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Antrostomus carolinensis, chuck-will's-widow

Figure 1—Chuck-will's-widow on nest in Exum, North Carolina. Photo © Dick Daniels, some rights reserved (CC BY-SA 3.0 DEED).

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Summary

This review synthesizes the information that was available in the scientific literature as of 2023 on the biology, ecology, and effects of fire on chuck-will's-widows.

Chuck-will's-widows are migratory birds whose populations have declined throughout much of their range. They breed in the eastern United States and winter in the southern United States, Mexico, Central America, northern South America, and the West Indies. Chuck-will's-widows prefer landscapes with forested areas interspersed with open areas, and often use edge habitat.

Chuck-will's-widows forage primarily on insects. They forage mostly during twilight and on moonlit nights. Foraging sites include canopy gaps in forests, woodlands, and savannas; and open areas that include shrublands, wetlands, and fields.

Chuck-will's-widows nest on the ground and usually lay two eggs/clutch and have one clutch/year. Eggs are laid on litter or on bare ground. Nesting occurs as early as early March and as late as early July, and the semiprecocial chicks hatch after 19 to 21 days. They typically nest in dry or dry-mesic pine, hardwood, or mixed pine-hardwood forests but will nest in a variety of habitats, preferring forests with a heterogeneous, uneven-aged structure and frequent canopy gaps.

Few studies were available on chuck-will's-widow's response to fire. What data are available suggest that chuck-will's-widows use burns at least within the first 3 to 5 years after fire but may avoid nesting in frequently burned areas. Forested landscapes with a small proportion of burned area may benefit chuck-will's-widows, but landscapes with a large proportion of burned area may be detrimental. Chuck-will's-widow eggs and nestlings are vulnerable to even low-intensity surface fire, which suggests that prescribed fires during the peak breeding season may harm Chuck-will's-widows.

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Introduction

FEIS Abbreviation
ANCO

Common Names
chuck-will's-widow

Taxonomy

Class
Aves

Order
Caprimulgiformes

Family
Caprimulgidae

Scientific Name
Antrostomus carolinensis (Gmelin) [14,22,69,81]

Subspecies
None

Synonyms
Caprimulgus carolinensis [69,81]

In 2010, the American Ornithologists Union changed the generic name of chuck-will's-widow from *Caprimulgus* to *Antrostomus* [23]. Studies are available that examine the phylogenetic relationship between chuck-will's-widow and other birds in the Caprimulgidae family (e.g., [5,48,111]).

Common names are used throughout this Species Review. See tables in the Appendix for scientific names of animals and plants mentioned in this Species Review and links to other FEIS Species Reviews.

Distribution and Occurrence

General Distribution

Chuck-will's-widows are native to North America, Central America, South America, and the West Indies [69,82] (fig. 2). They are generally migratory; however, year-round residents occur along the Gulf Coastal Plain from Texas to Florida. Breeding populations occur in the southeastern United States, and wintering populations occur in southern Texas, Central America, South America, and the West Indies [14,82].

Figure 2—Distribution of chuck-will's-widows in North America, Central America, South America, and the West Indies. Image © Straight and Cooper (2020), some rights reserved (CC BY-SA 4.0 DEED). May also be a year-round resident in Texas, Louisiana, Mississippi, and Alabama [14,26,117].

States and Provinces:

United States: AL, AR, DC, DE, FL, GA, IA, IL, IN, KS, KY, LA, MA, MD, MI, MO, MS, NC, NE, NJ, NY, OH, OK, SC, SD, TN, TX, VA, WV [69,82,101,117]

Canada: ON [69,117]
Mexico: Camp, Chis, Coah, Hgo, NL, Oax, Pue, QR, Qro, SLP, Tab, Tamps, Tlax, Ver, Yuc [69]

Breeding Range

In the United States, the chuck-will's-widow's breeding range extends from Long Island, New York [117] west to Michigan, Iowa, and Kansas and south to Texas and Florida [14]. They also breed in the Bahamas, possibly Cuba [117], and locally in extreme southern Ontario on Point Pelee. They are rare or accidental in other parts of southern Canada, including New Brunswick, Newfoundland-Labrador, Nova Scotia, and Quebec. They may be rare or accidental in parts of the Northeast, such as Maine, New Hampshire, Rhode Island, Connecticut, northern New York, and Pennsylvania; and in parts of the Midwest, such as Wisconsin, Minnesota, and South Dakota [69,117]. Vagrants have been observed in many parts of the West, including California, Nevada, and New Mexico [69]. They are mostly absent from the Appalachian Mountains from Maryland south to Georgia; from the Cumberland Plateau and Cumberland Mountains in Kentucky and Tennessee; from the Unaka Mountains in Tennessee; and from the Mississippi Alluvial Plain in Kentucky, Missouri, and Tennessee [117]. In the late 1900s and early 2000s, the chuck-will's-widow's range expanded northward and westward [51,117].

