: *Prescribed Fire* may be used in some situations to consume built-up fuels and reduce chance of wildfire, which could kill trees valuable for nesting

Wildlife or Fish Survey: transects conducted via boat parallel to the coastline counting murrelets on the water are useful to determine estimates of abundance.



R. Lowe



Mountain bluebird

General information

Mountain bluebirds are found across the western U.S. They use open savannas, pastures, parks, backyards, edges of hayfields and crop fields, and other herbaceous openings with scattered trees, which are used for perching and nesting (where cavities are available). Mountain bluebirds forage in open areas with short vegetation, but typically near trees or a fence that provide perches. Insects dominate the diet during spring and summer, whereas various fruits are most prevalent during fall and winter. Mountain bluebirds nest in cavities, especially old woodpecker cavities, as well as nest boxes. Clutches normally consist of 4-8 eggs.

Habitat requirements

Diet: invertebrates, especially grasshoppers, crickets, beetles, and spiders; various fruits in fall and winter

Water: necessary water obtained from diet

Cover: 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 mountain bluebirds

Create Snags: where cavities are limited to provide potential nest sites and to provide perching sites in open areas (not in forests)

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

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

Nesting Structures: may be placed 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: to aid in establishing herbaceous groundcover where 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 future

Set-back Succession: *Prescribed Fire, Disking, Herbicide Applications, Mowing, Chaining, and Drum-chopping* can be used to maintain and rejuvenate grasslands and reduce shrub cover where necessary; *Chainsawing,*



Dave Menke



Dozer-clearing, and *Root-plowing* can be used to convert forested or shrub-dominated areas to savannas and early successional communities; *Mowing* may be used to maintain foraging and loafing cover for mountain bluebirds in **Urban** areas

Wildlife or Fish Survey: point counts can be used to monitor bluebird populations; nest boxes should be checked to monitor use and nest success

Mourning dove

General information

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

Habitat requirements

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

Water: freestanding water required daily

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

Wildlife management practices

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

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

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

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

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

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

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



Dave Menke



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

Repair Spillway/Levee: if not functioning properly

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

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

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

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

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

Northern bobwhite

General information

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

Habitat requirements

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

Water: necessary water is obtained through the diet

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

Wildlife management practices

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

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

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

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

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



Heather Inman



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

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

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

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

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

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

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

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

Tillage Management: eliminate fall tillage to provide waste grain

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

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

Northern flicker

General information

Northern flickers occupy all of North America, and inhabit most of the U.S. year-round. Flickers are found in forests and woodlands interspersed with herbaceous openings. Northern flickers are often found along riparian zones and urban areas. They prefer older urban residential areas with large trees, golf courses, and parks. Flickers create cavities in trees for nesting; these cavities later become nesting and roosting sites for other species. Thus, flickers are considered an important species for biological diversity. Flickers eat insects, especially ants, as well as soft mast and seeds. Flickers can become problematic in urban areas where they may create holes in wood siding on houses or damage ornamental trees. Wildlife damage management may be necessary. European starlings often take-over flicker cavities for their own nests. Appropriate action should be taken to prevent starlings from occupying nesting cavities of flickers and other cavity-nesting wildlife.

Habitat requirements

Diet: ants are a favorite food and make up about 50 percent of the diet; seeds, soft mast, and earthworms are also eaten; flickers are partial to poison ivy fruit and may use artificial feeders

Water: daily water requirements unknown; sufficient water is probably obtained from diet

Cover: tree cavities are used for nesting; old, mature trees that show signs of senescence (old age) or decay are often used; softwood trees, such as yellow poplar, cottonwood, and willow, are preferred; flickers will nest in posts, holes in banks, and holes in houses and structures where trees are unavailable

Wildlife management practices

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

Create Snags: to enhance possible sites for cavities where snags are limiting, especially softwoods, but other species as well

Forest Management: *Forest Regeneration* will provide more open area and possibly snags for a short time; *Forest Stand Improvement* can open the structure of the forest and provide snags; snags should be retained during forest management activities

Plant Shrubs: several soft mast-bearing shrubs can provide additional food resource when limiting in open areas

Plant Trees: in large open areas without trees



Dave Menke



Set-back Succession: *Prescribed Fire* will consume the litter layer and facilitate foraging on the ground; *Chainsawing* may be used to reduce overstory tree density to create woodland conditions and improve tree species composition; *Mowing* may be used to maintain foraging and loafing cover for northern flickers in **Urban** areas

Wildlife Damage Management: may be necessary to prevent damage from foraging, drumming, and excavating wooden buildings; exclusion practices can prevent access to buildings; harassment can repel flickers from an area

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

Artificial Feeders: may be used to attract flickers in urban areas; suet is preferred

Northern goshawk

General information

Northern goshawks are relatively large raptors found throughout the northern, central, and western regions of the U.S. They prefer dense, mature forests where they nest 20 to 80 feet aboveground on a large horizontal limb of a mature tree. Nests are often used for up to five consecutive years. As a raptor, goshawks are fierce predators, commonly eating large birds, squirrels, rabbits, and hares. Goshawks perch while hunting and descend on prey. They will pursue prey for quite a distance when necessary. Goshawks do not prefer to be around human establishments.



Karen Laubenstein

Habitat requirements

Diet: mostly small- and medium-sized birds and mammals

Water: obtain necessary water from diet

Cover: mature forest and woodland; nest in mature trees

Wildlife management practices

Control Nonnative Invasive Vegetation: when nonnative invasive vegetation begins to compete with native vegetation and reduce habitat quality for northern goshawk and their prey

Forest Management: *Forest Regeneration (Single-tree Selection)* and *Forest Stand Improvement* can enhance habitat for prey; snags should be retained during forest management

Plant Trees: in large open areas to eventually provide habitat for goshawks

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



Northern harrier

General information

Northern harriers are medium-sized hawks that occur throughout North America. They nest throughout Canada and Alaska and much of the western U.S., and winter throughout most of the U.S. Northern harriers are found gliding low over grassland, croplands, and open wetlands searching for prey. They nest on the ground in grasslands and emergent marshes. The nest contains 4-5 eggs and they raise one brood per year. Males are mostly gray, whereas females are mostly brown.

Habitat requirements

Diet: small mammals, especially rodents, but also rabbits, songbirds, and sometimes ducks

Water: necessary water obtained from diet

Cover: large, undisturbed grasslands and emergent wetlands

Wildlife management practices

Control Nonnative Invasive Vegetation: when nonnative invasive vegetation begins to compete with native vegetation and reduce habitat quality for northern harriers and their prey; sod grasses on upland sites are particularly problematic

Delay Crop Harvest: hay harvest should be delayed until midsummer if possible to avoid ground nests

Leave Crop Unharvested: to encourage prey availability in fall and winter

Livestock Management: grazing should be managed to maintain a diverse vegetation structure conducive to prey and hunting efficiency for northern harrier

Plant Native Grasses and Forbs: where native grassland is limiting and planting is necessary

Set-back Succession: *Prescribed Fire* should be used to rejuvenate and maintain grasslands and wetlands when conditions permit; *Chaining* and *Drum-chopping* can be used to reduce shrub 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 open grassland

Tillage Management: delay fall tillage to facilitate hunting prey when waste grain is available

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



Greg Lavaty



Northern pintail

General information

The northern pintail is a large dabbling duck that ranges from 23 to 30 inches in length. Both sexes have blue-gray bills and gray legs and feet. The drake has a thin white stripe running from the back of its chocolate-brown head down its neck to a mostly white undercarriage. He also has gray, brown, and black patterning on his back and sides and long central tail feathers, which give the species its name. The northern pintail female appears to have drab brown feathers, much like those of other female dabbling ducks. Hens make a coarse quack, whereas drakes make a flute-like whistle. Northern pintails prefer open wetlands. They nest on the ground, and nests are hidden among vegetation in a dry location. Nest construction is a simple shallow scrape in the ground lined with plant material and down.

Habitat requirements

Diet: aquatic plant seeds and rhizomes; grain and other seeds found in fields; aquatic insects, mollusks and crustaceans

Water: water is obtained through diet

Cover: open freshwater wetlands and intertidal marshes

Wildlife management practices

Control Nonnative Invasive Vegetation: when nonnative aquatic weeds reduce or limit space for foraging or loafing, or when nonnative invasive plants degrade quality of nesting cover

Leave Crop Unharvested: to provide additional food for migrating and wintering pintails

Livestock Management: livestock should be excluded from nesting areas, from wetlands managed for waterfowl, and from food plots

Plant Food Plots: shallowly flooded grain food plots can provide a beneficial food source for migrating and wintering northern pintails

Plant Native Grasses and Forbs: where nesting cover is limiting and planting is necessary

Repair Spillway/Levee: if not functioning properly

Set-back Succession: *Prescribed Fire* should be used to maintain and rejuvenate nesting cover and maintain proper water and vegetation interspersions in wetlands; *Chainsawing*, *Dozer-clearing*, and *Root-plowing* may be used to clear trees where needed

Tillage Management: eliminating fall tillage can provide waste grain in the winter

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

Water Developments for Wildlife: shallow impoundments can flood fields and provide important



Dave Menke



foraging and loafing areas for migrating and wintering northern pintails

Wildlife or Fish Survey: observation counts and aerial surveys are used to estimate population trends

Nuttall's woodpecker

General information

Named after naturalist Thomas Nuttall, Nuttall's woodpecker is a small woodpecker that inhabits the oak woodlands and associated riparian areas of California in the Mediterranean ecoregion. Nuttall's woodpeckers use cavities for nesting; nests contain 3-6 eggs. Nuttall's woodpeckers eat insects that they glean mostly from oak, willow, and cottonwood trees.

Habitat requirements

Diet: 80 percent insects and other invertebrates and 20 percent plant material, including seeds and soft mast

Water: water requirements unknown

Cover: oak woodlands; cavities are excavated in softwoods (willow, cottonwood)

Wildlife management practices

Control Nonnative Invasive Vegetation: when nonnative invasive species begin to compete with native vegetation and reduce habitat quality for Nuttall's woodpecker

Create Snags: to increase potential cavity sites where limiting; softwood deciduous trees are particularly important

Forest Management: *Forest Stand Improvement* can reduce tree density where needed and promote desirable species; existing snags should be retained when implementing forest management

Plant Trees: in large open areas to provide future habitat

Wildlife Damage Management: may be needed in residential areas if the woodpeckers are damaging property

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



Greg Lavaty



Ovenbird

General information

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

Habitat requirements:

Diet: adult beetles and larvae, caterpillars, ants, and flies

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

Cover: mature deciduous forest with sufficient leaf litter for nesting and foraging

Wildlife management practices

Control Nonnative Invasive Vegetation: when nonnative invasive vegetation begins to reduce habitat quality for ovenbirds; several nonnative species, such as Japanese stiltgrass, threaten to reduce habitat quality for ovenbird in the *Eastern Deciduous Forest*

Livestock Management: livestock should be excluded from forests managed for ovenbirds

Plant Trees: in large open areas to produce future habitat

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



Greg Lavaty



Ovenbird nest

Peregrine falcon

General information

Peregrine falcons are found primarily along the coasts and mountain ranges of North America where congregations of shorebirds, songbirds, and waterfowl occur. They also may be found in urban and industrial areas with skyscrapers, smokestacks, bridges, and other tall structures and where abundant rock dove and European starling populations occur. Nests are often located on the ledges of cliffs or buildings from 25 to more than 1,300 feet high. They are one of the fastest birds on the planet, with a cruising speed of 25-34 mph to more than 200 mph in pursuit of prey.



Habitat requirements

Diet: mostly birds, but also bats, which falcons catch during flight

Water: requirements largely unknown; likely obtain water needs from foods they consume

Cover: require tall cliffs, buildings, and other tall structures for nesting and perching

Wildlife management practices

Nesting Structures: nesting platforms can be added to cliffs and skyscrapers

Wildlife Damage Management: peregrine falcons can prey upon domestic birds, such as homing pigeons; exclusion practices should be used to discourage damage

Wildlife or Fish Survey: visual surveys near known nesting areas can be used to monitor population trends



Prairie falcon

General information

Prairie falcons are large, pale brown falcons with pointed wings and a distinct dark mustache marking on their face. Prairie falcons are found in arid grasslands, shrublands, and deserts. They nest primarily on cliffs, laying their eggs in small depressions. They prey primarily on ground squirrels, but also on other small mammals and birds and occasionally lizards and insects.

Habitat requirements

Diet: ground squirrels, small mammals, birds, and occasionally lizards and insects

Water: water is obtained from the diet

Cover: nest in cliffs, rock outcrops, canyon walls, ridges, and cave walls; overhanging rocks serve as cover from the sun and weather.

Wildlife management practices

Nesting Structures: nesting platforms may be added to cliffs

Set-back Succession: *Prescribed Fire* can be used to maintain an open landscape that prairie falcons require when searching for prey; *Chaining* and *Drum-chopping* may be used to limit shrub and tree encroachment, such as juniper, and promote increased herbaceous groundcover

Wildlife or Fish Survey: monitoring active nests and observation counts along road transects are used to estimate population trends



USFWS



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 creeks 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

Pyrrhuloxia

General information

Pyrrhuloxias are a close relative to the northern Cardinal with a characteristic tall crest and stout, curved, parrot-like bill for cracking seeds. These gray or gray-brown birds have distinct red markings on their face, crest, breast, and tail, though the female will look grayer. Pyrrhuloxias are found year-round in arid regions of the Southwest, including Texas, New Mexico, Arizona, and Mexico. They prefer desert vegetation types, such as shrubby, dry grasslands, mesquite savannas, shrub-cactus, riparian woodlands, and farm-field hedgerows. They are commonly seen at bird feeders. Most of their water during the spring and summer months comes from the insects they eat, but in the winter they often relocate closer to free water sources. Pyrrhuloxias are very territorial during the breeding season, calling their sharp notes from perches and making short flights between scrub patches. The females construct their cup-like nest out of twigs, bark, and grass. The nest is often placed up in a tree 5-15 feet off the ground and away from the main trunk. They usually lay a clutch of 2-4 eggs and may have 1-2 broods per year. During winter, pyrrhuloxias come together in large flocks that may number as many as 1,000 birds. Predators include feral and domestic cats, ferruginous pygmy-owls, and greater roadrunners. Although it is not threatened, the pyrrhuloxia has experienced decline because of the conversion of shrubland to agriculture and urbanization.

Habitat requirements

Diet: seeds, including doveweed, sandbur, panicum, and pigweed; fruit, such as cactus and nightshade; insects, including grasshoppers, caterpillars, beetles, cicadas, and weevils

Water: get the majority of their water from their diet, but will drink free-standing water

Cover: shrubs, mesquite savannas, woodlands near streams, farm hedgerows; dense brush (mesquite, elderberry, paloverde) is often used for nesting cover

Wildlife management practices

Control Nonnative Invasive Vegetation: controlling areas of invasive vegetative can help maintain a diverse source of food resources and ensure food availability throughout all seasons

Edge Feathering: can enhance structure for nesting and foraging

Field Borders: can provide nesting and escape cover in areas lacking patches of dense brush

Plant Shrubs: can enhance escape cover and food sources in areas lacking adequate brush



Gary Kramer



Set-back Succession: Prescribed Fire, Disking, and Herbicide Applications can be used to maintain open areas for foraging and scattered brush; Chainsawing may be used to reduce tree cover

Water Developments for Wildlife: small ponds, guzzlers, and windmills may provide free-standing water, especially during winter months

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 inflicted 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



Red-tailed hawk

General information

Red-tailed hawks are one of the most abundant hawks in the U.S. They are large raptors with a pale breast, brown back, and red-topped tail, for which they are named. They usually have a dark band across their breast, but the overall plumage can vary. Red-tailed hawks are often seen soaring or perching near open grasslands, pastures, and fields where they search for prey. They dive and catch prey with sharp talons. Red-tailed hawks most often nest in tall trees where they have a good view of the surrounding land. Nests are primarily made of dry sticks that can create piles over 6 feet tall. A pair will continue to build upon nests where 1 to 5 eggs are subsequently laid.



Mark Bohn

Habitat requirements

Diet: small mammals, such as squirrels, rabbits, and mice, reptiles, and other birds

Water: necessary water is obtained from diet

Cover: nests are usually built 30 to 90 feet aboveground, often in the fork of a tree branch; cliffs may be used for nest sites when trees are not present; small trees, electric poles, and similar structures are used for perching

Wildlife management practices

Control Nonnative Invasive Vegetation: when nonnative invasive vegetation begins to compete with native vegetation and degrade habitat for red-tailed hawks or their prey

Create Snags: in open areas where live trees are available and perching sites could be enhanced

Delay Crop Harvest: (in some ecoregions) to provide additional food for prey and thus increase potential for increased prey

Edge Feathering: to increase usable space for prey, especially around row crop fields

Field Borders: to increase usable space for prey, especially around row crop fields

Forest Management: *Forest Regeneration (Clearcut)* to improve habitat for prey and increase usable space for red-tailed hawks in large expanses of mature forest

Plant Native Grasses and Forbs: to enhance early successional cover where limiting and where planting is necessary

Plant Shrubs: in large open areas where trees and shrubs are not present to create perching sites and provide cover for various prey species

Plant Trees: (in some ecoregions) in large open areas where trees are not present to create perching and nest sites

Set-back Succession: *Prescribed Fire, Disking,* and



Mowing may be used to maintain early successional communities for various prey species; *Chaining, Root-plowing,* and *Drum-chopping* may be used to set-back succession in areas dominated by shrubs where more open space is needed

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

Wildlife Damage Management: such as exclusion and fencing, may be necessary where livestock predation, such as chickens, is problematic

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

Redhead

General information

Redheads are diving ducks found across the U.S. and Mexico. They winter in southern areas of the U.S. and into Mexico. Redheads use open-water wetlands (especially for loafing) as well as those with a mosaic of open water with floating islands of organic material and some emergent vegetation. Redheads do not build nests, but instead use old nests of other ducks and wetland birds that are above water or very near the shore in dense emergent vegetation providing concealment. Like other waterfowl, chicks are precocial. That is, they are feathered with down and are able to swim about and forage upon hatching.

Habitat requirements

Diet: chicks primarily eat aquatic invertebrates (mollusks, snails, crustaceans) during late spring and early summer; during the rest of the year, redheads eat aquatic plants, such as pondweeds, muskgrass, bulrush seeds, wild celery, water lily seeds, and coontail

Water: obtained in diet

Cover: during spring and summer, dense emergent vegetation for nesting; open-water wetlands are used for loafing and foraging; wetlands with a mosaic of open water with submerged and emergent aquatic vegetation are used for foraging

Wildlife management practices

Control Nonnative Invasive Vegetation: when nonnative invasive aquatic vegetation begins to reduce habitat quality for redheads; this is most common when mats of nonnative species begin to form over the water surface and limit diving and foraging by redheads

Livestock Management: livestock should be excluded from wetlands managed for redheads during the nesting season to prevent deterioration of nesting cover

Repair Spillway/Levee: if not functioning properly

Set-back Succession: *Prescribed Fire* is recommended to rejuvenate vegetation when wetlands dry sufficiently to burn (most common in ephemeral wetlands or impoundments where water levels can be manipulated); *Chainsawing* may be used to clear trees where needed

Water Control Structures: should be installed in dams or levees if not present to enable water level manipulation and promote growth of tall emergent aquatic vegetation adjacent to wetlands with an abundance of floating and submerged aquatic vegetation (3 feet to 5 feet deep)

Water Developments for Wildlife: shallow impoundments may be constructed to temporarily flood areas dominated by tall emergent aquatic vegetation during the nesting season



Donna Dewhurst



Wildlife or Fish Survey: observation surveys and aerial surveys are most often used to estimate population trends

Ring-necked pheasant

General information

Ring-necked pheasants are nonnative gamebirds introduced into North America from Asia. They are most prevalent across the northern Great Plains, but also occur across portions of the Intermountain West and northeastern U.S. They are most often found in relatively dense grasslands, cattail marshes, and shrub cover adjacent to agricultural fields, woodlands, wetlands, and along ditches with dense vegetation. They are especially numerous in areas with abundant grain agriculture adjacent to nesting and escape cover.

Habitat requirements

Diet: various seeds, grains, grasses, leaves, fruits, and nuts; grains are used heavily in agricultural areas; insects constitute an important food item for females during the breeding season and young pheasants during the first several weeks after hatching

Water: necessary water is obtained in the diet

Cover: dense residual grass and forb cover for nesting and escape; shrubs and trees may be used for roosting; dense cattails adjacent to and within wetlands

Wildlife management practices

Control Nonnative Invasive Vegetation: ring-necked pheasants are adapted to many plants that are not native to areas where they occur in the U.S. However, there are some, including tall fescue and bermudagrass, that do not provide cover or food value for ring-necked pheasant.

Delay Crop Harvest: to avoid nest destruction when appropriate

Edge Feathering: to increase usable space around crop fields bordered by woods

Field Borders: to increase usable space around crop fields

Forest Management: where forests are adjacent to open areas used by pheasants, Forest Regeneration (Clearcut) will create brushy cover for 5 to 10 years; Forest Stand Improvement (heavy thinning) also can stimulate brushy understory cover in woodlots that may be used by pheasants

Leave Crop Unharvested: to provide additional food through winter

Livestock Management: grazing management should prevent overgrazing to maintain nesting and escape cover

Plant Food Plots: to provide additional food source where food is limiting

Plant Native Grasses and Forbs: where nesting and escape cover are limiting and planting is necessary

Plant Shrubs: where roosting and escape cover is limiting in open and agricultural areas



Dave Menke



Plant Trees: where roosting cover is limiting in open and agricultural areas

Set-back Succession: Prescribed Fire to rejuvenate dense, grassland and wetland (especially dense cattails) cover and reduce woody encroachment where needed; Herbicide Applications and Chainsawing can be used to reduce trees and shrub cover

Tillage Management: to provide cover and waste grain through fall and winter

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

Increase Harvest: where populations can sustain additional harvest pressure for hunting recreation and/or where populations need to be lowered, such as where pheasants (a non-native species) compete with native grassland species for habitat resources

Wildlife or Fish Survey: call counts, observation surveys, and point counts are used to estimate population trends

Rock pigeon

General information

Rock pigeons (commonly called pigeons) are an introduced species found year-round throughout urban and agricultural areas in the U.S. They are considered pests because they are generally protected in urban areas where they develop dense populations and damage buildings and other structures with accumulations of droppings. They also cause severe problems in agricultural areas by contaminating feed. Pigeons also can carry and spread diseases, including salmonella, encephalitis, Newcastle disease, and others, to people and livestock through their droppings. Droppings of rock pigeons may also contain histoplasmosis, a fungal disease that can cause respiratory problems in humans. Wildlife damage management practices are often required to control overabundant rock pigeon populations. Rock pigeons are regularly found around large buildings, parks, and open areas. They create a shallow nest of sticks, leaves, and other vegetation, and nest aboveground and on or around buildings. Rock pigeons primarily feed on the ground and eat small grains, seeds, crumbs, and garbage.

Habitat requirements

Diet: waste grain and weed seeds; in urban areas, rock pigeons commonly eat human handouts

Water: free-standing water is required frequently during warm seasons

Cover: barn lofts, window ledges, rooftops, bridges, and a variety of other structures

Wildlife management practices

Wildlife Damage Management: shooting (including pellet guns in urban areas), toxicants, and trapping are recommended direct control techniques; exclusion practices prevent access to livestock feed; food, water, and desirable cover should be removed when possible and when it does not impact desirable wildlife species; harassment practices may be effective; habitat management to attract rock pigeons should never occur

Wildlife or Fish Survey: observation counts and questionnaires related to wildlife damage management are used to estimate trends in populations



James W. Arterburn



Ruby-throated hummingbird

General information

There are 18 species of hummingbirds found in North America. The ruby-throated hummingbird is the most widespread species. Other than a couple of exceptions, hummingbirds migrate into Central and South America during winter. Hummingbirds use areas with flowering plants from which they can feed on the nectar. In urban settings, they prefer areas with large trees and nearby flowering plants. A hummingbird's nest is constructed in the shape of a small cup and is built of lichens and other vegetation. Hummingbirds require high-energy foods. Nectar is high in sugars that supply needed energy. Insects are an important source of protein.