Chuck-will's-widows show fidelity to breeding sites [42,46,117].

Year-round Range

Chuck-will's-widows appear to be year-round residents along the Gulf Coastal Plain from southern Texas east to southern Florida [14,117].

Wintering Range

The chuck-will's-widow's wintering range occurs in southern Florida and from northeastern Mexico south through Central America to Ecuador, Colombia, and Venezuela. They also winter throughout the West Indies. For a complete list of islands on which chuck-will's-widows winter in the West Indies, see Lepage (2023) [69]. They rarely winter in southeastern Texas, southern Louisiana, southern Alabama, and northern Florida [117]. They have been observed wintering in South Carolina [94], although this is unusual [117]. The southern United States is

considered a marginal wintering area for chuck-will's-widows because relatively frequent periods of prolonged cold can kill birds (Weber 1940, cited in [102]).

Migration

Migration Routes

Migration occurs throughout the southern United States, Mexico, and Central America [27,102,117]. Some individuals migrate over the Gulf of Mexico while others likely migrate around the Gulf of Mexico over eastern Mexico [8,27,102,115]. Migration routes probably vary with breeding location, with western breeders probably traveling along the Gulf of Mexico over land, while eastern breeders and those wintering in the West Indies cross the Gulf of Mexico or the Atlantic Ocean [117]. No information was available about key migration routes or stopover locations of chuck-will's-widows.

Migration Duration and Distance

No information was available about duration of migration or distance traveled by chuck-will's-widows during migration.

Migration Timing

Chuck-will's-widows arrive on breeding sites as early as February [9], with most arriving in March or April [9,117]. Birds arrive at breeding sites in coastal locations earlier than at inland locations at the same latitude [102]. Males arrive a few days before females [9,102,117]. They typically leave breeding sites from August to October, with peak migration beginning in September [117]. Arrival and departure dates to breeding grounds vary regionally (table 1).

It is difficult to distinguish between departing summer residents, arriving winter residents, and year-round residents in southern states such as Texas, Louisiana, Alabama, and Florida. Birds arrive on wintering sites from as early as July [131] and remain on wintering sites until as late as May [1,58,96,117] (table 2). Also see Appendix 2 in Straight and Cooper (2020) for extremes in arrival and departure dates at specific locations on breeding and wintering ranges [117].

Little information is available on the factors influencing the timing of chuck-will's-widow migration. Primary molt, which occurs in mid- to late summer, probably affects breeding site departure times. During primary molt, birds lose numerous flight feathers simultaneously. Birds depart after the primary molt is completed

[102], so if molting begins late, it may delay departure in fall [117]. The timing of molt likely depends on environmental factors, such as weather and food abundance [102].

Table 1—Timing of chuck-will's-widow arrival and departure on their breeding range.

Region	Earliest Arrival Date	Latest Departure Date
Northeast U.S.	30 March [7]	Late December [7]
Midwest U.S.	17 March [9]	Late September (Fleckenstein 1996b, cited in
Southeast U.S.	17 February [9]	31 December (LeGrand 1983, cited in [94])

Table 2— Timing of chuck-will's-widow arrival and departure on their wintering range.

Region	Earliest Arrival Date	Latest Departure Date
Southeast U.S.	22 August [102]	9 May [1]
Mexico	22 August [102]	21 April [72]
Central America	August 22 (Dod 1981, cited in [117])	28 April [78]
South America	9 September [50]	30 December [50] (data lacking)
West Indies	27 July [131]	May [58,96]

Plant Communities and Site Characteristics

Chuck-will's-widows are upland, terrestrial birds [117]. They occur mostly at low to mid-elevations [60]. On their wintering range, they often occur at higher elevations, typically up to about 1,500 m [104,117,128] or 1,700 m [2], but can occur up to about 2,600 m [26,98,117]. They are associated with relatively dry woodland habitats, but use dry to wet woodlands, forests, shrublands, and open areas [14,90,117]. They use many types of forests but are most common in pine, hardwood (especially oak), and mixed pine-hardwood communities [9,29,56,81,117]. Openings used by chuck-will's-widows include gaps in forests, woodlands, and savannas; barrens; rocky or sandy outcrops; shrublands; wetlands; and prairies, pastures, old fields, and agricultural fields (e.g., [6,9,14,81,117,133]).

Breeding Range

Habitats used by chuck-will's-widows on their breeding range are typically dry or mesic [81] and include pine [61], pine-oak [9,29,81], oak [29,81,117], and other hardwood forests [81].