Habitat requirements

Diet: nectar from flowers and insects found on flowers

Water: necessary water obtained from diet

Cover: trees and shrubs for nesting; flowers for feeding

Wildlife management practices

Control Nonnative Invasive Vegetation: when nonnative invasive vegetation begins to compete with native vegetation and reduce habitat quality for ruby-throated hummingbirds

Plant Shrubs: flowering shrubs and vines that provide nectar may be planted where nesting sites and food resources are limited; favorites include hibiscus, trumpet vine, and lilac

Plant Trees: where potential nesting sites are limited; flowering dogwood and various fruit trees are favorites

Wildlife or Fish Survey: observation counts, especially visitation at feeders, are used to estimate trends in populations

Artificial Feeders: artificial feeders filled with sugar-water (1 part sugar to 4 parts boiled water) may be used where flowers are limited; multiple feeders may reduce problems with territoriality; never give honey-water to hummingbirds because honey ferments faster than sugar and quickly develops a mold that can kill hummingbirds

Plant Flowers: preferred flowers include petunias, gladiolus, nasturtiums, begonias, morningglory, evening primrose, columbine, and cardinal flower

Rooftop/Balcony Gardens: can provide source of nectar if appropriate flowers are planted

NOTE: *Plant Flowers* should not be recommended to establish *Rooftop/Balcony Gardens*



Greg Lavaty



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

Create Snags: where drumming logs are limiting, large-diameter (18+ inches), non-mast producing trees may be killed or felled

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; *Forest Road Maintenance* may involve daylighting roads and planting forages where forage may be limiting

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



Bill Marchel



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 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

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 are used to estimate 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

Tillage Management: 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

Delay Crop Harvest: delaying hay harvest until after nesting season (June) can increase nesting success

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



Richard Baetsen



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

Tillage Management: 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 are used to estimate trends in populations

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

Wildlife or Fish Survey: call counts and point counts may be used to estimate population trends



Glen Tepke



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 are used to estimate 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 Control Structures: should be installed if one is not present in a wetland that has a dam or levee to allow the water level to be manipulated

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

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



Beedie Savage



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 can be used to estimate 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 wetlands 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 Control Structures: should be installed if not present in dikes to allow periodic water drawdowns to maintain a hemi-marsh structure and the appropriate shallow water required by Virginia rails

Water Developments for Wildlife: shallow impoundments can be constructed to provide habitat



Dave Menke



Wildlife or Fish Survey: Call counts are most often used to estimate 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

Create Snags: where cavities are limited to provide potential nest sites and perching sites in open areas

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

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 can be used to monitor bluebird populations; 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

Create Snags: to provide perching sites in open areas where trees are abundant

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 are used to estimate 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

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, bristlegrass, 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

Create Snags: where needed to create perching sites

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



Gray Kramer



Tillage Management: eliminate tillage in the fall 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 and point counts are 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, are preferred for brooding. Although wild turkeys spend most of their time on the ground, except when they fly up into trees in the evening to roost for the night, they can fly well and often take flight for short distances to escape predators.

Habitat requirements

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

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

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

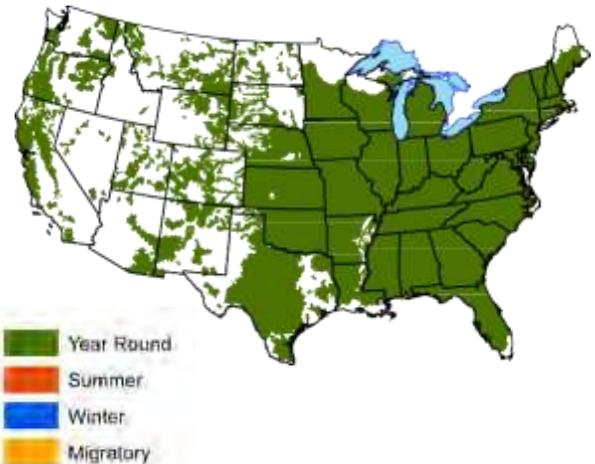
Wildlife management practices

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

Edge Feathering: can enhance nesting and brooding



Robert Burton



cover around fields

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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.



David Ward

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 Control Structures: should be installed in levees if not present to allow manipulation of water levels, expose mudflats, and encourage aquatic vegetation

Water Developments for Wildlife: shallow impoundments should be created where topography allows, providing increased feeding areas for snipe

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



Wood duck

General information

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

Habitat requirements

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

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

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

Wildlife management practices

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

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

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

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

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

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



Thomas G. Barnes



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

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

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

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

Repair Spillway/Levee: if not functioning properly

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

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

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

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

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

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 are used to estimate 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

Water Control Structures: a Clemson Beaver Pond Leveler or similar device can be installed in beaver dams to maintain water levels

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

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

Create Snags: to provide roost sites (only in areas where they pose no danger to human structures or health when they fall) where roost sites may be limiting

Nesting Structures: may provide additional roost sites if natural roost sites are limiting

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



Don Pfitzer



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

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

Black-tailed prairie dog

General information

The black-tailed prairie dog is the most widely distributed of the North American prairie dogs. They live in densely populated colonies (20 to 35 per acre) among subterranean burrows in grassland or sparse shrubland communities. Some areas of colonies will be bare ground where there is a high prairie dog density. They often establish colonies near intermittent streams, water impoundments, homestead sites, corrals, and windmills. They do not tolerate tall vegetation well—they avoid brush and timbered areas. In tall and mixed-grass rangelands, prairie dogs have a difficult time establishing a colony unless large grazing animals (bison or livestock) have closely grazed the vegetation. Prairie dogs often select heavily grazed or trampled areas. Periodic disturbance, such as grazing, is required to maintain suitable conditions for prairie dogs, particularly in areas where rainfall is sufficient to support shrub and tree cover. Prairie dogs occupied up to 700 million acres of western grasslands in the early 1900s. In Texas, the largest prairie dog colony on record measured nearly 25,000 square miles. Since 1900, prairie dog populations have been reduced by as much as 98 percent in some areas and eliminated in others. Today, only about 2 million acres of prairie dog colonies remain in North America. Colonies must be linked to other adjacent colonies (generally less than 1 mile) as colonies periodically move or disappear only to be repopulated by nearby colonies. Therefore, multiple adjacent colonies are critical for long-term population persistence. Although prairie dogs can cause substantial damage to agriculture, prairie dogs are a keystone species on native range and part of a healthy range system. The loss of prairie dog colonies affects many other plant and animal species.

Habitat requirements

Diet: green grasses and forbs

Water: necessary water is obtained from diet

Cover: open grassland with relatively short vegetation; burrows provide escape cover

Wildlife management practices

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

Livestock Management: grazing can promote suitable grassland structure for prairie dogs

Plant Native Grasses and Forbs: where planting is required to provide forage where limited



Elise Smith



Set-back Succession: *Prescribed Fire* is used to maintain grasslands; *Chaining, Drum-chopping, and Root-plowing* can be used to reduce shrub cover and promote grass/forb community

Decrease Harvest: on native range where shooting or other population reduction methods have reduced prairie dog colonies to the point where they are approaching unsustainable levels

Increase Harvest: where populations can withstand increased hunting for recreation; can be used to limit population growth where additional prairie dogs are not desired

Wildlife Damage Management: registered control techniques, such as toxicants (toxic baits), fumigants, and shooting can be used to reduce populations where damage is occurring to agricultural interests

Wildlife or Fish Survey: observation counts, aerial surveys, and extent of colonies are used to estimate population trends

Bobcat

General information

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

Habitat requirements

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

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

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

Wildlife management practices

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

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

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

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

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

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

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

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

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



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

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

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

Brazilian free-tailed bat

General information

The Brazilian free-tailed bat roosts in large numbers at a relatively small number of roost sites. They have brown fur with broad ears, large climbing feet, and a characteristic “free,” mouse-like tail. Anywhere from dozens to millions of bats may roost at a single site, which could be a cave, bridge, or other building structures with cracks or niches where bats can escape during the day. They are frequently found around and in buildings and have earned the nickname “house bats.” At dusk, these free-tailed bats emerge from roosts to feed on insects and are estimated to eat between 6,000 and 18,000 metric tons of insects annually, in Texas alone! This insectivore is beneficial both for human comfort and the reduction of agricultural pests. Millions of bats that roost in the U.S. spend their winters in Mexico, Central America, and possibly South America. In contrast, Brazilian free-tailed bats in some areas such as east Texas are non-migratory and remain during winter. Each female gives birth to one pup, which is unable to fly and without fur. Seventy percent or more of the young are born within a 10-day period in mid-summer. Young bats live in large congregations on cave ceilings. At about one month old, young bats are able to fly to find their own insects. Although a small percentage of the Brazilian free-tailed bat populations carry rabies (about 24 percent), humans occasionally use pesticides to poison the bats and vandalize key roosting sites because of fear.



J. N. Stuart



Habitat requirements

Diet: insects, such as moths, beetles, flying ants, and June bugs

Water: require free-standing water; Brazilian free-tailed bats sweep over water sources and drink while flying

Cover: caves, mine tunnels, hollow trees, bridges, and other buildings for roost sites during the day; young remain on the ceiling for about a month after birth

Wildlife management practices

Nesting Structures: providing man-made structures for bats to roost can help expand their population or decrease concentrations at existing roost locations.

Wildlife Damage Management: education on how to properly handle dead bats to protect humans from the rabies virus could decrease fears of bats spreading the disease

Wildlife or Fish Survey: exit counts from caves are used to estimate population trends

Collared peccary

General information

The collared peccary (also called javelina [*“have-a-leena”*]) is a game mammal found in the southwestern U.S. Although similar in appearance to pigs, the collared peccary is not in the same taxonomic family as pigs. They have a smaller body size than pigs with 4-toed hooves on their front feet and 3 toes on their back feet. The peccary’s large head and long snout are capped off by sharp tusks pointing toward the ground. Their black, bristly coats include a white collar around their neck. Javelinas have a strong-smelling musk gland on the top portion of their rump, which they use to mark their home range. They run in herds of a few to several dozen within fairly small home ranges and usually can be found cooling off near water or resting in the shade during the heat of the day. Collared peccaries are the only wild ungulate in the western hemisphere that breed all year long, and breeding may be dependent upon rain events. Females will give birth to 1 to 5 young. Peccaries may be aggressive, increasing unnecessary fear among humans, but will not attack unless they are defending themselves. Often confused with pigs, they push dirt around, but do not root-up the ground.

Habitat requirements

Diet: cacti, mesquite beans, lechuguilla and other succulent vegetation, fruit, mast, insects, and small lizards

Water: free-standing water is required unless prickly pear is abundant

Cover: thickets of brush, prickly pear, scrub oak, or rocky canyons

Wildlife management practices

Control Nonnative Invasive Vegetation: when nonnative vegetation is competing with native vegetation and reducing habitat quality for collared peccary

Plant Shrubs: planting prickly pear cacti where limited may increase available food resources

Set-back Succession: *Prescribed Fire, Chaining, and Drum-chopping* can be used to maintain low-growing shrub cover and herbaceous groundcover

Water Developments for Wildlife: peccaries do not sweat; thus, free-standing water is necessary for cooling in hot environments

Decrease Harvest: when populations are declining in good habitat and additional animals are desired

Increase Harvest: when additional harvest is desired and populations can withstand additional harvest and when the population needs to be lowered

Wildlife or Fish Survey: spotlight surveys, camera surveys, and hunter harvest data can assess population trends



C. Burnett



Columbian black-tailed deer

General information

The Columbian black-tailed deer is a subspecies of mule deer that occurs in the coastal regions of northwestern North America (northern California, Oregon, Washington, and southern British Columbia). Columbian black-tailed deer use a mixture of openings (with herbaceous groundcover and scattered shrubs) and conifer forest. Black-tailed deer are ruminants (animals with a four-chambered stomach) and are adapted to eat higher-quality forages more so than some other ruminants (such as elk or cattle). Black-tailed deer are crepuscular (active at dawn and dusk) and prefer relatively flat areas at mid- to low elevations (below 1,500 ft.) on south-facing slopes. These sites tend to be dominated by vine maple, huckleberry, and salal plant communities, which provide preferred forage, minimal duration of snow cover, and protection from cold winds. Where overabundant, black-tailed deer can cause damage to ornamental plantings, forest crops, and row crops, and can be hazardous for motor vehicles.

Habitat requirements

Diet: forbs, browse, soft mast, grains, and grasses

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

Cover: mixture of dense young forest, mature forest, and early successional cover

Wildlife management practices

Control Nonnative Invasive Vegetation: may be necessary if the native plant community is being outcompeted and food and cover resources are being reduced

Edge Feathering: will encourage shrub and young tree growth to enhance travel corridors, fawning cover, and forage availability

Field Borders: to increase fawning cover and forage availability around fields

Forest Management: *Forest Regeneration*, especially *Clearcut*, can stimulate herbaceous cover and provide additional brushy cover for a few years; *Forest Stand Improvement* can stimulate additional herbaceous cover and browse in the understory, if the understory is limited

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

Livestock Management: should prevent overgrazing in early successional areas to maintain forage and browse for black-tailed deer; livestock should be excluded from forested areas where black-tailed deer is a focal species to maintain the forest understory

Plant Food Plots: to provide additional nutrition, particularly during summer lactation period and during winter in some areas where naturally occurring food resources are limited

Plant Native Grasses and Forbs: where early successional



Erin Willett



cover is limited and additional grasses and forbs are needed for forage

Plant Shrubs: in large open areas where additional shrub cover, browse, or soft mast is needed

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

Set-back Succession: *Prescribed Fire* can be used to maintain early successional openings and to improve forest understory structure and composition for increased forage and soft mast; *Disking* can be used to maintain early successional openings; *Chainsawing* and *Root-plowing* can be used to create forest openings and maintain shrub-dominated communities

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

Water Developments for Wildlife: where water is limiting (within one-half mile), ponds and shallow impoundments can provide water for drinking

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

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

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

Wildlife or Fish Survey: spotlight surveys, camera surveys, and hunter harvest data can assess population trends

Common muskrat

General information

Muskrats are large rodents found throughout the U.S., especially in shallow marshes with abundant cattails. They are mainly nocturnal and need water at least 4 feet deep or flowing water that allows free movement under ice during winter. Muskrats prefer water 1 to 2 feet deep during summer, with about 20 percent of the wetland open water, free of emergent aquatic vegetation. Muskrats build lodges of cattails or other herbaceous vegetation, but do not use sticks or limbs. They sometimes nest in a bank burrow along a waterway. Burrowing and denning activities can cause problems in flooded agricultural areas, such as rice fields and waterfowl management areas.

Habitat requirements

Diet: roots, tubers, and green shoots of emergent aquatic vegetation, such as cattails and bulrushes

Water: necessary water obtained from diet

Cover: primarily shallow-water wetlands with a mixture of open water and emergent aquatic vegetation; den in lodges built from cattails and bulrushes; loaf on floating logs or tops of lodges

Wildlife management practices

Control Nonnative Invasive Vegetation: when nonnative invasive aquatic vegetation is competing with the native aquatic plant community and reduce habitat quality for common muskrat

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

Repair Spillway/Levee: if not functioning properly

Set-back Succession: *Prescribed Fire* is recommended to rejuvenate old, decadent wetland vegetation

Water Control Structures: should be installed if not present in levees or dams to control water levels and allow cattails and bulrushes to grow

Water Developments for Wildlife: small impoundments can be built in low-lying areas to provide habitat

Decrease Harvest: when trapping efforts have reduced population below desirable levels

Increase Harvest: when populations can sustain additional trapping or where populations need to be lowered

Wildlife Damage Management: may be necessary when muskrats damage dikes in agricultural areas and waterfowl management areas; populations are typically reduced by trapping



Bo Zaremba



Wildlife or Fish Survey: observation surveys, track counts, and presence of lodges 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 have an extremely varied diet that fluctuates with the seasons.

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;



Steve Thompson



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.

Desert cottontail

General information

Desert cottontails can be found in woodlands, grasslands, creosote brush, and desert areas from California to Texas and from northern Montana to Mexico. In the **Hot Desert** ecoregion, desert cottontails use thick shrub cover interspersed with open areas. Riparian and urban areas also are used. Because cottontails do not travel far, shelter and food must be close together.

Habitat requirements

Diet: a variety of forbs and grasses spring through fall; in winter, bark and twigs of shrubs are important; buds, grain, seeds, and soft mast also are eaten when available

Water: necessary water obtained from diet

Cover: grassland, shrub vegetation, and ground burrows for hiding and nesting cover

Wildlife management practices

Control Nonnative Invasive Vegetation: where nonnative invasive vegetation is competing with native vegetation and limiting habitat for cottontails

Field Borders: to increase usable space around row crop fields

Forest Management: (*Mediterranean* ecoregion only)

Forest Regeneration (Clearcut) provides optimal brushy cover for a few years

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

Livestock Management: prevent overgrazing to allow ample amounts of herbaceous vegetation for nesting, cover, and forage; livestock should be excluded from food plots

Plant Food Plots: where rainfall is sufficient, forage plots may be planted adjacent to shrub cover

Plant Native Grasses and Forbs: where early successional cover is limited and planting is necessary to provide additional grasses and forbs

Plant Shrubs: in areas where shrub cover is lacking

Set-back Succession: *Prescribed Fire* is recommended to maintain herbaceous openings; *Prescribed Fire* and *Chaining* can rejuvenate decadent shrublands and encourage additional herbaceous groundcover (burning is not recommended in the **Hot Desert** ecoregion unless sufficient precipitation is available); *Mowing* can be used to maintain herbaceous openings in **Urban** areas

Tillage Management: cropland tillage may be delayed in spring to allow use of standing stubble for cover; tillage may be eliminated in the fall to allow access to waste grain



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

Increase Harvest: where populations can sustain additional hunting and trapping pressure for recreation and 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, and transect flush counts can be used to estimate population trends

Eastern cottontail

General information

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

Habitat requirements

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

Water: necessary water obtained from diet

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

Wildlife management practices

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

Edge Feathering: to increase usable space around fields

Field Borders: to increase usable space around fields

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

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

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

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

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

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

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



Aubrey Deck



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

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

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

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

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

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

Eastern 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

Tillage Management: 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

Eastern gray squirrel

General information

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

Habitat requirements

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

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

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

Wildlife management practices

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

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

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

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



Laura Perfick



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

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

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

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

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

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

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

Elk

General information

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

Habitat requirements

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

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

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

Wildlife management practices

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

Edge Feathering: may increase forage availability in woods around fields

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

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



Erwin and Peggy Bauer



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

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

Plant Trees: where additional forest cover is needed

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

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

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

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

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

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

Fisher

General information

Fishers are furbearers found in forests in the upper Great Lakes area and the mountains of the Pacific and northeastern U.S. Fishers were once a valuable fur resource that led to over-trapping and population decline in many areas. Fishers are likely more adept at preying on porcupines than any other predator. A desire to control porcupines in some areas because of the damage they cause to trees has led to large-scale reintroduction of fishers throughout many portions of their former range. Fishers are now re-established as far south as West Virginia and Pennsylvania along the Appalachian Mountain range.



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Habitat requirements

Diet: primarily small rodents and snowshoe hare; will readily consume other rodents, rabbits, porcupines, insects, reptiles, soft mast, and carrion; and small domestic pets

Water: necessary water obtained from diet

Cover: mature conifer or mixed hardwood forests with abundant down woody debris; den in hollow logs, snags, or live trees



Wildlife management practices

Control Nonnative Invasive Vegetation: when nonnative invasive vegetation is competing with native vegetation and reducing habitat quality

Create Snags: in forested areas where denning cavities are suspected to be limiting the population

Forest Management: *Forest Regeneration (Single-tree Selection, Group Selection)* can improve forest structure for several prey species; *Forest Stand Improvement* can increase understory development that can lead to increased prey populations; forest management can also increase down woody debris

Plant Trees: in large open areas where additional forest cover is needed (should maintain >50 percent canopy cover)

Decrease Harvest: may be necessary when trapping pressure is limiting population growth and additional fishers are desired

Increase Harvest: where populations can sustain additional trapping pressure or a reduction in the population is desired

Wildlife Damage Management: may be necessary if small domestic pet depredation is a problem

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

Gray fox

General information

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

Habitat requirements

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

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

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

Wildlife management practices

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

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

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

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

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

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

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

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

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

Increase Harvest: when the population can sustain



USFWS



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

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

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

Indiana bat

General information

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

Habitat requirements

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

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

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

Wildlife management practices

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

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

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

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

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



Susi von Oettingen



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

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

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

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

Mink

General information

Mink occur in Alaska, Canada, and across most of the U.S. They are mainly nocturnal and are found along stream banks, riverbanks, and edges of a variety of wetlands. Mink are strictly carnivorous. Most prey is found in close association with dense vegetation along wetland edges and other riparian areas. Availability of den sites is considered a key factor in how mink use an area. Areas with lots of trees and shrubs and limited livestock grazing near riparian areas usually have more den sites. Mink can eat significant numbers of upland nesting waterfowl or gamebirds, especially in areas where nesting cover is limited.



Bo Zarembo

Habitat requirements

Diet: rabbits, mice, muskrats, crayfish, snakes, and birds

Water: necessary water probably obtained through diet

Cover: closely associated with water; riparian areas and wetland edges; dens often located under log jams and tree roots, old muskrat burrows, and rock piles



Wildlife management practices

Control Nonnative Invasive Vegetation: when nonnative invasive vegetation begins to reduce habitat quality for mink and their prey

Livestock Management: livestock should be excluded from wetlands and riparian areas where mink is a focal species; 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

Set-back Succession: *Prescribed Fire* is recommended to rejuvenate old decadent wetland vegetation that can improve habitat for prey

Water Control Structures: are necessary to regulate water level and manipulate growth of emergent aquatic vegetation adjacent to an impoundment

Water Developments for Wildlife: shallow impoundments can be developed to increase habitat where needed

Decrease Harvest: may be necessary when trapping pressure is limiting population and an increase in population is desired

Increase Harvest: where populations can sustain additional trapping pressure, and when mink have been identified limiting upland nesting waterfowl or gamebirds

Wildlife Damage Management: mink may occasionally kill domestic poultry, but this is rare and localized. Trapping and exclusion are effective methods to reduce damage.

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

Moose

General information

The moose is the largest member of the deer family. Adult males can reach 1,800 pounds and females may weigh 1,000 pounds. Males exhibit palmated (flattened or palm-like) antlers, whereas most other members of the deer family have a dendritic (twig-like) antler configuration. Moose are herbivores and inhabit both boreal and mixed deciduous forests in temperate and subarctic climates. Moose are typically solitary and do not group into herds. Predators include wolves, bears, and humans. Moose are typically found around wetlands (such as swamps, streams, lakes) because of the abundance of browse and aquatic plants moose prefer. The moose is the only deer species that can dive underwater to reach plants on stream, marsh, and lake bottoms. An adult moose can consume as much as 70 pounds of vegetation per day. In spring, moose are often drawn to roadways to satisfy their sodium requirements where they lick salt applied to road surfaces to melt snow and ice. This habit leads to moose-vehicle collisions wherever roads are salted during winter. Moose populations have rebounded over the past 30-40 years as pollution in waterways has been reduced and abandoned farms have succeeded into shrub-dominated and young forest cover.

Habitat requirements

Diet: leaves and twigs of willow, maple, aspen, mountain ash, and birch trees, as well as aquatic vegetation, including submerged aquatic vegetation, which may represent as much as half of the diet

Water: water requirements are met through consumption of aquatic vegetation and standing water where they are typically found

Cover: riparian areas along streams and rivers, edges of marshes adjacent to thick upland cover, mature softwood stands during extreme cold and/or deep snowfall

Wildlife management practices

Control Nonnative Invasive Vegetation: may be necessary when native plant communities, both upland and aquatic, are being threatened by nonnative invasive vegetation and habitat quality for moose is declining

Forest Management: *Forest Regeneration (Clearcut, Shelterwood, Group Selection)* will provide increased browse

Plant Shrubs: may be necessary in large open areas where additional shrub cover is needed

Plant Trees: may be necessary in large open areas where additional forest cover is needed

Repair Spillway/Levee: if not functioning properly



Karen Laubenstein



Set-back Succession: *Prescribed Fire* and *Chainsawing* can be used to rejuvenate and enhance low-growing woody cover and increase browse

Water Control Structures: should be installed in existing dikes and levees if not already present to manipulate water levels and maintain aquatic vegetation surrounding wetlands

Water Developments for Wildlife: shallow impoundments can be created if a lack of wetlands are limiting the presence or abundance of moose

Decrease Harvest: may be necessary if hunter harvest has limited the population and a population increase is desired, or if winter mortality, particularly from winter tick loads on calves and yearlings, is excessive

Increase Harvest: may be implemented if the moose population needs to be lowered

Wildlife or Fish Survey: aerial surveys may be used to monitor moose populations

Mountain cottontail

General information

Mountain cottontails occur in the mountainous regions of the western U.S. They use thick shrubs and burrows for nesting and cover, and eat a variety of forbs, grasses, and browse. They have relatively small home ranges and daily movements, so food and cover should be close together.

Habitat requirements

Diet: a variety of forbs, grasses, seeds, and soft mast in spring through fall; in winter, bark and browse is most important; grains and alfalfa are eaten when available

Water: necessary water is obtained from diet

Cover: thick shrubs and burrows for nesting and cover



Lewis Scharpf

Wildlife management practices

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

Forest Management: *Forest Regeneration (Clearcut)* will enhance cover and stimulate additional forage for a few years; *Forest Road Maintenance* may involve daylighting roads and planting forages where forage may be limiting

Livestock Management: should prevent overgrazing and maintain sufficient groundcover for rabbits

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

Plant Native Grasses and Forbs: where desirable groundcover is lacking and planting is necessary for establishment

Plant Shrubs: where shrub cover is lacking

Set-back Succession: *Prescribed Fire* and *Chaining* can be used to rejuvenate and maintain shrubby cover and stimulate forbs and grass interspersed with shrub cover; Mowing may be used in Urban areas to maintain openings

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

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

Wildlife Damage Management: may be necessary to control damage to ornamental and landscaping plants and vegetable gardens

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



Mountain lion

General information

The mountain lion (also called cougar, panther, painter, or puma) are predatory cats once common across North America. Adult mountain lions weigh 80 to 200 pounds. Males are larger than females. Mountain lions are typically buff, cinnamon, tawny, or reddish color. Contrary to local belief, there is no such thing as a black mountain lion. Mountain lions are primarily nocturnal, but may be active during daylight hours. The mountain lion is a stalk-and-ambush predator and pursues a wide variety of prey. Populations in the eastern U.S. were drastically reduced as the country was settled. Populations may fluctuate with prey abundance. Mountain lions are a game species in several western states, but have historically been removed because of livestock depredation. The mountain lion is listed as an endangered species in Florida (a.k.a. Florida panther.)

Habitat requirements

Diet: primary food source is deer and rabbits, but beaver, porcupine, mice, skunks, marten, coyote, javelina, bighorn sheep, pronghorn, moose, elk, ruffed grouse, wild turkey, fish, and occasionally domestic livestock, dogs, and house cats also may be eaten

Water: free-standing water is required for drinking; water sources are also used as ambush sites for prey

Cover: coniferous and tropical forests, grasslands, swamps, brushland, and desert edges; mountain lions can survive in most any environment that supports an abundance of deer

Wildlife management practices

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

Forest Management: (in some ecoregions) *Forest Regeneration (Clearcut, Shelterwood, Group Selection)* and *Forest Stand Improvement* can enhance cover and food resources for a variety of prey species if prey abundance is limiting mountain lion populations

Plant Shrubs: in large open areas where shrub cover is limiting prey for mountain lions

Plant Trees: (in some ecoregions) in large open areas where additional forest cover is needed

Set-back Succession: *Prescribed Fire, Herbicide Applications, Dozer-clearing, and Drum-chopping* may be used to enhance cover and food availability for several prey species



NPS



Water Developments for Wildlife: may be implemented where free-standing water is limited for prey and mountain lions, which also may increase prey opportunities

Decrease Harvest: may be necessary where mountain lion populations have declined and hunting pressure may be limiting population increase

Increase Harvest: may be implemented when mountain lion populations are limiting other wildlife species, such as white-tailed or mule deer

Wildlife Damage Management: may be needed if livestock depredation is problematic and in the rare instance of attacks on humans (approximately 90 attacks on humans have been documented in the last 125 years)

Wildlife or Fish Survey: track counts, scent stations, hunter observation data, and camera surveys can be used to estimate population trends

New England cottontail

General information

The New England cottontail (NE cottontail) is found in isolated areas of Maine, New Hampshire, New York, Connecticut, Massachusetts, and Rhode Island. The USDA-NRCS included them in its Working Lands for Wildlife Initiative. NE cottontail is often confused with the eastern cottontail, which looks very similar, and because the eastern cottontail is more of a habitat generalist, it has been displacing the NE cottontail since the eastern cottontail was introduced to the New England states in the early 1900s. Because this region has dense human populations, habitat distribution for NE cottontail has declined by 86 percent since 1960. In addition to reduction of habitat distribution, urban sprawl also indirectly reduces habitat quality and quantity because of land-use changes (fire suppression, aesthetic mowing, afforestation, and the reduction of timber harvest). The remaining habitat is largely fragmented and isolates local populations, making them more vulnerable to overall population decline. Early successional cover in at least 25-acre blocks is desirable. Habitat may be provided in old-fields, cleared areas (such as utility and railroad right-of-ways), young regenerating forest, shrubby fringes around swamps and beaver ponds, managed early successional openings, and coastal shrublands. Nests are constructed of fur, grass, and leaves on the ground in a 4-inch depression.

Habitat requirements

Diet: forbs, grasses and soft mast in late spring and summer; grasses, leaves, soft mast, and buds in fall; bark, twigs, buds, and grasses in winter

Water: obtained through diet

Cover: early successional cover consisting of shrubs, forbs, and perennial native grasses; evergreen shrubs and trees are critical for escape and thermal cover in winter

Wildlife management practices

Conservation Easement: can protect critical habitat for this declining species

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

Edge Feathering: to enhance cover and forage availability between fields and forest

Field Borders: to increase usable space around crop fields

Forest Management: *Forest Regeneration (Clearcut, Shelterwood, Seed-tree)* will enhance habitat for a few years; *Forest Road Maintenance* may involve daylighting roads and planting forages where forage may be limiting

Livestock Management: should exclude livestock from



food plots and prevent overgrazing to allow sufficient herbaceous vegetation for nesting, cover, and forage
Plant Native Grasses and Forbs: where herbaceous vegetation is limiting and planting is necessary to establish desirable cover

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

Plant Shrubs: where there is a lack of shrub cover and none is regenerating naturally

Plant Trees: evergreen species may be planted in areas lacking thermal cover in winter

Set-back Succession: *Prescribed Fire, Herbicide Applications, and Disking* can be used to maintain early successional areas; *Prescribed Fire* can be used to rejuvenate and maintain shrub cover; *Chainsawing, Dozer-clearing, and Root-plowing* can be used to convert forest to early successional cover

Decrease Harvest: may be necessary if the local population is declining or cannot withstand harvest.

Wildlife or Fish Survey: because differentiating New England cottontails from Eastern cottontails is very difficult and only reliable under genetic testing or morphological skull identification, wildlife agencies request hunters submit heads of harvested rabbits for identification and analysis of population trends

Pronghorn

General information

Pronghorns are hooved ungulates found in open prairie and sagebrush desert of the western U.S. Although somewhat similar in appearance, the pronghorn is not an antelope, goat, or deer. The pronghorn is the second-fastest land mammal in the world, reaching a top speed of about 55 mph (cheetahs can run short distances up to 75 mph). Both the male and female pronghorn have horns that are covered in a black keratin sheath, which is shed annually. The sheath curves backward and has a prong which points forward (hence the name, pronghorn). Pronghorns of females are much smaller than those of males. According to location, some pronghorn populations migrate long distances between their summer and winter ranges. Corridors that allow safe passage are a management concern for migrating pronghorn. Pronghorns are generally tan with white markings on the face, neck, stomach, and rump. When alarmed, pronghorn often raise the white hairs on their rump to signal danger to other pronghorn. Pronghorns have fantastic vision, which helps them identify predators in the open country they inhabit.

Habitat requirements

Diet: varies with season; grasses, forbs, and cacti in spring and summer; primarily browse in winter

Water: free-standing water is required

Cover: native grassland and desert sagebrush with flat to rolling terrain that allows long-range visibility

Wildlife management practices

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

Livestock Management: should maintain appropriate stocking rate to prevent overgrazing and maintain adequate herbaceous groundcover; fencing should be kept to a minimum with at least 16 inches between the ground and the bottom wire, which should be smooth, not barbed; the top wire should not be more than 42 inches aboveground; large blocks of rangeland should be maintained, and no more than 30 percent of a management area should be cropland

Plant Food Plots: in areas where there is adequate rainfall, food plots can provide high-quality forage, such as alfalfa, for increased nutrition

Plant Native Grasses and Forbs: where herbaceous vegetation is lacking and planting is required to establish desirable groundcover



James C. Leupold



Set-back Succession: Prescribed Fire, Chaining, and Root-plowing are recommended to stimulate additional herbaceous groundcover in large expanses of shrubland

Water Developments for Wildlife: where water is limited or absent within two miles, development of dugouts, windmills, and spring developments is warranted

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

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

Wildlife Damage Management: may be necessary in areas where crop damage is occurring

Wildlife or Fish Survey: observation counts are 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

Tillage Management: 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

Red fox

General information

Red foxes are the most widely distributed carnivore in the world and occupy a wide range of ecoregions and vegetation types, including grasslands, shrublands, woodlands, farmlands, and cities. They typically prefer brushy areas in winter. Red foxes are solitary animals and are mostly nocturnal. They can be seen sometimes during the early morning and early evening. Red foxes use dens for shelter and raising young. Red foxes have a characteristic manner of hunting small mammals by standing motionless, listening, and watching intently. When a red fox locates prey, it often leaps high and brings the forelimbs straight down, pinning the prey to the ground.

Habitat requirements

Diet: primarily small mammals, birds, insects, hard and soft mast, and occasionally carrion; red foxes will store food and are very good at relocating these caches

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

Cover: prefer a mixture of herbaceous openings with brushy cover, shrubland, and woodland; dens are located in brushy areas and in hollow logs, under large brush piles, under large rocks, or in underground burrows often under roots of blown-over trees; daytime resting sites are generally thickets and brushy areas

Wildlife management practices

Control Nonnative Invasive Vegetation: when nonnative vegetation begins to compete with native vegetation and decrease habitat quality for red fox and their prey

Edge Feathering: will enhance cover in woods around fields for red fox and their prey

Field Borders: will enhance cover around crop fields for red fox and their prey

Forest Management: *Forest Regeneration* (especially *Clearcut* and *Forest Stand Improvement*) in relatively large areas of mature forest will temporarily enhance cover for prey and may provide increased denning sites (down logs and debris) and daytime resting sites; *Forest Road Maintenance* may involve daylighting roads and planting forages to enhance habitat for prey species

Livestock Management: grazing should be managed to maintain suitable cover for prey

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

Plant Shrubs: in relatively large open areas where brushy cover or thickets for denning and resting sites is limiting

Set-back Succession: *Prescribed Fire* is recommended



Ronald Laubenstein



to maintain early successional areas and enhance understory structure in savannas and woodlands; *Chainsawing*, *Dozer-clearing*, and *Root-plowing* may be used to convert forest cover to herbaceous openings and shrublands; *Drum-chopping* may be used to enhance shrublands when shade limits herbaceous growth

Decrease Harvest: when the population is declining in response to trapping or hunting pressure and an increase in population is desired

Increase Harvest: when the population can sustain additional harvest for additional recreational trapping or hunting; to promote increased abundance of prey species, such as waterfowl (nests) or cottontails, if red fox has been identified as limiting those populations; increasing harvest also may reduce damage issues associated with poultry

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

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

Red squirrel

General information

Red squirrels are relatively small tree squirrels that occur in the Rocky Mountains, Great Lakes, and New England regions, and down the Appalachians. As their name implies, they are reddish or yellowish on back and sides with a white belly. They are found primarily in boreal coniferous forest and mixed deciduous-coniferous forest. Red squirrels den in tree cavities, but will make ball nests on large tree limbs close to the trunk or in underground burrows if cavities are not available. They will tunnel in snow and store conifer seeds in caches. Red squirrels often eat from the same stump or downed log where hulls of nuts and cones accumulate. Young are born in spring and late summer.

Habitat requirements

Diet: wide variety of seeds (especially pine seeds), eggs, and mushrooms

Water: freestanding water required regularly

Cover: coniferous and mixed deciduous-coniferous forest; nest in tree cavities and build nests of shredded bark, grass, leaves, twigs

Wildlife management practices

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

Forest Management: *Forest Stand Improvement* can improve species composition and help increase mast production; snags should be retained for possible cavities

Livestock Management: livestock should be excluded from forests managed for red squirrel

Plant Trees: in large open areas to provide future habitat for red squirrels

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

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

Wildlife or Fish Survey: observation surveys can be used to estimate population trends



Gilles Gonthier



River otter

General information

The river otter is a brownish black semi-aquatic mammal that is a member of the weasel family. River otters are highly social and the group is called a family, which consists of an adult female and her offspring. Adult males form social groups separate from the families except during the breeding season. Adults typically weigh 15 to 25 pounds and are well equipped for aquatic life with short fur, short powerful legs, webbed toes, and long tapered tails. River otters are superb swimmers and divers and can remain underwater for several minutes. They are active year-round, but are mostly nocturnal during spring, summer, and fall. River otters live in a holt, which is a den constructed of burrows of other mammals. They also den along undercut riverbanks, hollow logs near or in the water, rock formations, and flooded debris that provide protection and seclusion with easy access to water. Urbanization and pollution have decreased the range of river otters.

Habitat requirements

Diet: primarily fish, but they also will feed extensively on aquatic insects and crayfish; small mammals and amphibians are eaten occasionally

Water: largely obtained from their diet; clean water is essential for fish populations

Cover: riparian areas along creeks and rivers, as well as freshwater lakes, inland wetlands, coastal shorelines, marshes, and estuaries

Wildlife management practices

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

Livestock Management: livestock should be excluded from forests managed for river otter

Repair Spillway/Levee: if not functioning properly

Water Control Structures: should be installed in levees and dams if not present to manage water levels in impoundments and influence habitat for river otters and prey

Water Developments for Wildlife: impoundments may be created adjacent to riparian areas where additional habitat for river otters is desired

Decrease Harvest: may be necessary if trapping has been excessive and an increase in population is desired

Increase Harvest: may be required if predation is limiting populations of various prey species or when a reduction in population is desired

Wildlife Damage Management: is necessary when recreational or commercial fisheries are being threatened by river otters



Jim Leopold



Wildlife or Fish Survey: track surveys, latrine site surveys, bridge surveys (for latrines), trapper harvest data, and camera surveys can be used to monitor populations

Rocky Mountain mule deer

General information

Rocky Mountain mule deer, a subspecies of mule deer, occur in western North America (from Oklahoma to California and northward to Northern Canada), just north of the range of the desert mule deer. They are adapted to a wide range of



Tupper Ansel Blake



western plant communities from prairie to alpine to semi-desert, but prefer a mixture of early successional areas with scattered shrubs and mature forest. Mule deer are ruminants (animals with a four-chambered stomach) and are adapted to eat higher-quality forages, more often than other ruminants (such as elk or cattle). Rocky Mountain mule deer that occupy ranges with high elevations migrate to lower elevations in winter for access to preferred forage, avoidance of deep snow cover, and protection from cold winds. Mule deer can cause significant damage (ornamental plantings, forest crops, and row crops) when overabundant and can be hazardous for motor vehicles.

Habitat requirements

Diet: forbs, browse, soft mast, grains, and grasses

Water: free-standing water is required nearly daily in dry ecoregions and during summer; water should be available within one mile

Cover: dense woody vegetation and relatively tall early successional cover, including native grasses, forbs, and shrubs; rock outcrops and ravines for loafing cover; in the **Intermountain** ecoregion, 50 percent young and mature forest, well interspersed with herbaceous and shrubby cover is optimal

Wildlife management practices

Control Nonnative Invasive Vegetation: if nonnative invasive plants are competing with native vegetation and reducing habitat quality for Rocky Mountain mule deer

Edge Feathering: (in some ecoregions) to create an ecotone between openings and forest that will provide increased browse and enhance fawning cover

Field Borders: (in some ecoregions) to increase fawning cover and forage availability around row-crop fields

Forest Management: (in some ecoregions) *Forest Regeneration (Clearcut, Shelterwood, Seed-tree, Group Selection)* can stimulate herbaceous cover and provide additional brushy cover for a few years; *Forest Stand Improvement* can stimulate additional herbaceous cover and browse in the understory where needed

Leave Crop Unharvested: (in some ecoregions) to provide additional food resource, especially near cover

Livestock Management: grazing intensity should be managed to maintain forbs for forage, adequate cover for fawning, and shrubs and young trees for browse and cover;

livestock should be excluded from forests to prevent destruction of the understory where mule deer is a focal species; livestock watering facilities may be necessary in uplands to discourage congregation in and overuse of riparian areas; livestock should be excluded from food plots

Plant Food Plots: (in some ecoregions) where naturally occurring food resources are limited; food plots may provide additional nutrition, particularly during late summer and winter in some areas

Plant Native Grasses and Forbs: where planting is necessary to increase grasses and forbs for forage and cover

Plant Shrubs: where additional shrub cover and browse is needed

Plant Trees: (in some ecoregions) where additional forest cover is needed

Set-back Succession: *Prescribed Fire, Disking, and Herbicide Applications* is recommended to maintain herbaceous cover and revert shrubby areas and young forest back to herbaceous vegetation; *Prescribed Fire* also to stimulate the understory for increased forage and soft mast in young and mature forests; *Chainsawing, Dozer-clearing* and *Root-plowing* may be used to create additional open areas

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

Water Developments for Wildlife: where water is limited or absent (within one mile), ponds and shallow impoundments can provide an external water source for drinking

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

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

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 is recommended when local overabundance is causing crop depredation and increasing vehicle collisions

Wildlife or Fish Survey: spotlight surveys, camera surveys, and hunter harvest data help assess population trends

Snowshoe hare

General information

Snowshoe hares are found in the northern U.S., the Rocky Mountains, the Sierra Nevada, and the Appalachians. They have large feet but smallish ears for a hare. Their summer coat is dark brown and their winter coat is white. They are commonly found in both young and mature coniferous and deciduous forest, but prefer dense cover, especially near low wet areas. They forage in recently regenerated forest and forest openings. Snowshoe hares do not use dens. Home range is about 10 acres. They have 2-3 litters of 2-4 young, which are born April-August.



Habitat requirements

Diet: forbs, grasses, soft mast in spring and summer; browse and bark in winter (as well as forbs and grasses when available)

Water: probably obtain necessary water through diet

Cover: dense thickets and young forest cover; mature forest with dense understory; seldom far from dense cover; forest openings and riparian areas; give birth under a shrub or fallen log



Wildlife management practices

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

Forest Management: *Forest Regeneration (Clearcut, Shelterwood, Seed-tree)* will provide dense cover and increased soft mast for several years after harvest; *Forest Stand Improvement* can enhance understory development and soft mast production; *Forest Road Maintenance* may involve daylighting roads and planting clovers where forage may be limited

Livestock Management: livestock should be excluded for forests managed for snowshoe hare; should prevent overgrazing in forest openings to maintain sufficient cover and forage for snowshoe hares

Plant Food Plots: (in some ecoregions) forest openings may be planted in forages where food may be lacking

Plant Shrubs: where dense shrub cover is lacking and planting is necessary

Plant Trees: in relatively large open areas to maintain at least 80 percent forest cover

Set-back Succession: *Prescribed Fire* is recommended to maintain herbaceous openings and stimulate forest understory for increased cover, forage, and soft mast; *Chainsawing* may be used to reduce trees and enhance dense cover; *Chainsawing, Dozer-clearing,* and *Root-plowing* may be used to convert forest to early successional plant communities; *Herbicide applications*

may be used to improve plant composition

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

Increase Harvest: when populations can sustain additional hunting pressure for recreation and when population reduction is desired

Wildlife Damage Management: when snowshoe hare populations eat the bark of commercially valuable trees during winter

Wildlife or Fish Survey: track counts, observation counts, and hunter observation data can be used to estimate 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, grasses, and mushrooms; in the northern parts of the range, coniferous browse is important in winter

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

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

Wildlife management practices

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

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

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

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



Steve Hillebrand



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

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

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

Plant Food Plots: when naturally occurring food sources are limited, food plots may provide additional nutrition
Plant Native Grasses and Forbs: where early successional vegetation is limiting and planting is necessary for establishment

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

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

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

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

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

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

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

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

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

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, creeks, 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

Eastern box turtle

General information

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

Habitat requirements

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

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

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

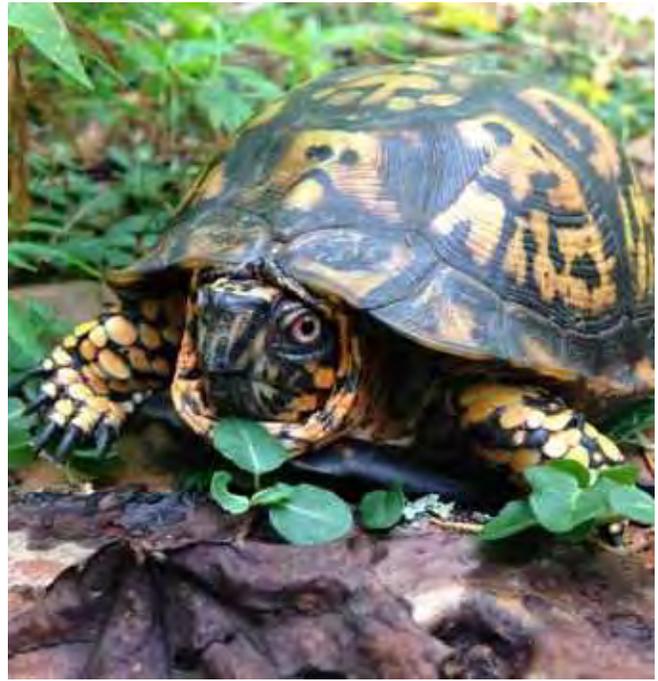
Wildlife management practices

Control Nonnative Invasive Vegetation: when nonnative invasive vegetation begins to compete with native vegetation and reduce habitat quality; sodgrasses in openings is particularly problematic for nesting; jangrass in forests is not a problem for eastern box turtle, but may be a problem for other species. However, jangrass (or Japanese stiltgrass) in forested areas is not a problem for eastern box turtles as they regularly forested areas where jangrass occurs in the understory.

Field Borders: to increase usable space around row crop fields

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

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



Katie A. Harris



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

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

Plant Trees: where additional forest cover is needed

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

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

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

Eastern indigo snake

General information

Eastern indigo snakes are found primarily in Florida and southern Georgia and have been listed as federally endangered since 1971. They are the largest snakes in the United States, reaching lengths of 60-84 inches. Although they prefer wetland areas, they also may be found in pine and shrubby flatwoods, grasslands, tropical hammocks, agricultural fields, and coastal dunes. They use abandoned gopher tortoise burrows and other burrows for reproduction and cover. Eastern indigo snakes have a docile, non-aggressive nature and can live near humans without negative interactions. They are important predators of rodents and venomous snakes.

Habitat requirements

Diet: small mammals, frogs, lizards, fish, eggs, birds, and other snakes

Water: requirements largely unknown; likely obtain water needs from the foods they consume

Cover: sandy soils with an abundance of animal burrows and stump holes in areas dominated by pine and hardwood forests, woodlands, and savanna; they also use hammocks, palmetto flats, and brushy areas near riparian areas and wetlands

Wildlife management practices

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

Control Nonnative Invasive Vegetation: when nonnative invasive vegetation begins to decrease habitat quality for eastern indigo snakes

Forest Management: *Forest Regeneration*, especially *Seedtree* and *Single-tree Selection*, in pine forests and woodlands can enhance cover for prey and provide stump holes and down woody debris; *Group Selection* and *Forest Stand Improvement* can enhance understory cover for eastern indigo snakes and their prey in hardwood stands

Plant Native Grasses and Forbs: may be necessary in open areas with insufficient groundcover

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

Set-back Succession: *Prescribed Fire* is recommended to maintain herbaceous groundcover in longleaf pine savanna and woodland, and maintain an early successional stage in old-fields and grasslands

Water Developments for Wildlife: where lacking, small ponds and shallow impoundments can increase habitat suitability

Wildlife or Fish Survey: transect surveys and drift fences with snake traps may be used to estimate population trends



Daniel Dye



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



Chelsi Hornbaker



Gila monster

General information

The Gila monster is the largest lizard native to the U.S., and one of only a few venomous lizard species in the world. Most of the Gila monster's teeth have two grooves that allow its venom, a nerve toxin, to flow into the wound as the lizard holds its prey. Gila monster venom is not fatal to humans. Furthermore, the Gila monster is not aggressive and prefers to avoid people. It is restricted to the arid regions of the desert southwest. It is most active during the spring and summer months, but spends more than 95 percent of the active season in burrows or under rocks emerging mainly to bask and feed. The Gila monster is a carnivore that feeds on nestling mammals and birds, eggs of birds and reptiles, lizards, and carrion. They are able to go months between meals and store fat reserves in their stout tails.

Habitat requirements

Diet: young of small mammals and birds, eggs of lizards and ground nesting birds, carrion

Water: receives necessary water from diet

Cover: typically found in desert grasslands, Mojave and Sonoran desert scrub, and thorn scrub (Sonora); less often oak or pine-oak woodland; sub-surface shelters are important components of its habitat

Wildlife management practices

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

Plant Shrubs: where cover is lacking for prey species

Water Developments for Wildlife: in certain areas, it may be possible to create standing water to attract prey species

Wildlife or Fish Survey: transect surveys are used to estimate population trends



Gary M. Stolz



Gopher tortoise

General information

The gopher tortoise occurs in the southeastern Coastal Plain from southeastern South Carolina to extreme southeastern Louisiana. It inhabits open uplands, especially those with relatively well-drained, sandy soils. The gopher tortoise prefers longleaf pine and oak sandhills with open canopies, but also occurs in dry prairie, coastal grasslands and dunes, and mixed hardwood-pine stands. Gopher tortoises dig burrows up to 20 feet long and 6 feet deep. These burrows, from which the species was named, provide it protection from high and low temperatures extremes, moisture loss, and predators. These burrows also serve as a refuge for nearly 400 other species (including the federally endangered indigo snake). Gopher tortoises require a diverse understory of plants close by as most feeding occurs within 150 feet of their burrow entrance.



Dwayne Elmore

Habitat requirements

Diet: grasses, legumes, and fruits

Water: necessary water obtained from diet

Cover: burrows provide necessary cover

Wildlife management practices

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

Control Nonnative Invasive Vegetation: when nonnative invasive vegetation begins to reduce habitat quality for gopher tortoises, especially by limiting herbaceous diversity

Forest Management: *Forest Regeneration (Single-tree Selection)* is recommended to regenerate and maintain mature stands of longleaf pine; *Forest Stand Improvement* can remove undesirable species

Plant Native Grasses and Forbs: may be necessary in open areas with insufficient groundcover

Plant Trees: where additional forest cover is needed (maintain 20-60 percent canopy cover)

Set-back Succession: *Prescribed Fire* is recommended to maintain a diverse herbaceous understory; *Chainsawing* is recommended to maintain <60 percent canopy cover and to maintain a diverse herbaceous understory;

Herbicide Applications may be used with fire; *Forest Stand Improvement* may be implemented to control undesirable species and help maintain diverse understory

Wildlife or Fish Survey: observations and use of gopher tortoise burrows are used to estimate population trends



Plains hog-nosed snake

General information

Plains hog-nosed snakes are characterized with dark blotches down a pale tan or yellowish back with a strongly upturned, pointed snout. They are relatively thick, heavy-bodied snakes, reaching 2-3 feet in length. Plains hog-nosed snakes prefer shrubby flat or gently rolling prairies with loose, sandy soil. They use their snouts to burrow into loose soil to find food and spend the winter. Often these sandy sites are characterized by sparse vegetation in most years. Plains hog-nosed snakes have slightly toxic saliva that is not dangerous to humans, but it helps hog-nosed snakes subdue prey. Hog-nosed snakes are masters at bluff behavior. When threatened, they will flatten their heads, giving a hood appearance, similar to a cobra. Then, they often inflate themselves with air and slowly release the air with a hissing noise, similar to a rattlesnake. They may strike, but usually with a closed mouth! It is actually difficult to get a plains hog-nosed snake to bite in self-defense. It will turn over on its back, thrash back and forth, open its mouth and stick its tongue out, and feign death, while upside down.



Gary M. Stolz



Habitat requirements

Diet: mostly toads, but also other reptiles, birds, mice, and eggs

Cover: shrublands and grasslands

Water: necessary water obtained from diet

Wildlife management practices

Control Nonnative Invasive Vegetation: when nonnative invasive vegetation begins to reduce habitat quality for plains hog-nosed snakes

Livestock Management: should prevent overgrazing and leave adequate cover for prey

Plant Native Grasses and Forbs: in open areas where groundcover is lacking and planting is necessary

Set-back Succession: *Prescribed Fire* and *Chaining* are recommended to reduce woody vegetation where needed and maintain native shortgrass prairie; it is important these practices occur during the inactive season to minimize negative effects on snakes

Wildlife or Fish Survey: transect surveys are used to estimate population trends

Texas horned lizard

General information

Texas horned lizards are spiny lizards with a wide body. They are found in deserts, grasslands, and shrublands of the southwestern United States. They regulate their body temperature by basking and burrowing. When a predator approaches, Texas horned lizards will inflate themselves. If the lizard is further frightened, it is capable of squirting nearly one third of its blood volume through a pore near the eye. They also “rain harvest.” During heavy rain, they stand high on their feet, flatten the body, and lower the head. This behavior funnels rain to the mouth through specialized scales. Daily activities often are timed around highest ant activities.

Habitat requirements

Diet: mostly ants, but also other invertebrates

Water: known to drink using specialized scales to harvest rainwater during heavy rains

Cover: sandy to rocky soils with sparse vegetation of grass, cactus, or scattered shrubs

Wildlife management practices

Control Nonnative Invasive Vegetation: when nonnative vegetation reduces habitat quality; in particular, dense sod grasses planted as livestock forage should be eradicated where possible when the Texas horned lizard is a focal species.

Plant Shrubs: where shrub cover is lacking

Set-back Succession: *Prescribed Fire* is recommended to maintain diverse grasslands and shrublands; *Drum-chopping* and *Chainsawing* can rejuvenate shrublands; it is important that these practices occur during the inactive season to minimize negative effects on the lizards

Wildlife or Fish Survey: transect surveys are used to estimate population trends



Robert Burton



Timber rattlesnake

General information

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

Habitat requirements

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

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

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

Wildlife management practices

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

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

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



conducted during the inactive season, especially around denning sites

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

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

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

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

Western diamond-backed rattlesnake

General information

Western diamond-backed rattlesnakes are found in deserts, grasslands, shrublands, and woodlands of the southwestern United States. They are pit vipers, which means they have a heat-sensing organ beneath the nostrils that can detect temperature differences that allows the snake to determine if another animal is a predator or prey. Western diamond-backed rattlesnakes usually spend daylight hours in the shade of low-growing shrubs, debris piles, or rocks. They are most active around sunrise and sunset, and at night during summer. The rattle is made of the keratin, which is a protein, and a new segment is added each time the snake sheds. A rattlesnake cannot be aged by counting the rattle segments because snakes shed at varying rates, often multiple times in one year, and rattle segments commonly break-off. To rattle, rattlesnakes move the rattle back and forth as much as 40-60 times per second. Western diamond-backed rattlesnakes are venomous and should not be handled.

Habitat requirements

Diet: mostly mammals (rabbits, squirrels, mice, and rats), but also lizards and birds

Water: will consume their body weight in free-standing water annually; they also get water from their food and some is absorbed during shedding.

Cover: areas with grass, forbs, cactus, or scattered shrubs; areas with sandy to rocky soils may provide animal burrows and rocky crevices used for cover

Wildlife management practices

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

Plant Native Grasses and Forbs: when grass/forb cover is limiting and planting is necessary

Plant Shrubs: in large open areas where additional shrub cover is needed to provide daytime loafing areas and attract prey

Set-back Succession: *Prescribed Fire* is recommended to maintain diverse grasslands and rejuvenate shrublands that have become too dense to allow sufficient herbaceous groundcover; *Drum-chopping* and *Chaining* also can be used to rejuvenate shrublands; it is important these practices occur during the inactive season to minimize negative effects on snakes

Wildlife Damage Management: it may be necessary to remove western diamond-backed rattlesnakes from around human dwellings; debris piles attract prey, and thus snakes, making it desirable to keep such debris away from houses and buildings

Wildlife or Fish Survey: transect surveys are used to estimate population trends



Gary M. Stolz



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.

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



Bill Buchanan



Crawfish frog

General information

Crawfish frogs occur from Indiana south to Louisiana, and from eastern Kansas south to the Texas coast. Crawfish frogs are found in a variety of vegetation types ranging from damp wooded valleys, open brushy fields, to tallgrass prairies. Populations are often associated with major river floodplains. Areas with shallow soils and intensive agriculture are avoided. Crawfish frogs are largely fossorial and spend the non-breeding season in crayfish burrows. Adults make annual migrations to temporary, fishless ponds to breed. Eggs hatch within 3-4 days, but tadpoles may take 2 months to transform.



Rick Fridell

Habitat requirements

Diet: adults eat beetles, spiders, crickets, ants, millipedes, and small crayfish; tadpoles filter feed on phytoplankton

Water: breed in ephemeral, fishless ponds with grassy margins

Cover: adults require low, wet areas, including moist meadows, prairies, woodlands, and brushy fields; burrows are required; crayfish burrows are preferred, but any burrow may be used as long as it reaches the water table; tadpoles require ponds that contain some algae, pondweed, and other vegetation to provide food and shelter



Wildlife management practices

Conservation Easement: can protect critical habitat for this declining species

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

Livestock Management: livestock should be excluded from ponds that may be used as breeding ponds for crawfish frogs; livestock watering facilities should be developed away from pond

Plant Native Grasses and Forbs: may be necessary to convert fields currently in row-crop agriculture to crawfish frog habitat

Plant Shrubs: in fields that are currently in row-crop agriculture to convert them to crawfish frog habitat, or in large open areas that need additional cover

Water Control Structures: should be installed if not present in ponds with levees that are managed for crawfish frogs to enable the pond to be drained, especially if fish are present

Water Developments for Wildlife: small, fishless ponds and impoundments may be created if additional breeding ponds are needed

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

Monterey salamander

General information

The Monterey salamander occurs along the Pacific coast from Washington to southern California. This species is treated as a “ring” species whose subspecies form a ring-shaped distribution around the Central Valley of California and do not interbreed where the ends of the ring overlap in southern California. It inhabits a wide variety of vegetation types in hilly or mountainous terrain from near sea level to approximately 10,000 feet in elevation. Monterey salamanders occur in chaparral, wet coastal forests, coastal sagebrush, pine-oak woodlands, and mixed conifer-hardwood forests. Moist soil conditions are necessary for Monterey salamanders to occur because they lack lungs and respire through their moist skin.

Habitat requirements

Diet: invertebrates, such as sow bugs, mites, spiders, centipedes, and beetles

Water: moist soil required for respiration

Cover: large amounts of downed woody debris; they also hide beneath moss mats, rocks, leaf litter, and within rodent burrows

Wildlife management practices

Forest Management: *Forest Regeneration (Group Selection, Single-tree Selection)* or *Forest Stand Improvement* may be beneficial in areas where additional down woody debris is needed; when regenerating a forest, it is important to use either *Group Selection* or *Single-tree Selection* to minimize area exposed to sunlight and soil-drying conditions

Plant Shrubs: where cover is limiting

Plant Trees: where cover is limiting

Wildlife or Fish Survey: drift fences with pitfall traps are used to estimate population trends



Stuart Wilson



Northern red-legged frog

General information

Northern red-legged frogs are found in low, moist forests of the Pacific Northwest. They typically occur near permanent, quiet water, such as stream pools, marshes, and ponds. During wet weather, they can be found in damp woods and meadows, as well as ephemeral pools. They are active mostly at night, especially during wet periods. Northern red-legged frogs usually remain motionless when approached before bounding away with long, evasive jumps. The breeding call is relatively weak and consists of 4-7 notes that sound like “uh-uh-uh-uh.” When captured by a predator, they often emit a loud scream.

Habitat requirements

Diet: tadpoles are herbivores, consuming algae and organic debris; adults consume small invertebrates, including beetles, caterpillars, and isopods

Water: non-flowing water is required for reproduction

Cover: breeding ponds must not contain fish, and limbs or stems must be present at the surface to attach egg masses; adults use damp woods and meadows with permanent water; fallen logs and other coarse woody debris must be present

Wildlife management practices

Control Nonnative Invasive Vegetation: when nonnative invasive vegetation begins to reduce habitat quality for northern red-legged frogs

Forest Management: Forest Regeneration (Group Selection and Single-tree Selection) can create small canopy gaps in the forest and increase the amount of coarse woody debris; Forest Stand Improvement can also increase understory structure and coarse woody debris; it is important to retain considerable overstory cover

Livestock Management: livestock should be excluded from forests where northern red-legged frogs are a focal species; livestock should be excluded from ponds that may be used as breeding ponds for northern red-legged frogs; livestock watering facilities should be developed away from pond

Plant Trees: where forest cover is limiting

Water Developments for Wildlife: small ponds and impoundments can be created in forested areas to provide breeding areas; woody debris in the pond should include small stems at the water surface for egg mass attachment.

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



Nirvan Hope



Rough-skinned newt

General information

Adult rough-skinned newts prefer moist coniferous and hardwood forests, but also are found in open valleys. Newts require permanent water, such as ponds or slow-moving streams, for courtship, breeding, egg-laying, and larvae development. Eggs are laid singly on aquatic vegetation or submerged twigs. Aquatic larvae transform in late summer, or they over-winter and transform the following summer. Adult rough-skinned newts are generally terrestrial, often seen crawling over land in the daytime and becoming aquatic when breeding. However, some populations hide in daylight and are active at night. Some adults are primarily aquatic. Newts often are seen moving in large numbers to breeding sites during the breeding season. Some newts spend the dry summer in moist areas under woody debris, rocks, or animal burrows. Adults emerge to feed after fall rains. In some populations, adults remain in ponds throughout summer and migrate back onto land in fall following rain events. Often, they will form large aggregates of thousands of newts in the water. Adult newts have rough or granular skin, which produces toxins that repel most predators. Rough-skinned newts may assume a swaybacked defense pose with a coiled tail, exposing the bright ventral surface to warn potential predators. Toxin-resistant garter snakes are the only known animals that prey on rough-skinned newts.

Habitat requirements

Diet: larvae feed on aquatic invertebrates; adults eat amphibian eggs and larvae, aquatic and terrestrial invertebrates, worms, and slugs

Water: permanent water, such as ponds and slow-moving streams, are required for breeding and larval development

Cover: shallow water with aquatic vegetation or submerged woody debris is needed for attachment of eggs; soft logs, rocks, and bark are necessary for adult escape cover

Wildlife management practices

Control Nonnative Invasive Vegetation: when nonnative invasive vegetation begins to reduce habitat quality for rough-skinned newts

Livestock Management: livestock should be excluded from forests where rough-skinned newt is a focal species and from ponds that may be used as breeding ponds for rough-skinned newts; livestock watering facilities should be developed away from pond



Repair Spillway/Levee: if not functioning properly

Water Control Structures: should be installed in pond dams or impoundment levees if none are present so water depth can be controlled

Water Developments for Wildlife: small ponds and impoundments can be constructed when breeding ponds are limiting

Wildlife or Fish Survey: seine surveys and minnow traps could be used to estimate population trends

Tiger salamander

General information

The tiger salamander is a wide-ranging species occurring throughout the Great Plains and much of the eastern U.S. (it is absent from the Appalachian mountain regions). It is one of the largest terrestrial salamanders in North America with adults attaining more than one foot in length. Adults inhabit a wide array of vegetation types including bottomland deciduous forests, conifer forests, woodlands, fallow fields, grasslands, meadows, brushy areas, semideserts, and deserts. Free-standing water must be present for breeding. Adults are terrestrial, but make annual, spring migrations to ephemeral (temporary) ponds to breed. Ephemeral ponds contain water during only a portion of the year. The breeding season is short and eggs develop rapidly. Larvae are top predators in fishless ponds. They often grow quickly and can reach 4-6 inches in length before transforming in late summer.

Habitat requirements

Diet: adults eat worms, snails, insects, and slugs; larvae eat a wide variety of aquatic organisms, including invertebrates and other amphibian eggs and larvae

Water: ephemeral or semi-permanent ponds are necessary for reproduction; ponds should be fishless if successful reproduction is to occur

Cover: adult tiger salamanders live underground in burrows for most of the year; deep leaf litter and large amounts of downed woody debris are most desirable

Wildlife management practices

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

Livestock Management: should prevent overgrazing where tiger salamander is a focal species; livestock should be excluded from ponds that may be used as breeding ponds for tiger salamanders; livestock watering facilities should be developed away from pond

Plant Native Grasses and Forbs: when converting fields that are currently in row-crop agriculture to tiger salamander habitat

Plant Shrubs: when converting fields that are currently in row-crop agriculture to tiger salamander habitat, or in relatively large open areas that need additional cover

Plant Trees: where additional forest cover is needed

Water Control Structures: should be installed if not present in ponds or impoundments with levees that are managed for tiger salamanders to enable the pond to be drained, especially if fish are present



Gary M. Stolz



Water Developments for Wildlife: small, fishless ponds or impoundments may be created if additional breeding ponds are needed

Wildlife or Fish Survey: cover boards and pitfall traps along drift fences are used to estimate population trends

Wood frog

General information

Wood frogs have the most extensive range of any North American frog or toad. They occur from the southern Appalachian mountains of Georgia to northern Canada, and westward throughout the Great Lakes region, Canada, and Alaska (not shown on map below). In the northern climates, wood frogs bury themselves in the leaf litter to escape freezing temperatures. They also are able to withstand extended periods of sub-freezing temperatures by increasing blood-glucose levels, which serve as cryoprotectants (antifreeze). Individuals can survive whole-body freezing for more than a week. Wood frogs are closely associated with closed-canopy deciduous and boreal forests. Adults are largely terrestrial, but make annual migrations to ephemeral ponds to breed. The breeding seasons are short (6-14 days) and eggs develop rapidly (4-30 days) in the shallow ponds. Tadpoles grow quickly and generally transform in 6 to 15 weeks.

Habitat requirements

Diet: adults eat terrestrial invertebrates, such as beetles, crickets, spiders, and earthworms; tadpoles filter phytoplankton from the water

Water: breed in shallow water within closed-canopy forests; breeding ponds are usually fishless and are dry at some time of the year

Cover: optimum habitat consists of >70 percent canopy cover in deciduous or boreal forests; prefer areas with moist soils, abundant leaf litter, and downed woody debris

Wildlife management practices

Control Nonnative Invasive Vegetation: where nonnative invasive vegetation creates undesirable conditions for wood frogs, limiting movement to breeding ponds

Livestock Management: livestock should be excluded from forests and from ponds that may be used as breeding ponds for wood frogs; livestock watering facilities should be developed away from pond

Plant Trees: in large open areas where additional forest cover is needed (should maintain >70 percent canopy cover)

Water Developments for Wildlife: maintain ephemeral pools; create small, fishless ponds or impoundments if additional breeding sites are needed

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



Bo Zaremba



Fish

Bluegill

General information

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

Habitat requirements

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

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

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

Wildlife management practices

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

Repair Spillway/Levee: if not functioning properly

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

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

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

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

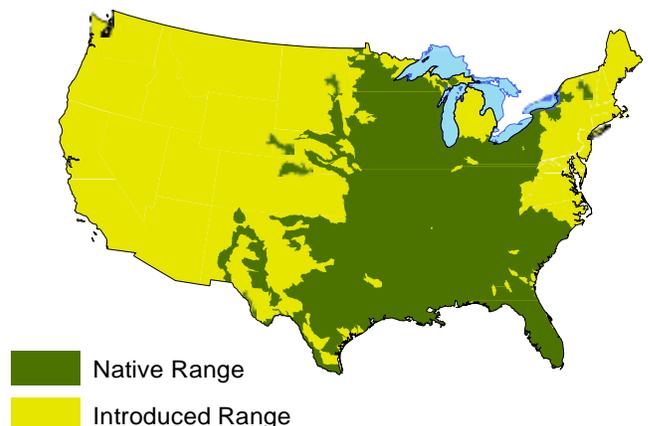
Construct Fish Pond: where no suitable water source is present or where an existing fish pond needs extensive repair, especially to the dike or dam

Control Aquatic Vegetation: when necessary to discourage undesirable aquatic vegetation

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



Eric Engbretson



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

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

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

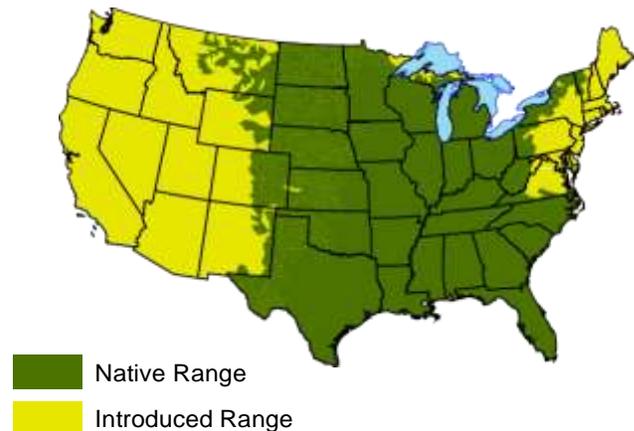
Livestock Management: livestock should either be excluded from fish ponds or only allowed access to a small part of the fish pond; livestock watering facilities should be developed away from the fish pond

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

Coho salmon

General information

The Coho salmon is an anadromous fish species, which means they live part of their lives in saltwater before migrating to freshwater to spawn. They can attain weights of about 35 pounds, but 10 pounds is the average. The range of the Coho salmon in the U.S. is from Alaska southward to northern California. While in the ocean, Coho salmon have dark bluish backs and silver sides and are therefore often called silver salmon. When mature (3 years old), Coho salmon migrate to freshwater to spawn (November to January) and their coloration darkens with reddish sides. Males develop a pronounced hooked jaw/nose during the spawning season. Adults return to their stream of origin to spawn and die after spawning. The eggs are laid in nests called redds and hatch 6 to 7 weeks later in the spring. Young Coho salmon remain in streams and freshwater tributaries for more than a year before migrating (they are called smolts in this life stage) to the ocean. The life cycle is complete when they return to their freshwater stream of origin to spawn. The Coho, like many other salmon species found on the west coast, have experienced severe population declines in the past several decades. Reasons for these declines are complex, but include siltation of spawning areas, blockage of migratory routes by dams, and inadequate water flows in spawning areas as a result of water diversion for other purposes. Estuarine and marine ecosystems are often negatively impacted by shoreline development, residential drainage, and filling marine wetlands. Several Coho salmon populations occurring from California to Oregon have been listed as federally endangered or as species of concern. However, this species is an important recreational and commercial fish where populations remain strong, especially in Alaska.



Timothy Knepp



Habitat requirements

Diet: in the freshwater juvenile or fingerling stage, Coho salmon feed on plankton, insects, and small fish; smolts switch to a diet comprised solely of fish upon entering the ocean

Water: obtained from aquatic environment and food

Cover: Coho salmon need pollution-free freshwater and marine ecosystems; spawning streams must have a stable gravel substrate for construction of redds

Wildlife management practices

Wildlife or Fish Survey: fishing records, seining, electroshocking, and fish condition are used to survey Coho salmon populations

Streams—Remove Fish Barriers: such as culverts or dams that may prevent Coho salmon from migrating upstream to spawn

Cutthroat trout

General information

Cutthroat trout are native to the western U.S. They are found in diverse areas, such as the Rocky Mountains, the valleys of the Great Basin, and inshore areas of the Pacific Ocean, especially along the Washington coastline. They prefer rivers and streams with a gravel bottom, but several subspecies mate in lakes and ponds. Cutthroat trout are carnivores, eating a variety of organisms found in streams and lakes.

Habitat requirements

Diet: young cutthroat trout eat algae and small crustaceans; adults eat crustaceans, eggs, aquatic insects, mollusks, amphibians (tadpoles), and other fish; adults also eat terrestrial organisms if they fall into stream, but they are not a major part of their diet

Water: streams, lakes, and ponds where water does not rise above 70 F in summer; ideally streams should have a variety of riffles, runs, and pools; basic requirements include dissolved oxygen (minimum 6 parts per million); pH range between 6.5 and 9.0

Cover: prefer streams with overhanging vegetation along the shore that provides shade and reduces water temperature, providing terrestrial organisms for food; rocks, as well as debris on the bottom of the river or lake, provide cover that will hide them from prey

Wildlife management practices

Livestock Management: livestock should be excluded from areas managed for cutthroat trout or only allowed access to a small portion; fencing along the riparian area or lakeside may be necessary; livestock watering facilities should be developed away from streams, rivers, lakes, or ponds;

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, electro-shocking, and fish condition are used to survey cutthroat trout populations

Streams—Create Pools: gravel and cobble should be placed in streams to provide structure for insects and locations for spawning; structures should not change currents, which could increase bank erosion; boulders and logs may be placed in the stream or lake to provide cover for trout while hunting, as well as cover for prey species; this practice is not likely needed if there are overhanging stream banks that provide cover



NPS



Streams—Remove Fish Barriers: because most cutthroat trout populations are migratory, dams can impede their ability to return to spawning grounds; installing fish ladders or removing dams will improve the ability of cutthroat trout to migrate

Largemouth bass

General information

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

Habitat requirements

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

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

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

Wildlife management practices

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

Repair Spillway/Levee: if not functioning properly

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

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

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

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

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

Control Aquatic Vegetation: when necessary to discourage undesirable aquatic vegetation

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

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



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

Rainbow trout

General information

Rainbow trout are native to the U.S. west of the Rocky Mountains. However, they have been introduced throughout the U.S. as a sport fish. Rainbow trout are cool- to cold-water fish that do best in freshwater systems below 70 F. They can thrive in both rivers and lakes. Rainbow trout are carnivorous and spawn in areas with a rocky bottom. A water flow that reduces sedimentation of the river floor will increase spawning. A healthy riparian system supports trees and shrubs that prevent erosion and sedimentation and shade the water along the sides of the stream or river. Rainbow trout have driven many native species into extinction or endangerment in places where they have been introduced. Thus, increased harvest may be required in some streams to control their abundance in river systems and protect native species.

Habitat requirements

Diet: fish, aquatic insects, crustaceans, and mollusks; also eat terrestrial organisms that fall into the water

Water: streams, lakes, and ponds where the water does not get above 70 F in summer; ideally, stream should have 50 percent riffles and 50 percent pools; basic requirements include dissolved oxygen (minimum of 6 parts per million); pH should range between 6.5 and 9.0

Cover: rocks, as well as debris on the bottom of the river or lake, provide cover for hiding from prey or fishermen

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 242 for specifics on fish harvest;

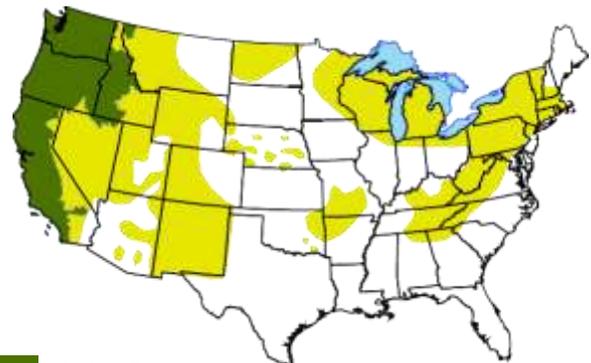
managers have begun reducing rainbow trout populations to minimize predation on or competition for resources with native fish species; increasing harvest can reduce the rainbow trout population

Wildlife or Fish Survey: fishing records, seining, electroshocking, and fish condition are used to survey rainbow trout 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



Robert A. Pos



Native Range

Introduced Range

Control Aquatic Vegetation: when necessary to reduce 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 **Streams—**

Create Pools: gravel and cobble can be placed in stream to provide structure for insects and locations for spawning; structures should not change currents, which could increase bank erosion; boulders and logs may be placed in the stream or lake to provide cover for trout while hunting, as well as cover for prey species

Streams—Remove Fish Barriers: because most native rainbow trout populations are migratory, dams can impede their ability to return to spawning grounds; installing fish ladders or removing dams will improve the ability of rainbow trout to migrate