Southeast: In the Southeast, chuck-will's-widows are common in pine, oak, and pine-oak communities (e.g., [28,40,61,109]). They occur in longleaf pine forests and savannas, loblolly pine-shortleaf pine forests, shortleaf pine forests, slash pine forests and plantations, and sand live oak-sand pine forest [18,20,33,47,52,75,88,95,112]. They occur in xeric post oak forests, mesic "climax" oak forests, and in post oak forest-broomsedge bluestem field habitat edges [47,88,109] as well as in oak-hickory and oak-pine forests [6,20,80]. They occur in other types of hardwood forests throughout the Southeast, including hardwood hammocks [10,29] and riparian areas [20,47,88]. For example, in Alabama, they occur in hardwood forests, especially where there is a thick undergrowth of pines, shrubs, and cane [106]; and in Oklahoma, nesting chuck-will's-widows were densest in river bottom forests dominated by American holly, white oak, sweetgum, hickory, ash, and bald cypress. They also occurred in stream bottom forests characterized by white oak, northern red oak, and flowering dogwood [20].

Northeast: In the Northeast, chuck-will's-widows are generally found in dry, open pine and oak woodlands, such as pitch pine-bear oak barrens [70,129], as well as in hardwood forests [110] and shrubby thickets [81]. For example, in New Jersey, they occur in hardwood forests, such as "particularly dense, low woods" with sassafras and holly [110]. In New York, foraging habitat includes northern bayberry, greenbrier, and eastern poison-ivy thickets and woolly beachheather openings (Andrle and Carrol 1988, cited in [81]).

Midwest: In the Midwest, chuck-will's-widows commonly occur in pine, eastern redcedar, and oak-hickory forests, woodlands, and savannas [15,90,107,133,134] as well as in upland hardwood forests [134], floodplain forest [16], and shrublands [134]. For example, in Sand Ridge State Forest, Illinois, they frequently use farm fields interspersed with pine and oak woodlands as well as pitch pine plantations [15]. "Optimal" sites in Kentucky are dominated by oaks and hickories, with scattered eastern redcedars or pines [90]. In Kansas, chuck-will's-widows occur in eastern redcedar shelterbelts [107].

Migration

Plant communities used during migration are likely similar to those used on breeding and wintering ranges [117], although little information is available in the literature. In Beliz, migrants often occur on cayes [53].

Wintering Range

On their wintering range, chuck-will's-widows use a variety of pine and hardwood forests, woodlands, savannas, shrublands, openings, and ecotones between these communities [21,26,35,60,78,81,98,128,132]. In the Southeast, they use pine and oak forests [3,108] and palmetto thickets [81]. In Mexico and Central America, they use tropical humid and premontane wet forest [2,53,69], pine and hardwood forests [35,117], second-growth forests and plantations [34,117], mangroves [34,53], tall hedgerows and thickets in savannas [128], scrublands [117], marshes [128], riparian areas, old fields [117], and agricultural areas [117,128]. In Hispaniola, West Indies, chuck-will's-widows were captured in low-elevation desert thorn scrub and are moderately common in lowland dry forest and transitional hardwood forest [67,68]. They have been described as a forest generalist in El Salvador [60].

Biological Characteristics

This review includes information covering many aspects of chuck-will's-widow's life history and focuses on those most relevant to fire. Much of the included information on the general biology of chuck-will's-widows comes from a literature review in Birds of the World by Straight and Cooper (2020) [117]. Many aspects of its biology and ecology are poorly understood [81,117].

Species Description

Chuck-will's-widows are aerial insectivores that forage only during twilight and moonlit nights [117]. They are migratory, ground-nesting birds with cryptically patterned cinnamon-brown, buff, and black plumage that blends in easily with the deciduous leaf litter and tree branches on which they roost during the day [25,117]. The plumage of males and females is similar except that males have conspicuous white corners on the tail [26,117].

The chuck-will's-widow is the largest nightjar in North America [117]. Overall adult body lengths range from 28 to 32 cm, wingspans range from 20.0 to 22.5 cm, and tails range from 12.8 to 15.1 cm long [26,117]. Adults weigh from 66 to 188 g [26,69,77,89,103,117]. The size of males and females overlap, although males tend to be larger [117]. The head and eyes of chuck-will's-widows are large, and its bill is

small with an enormous gape that can consume large-bodied flying insects, their primary prey [58,131].

Figure 3—Chuck-will's-widow roosting on a branch on South Padre Island. Photo © Tony Castro, some rights reserved (CC BY-SA 4.0 DEED).

Social Structure

Chuck-will's-widows are generally solitary [117,128], although pairs appear to form during the breeding season [102], and family groups spend time together after young can fly (Hoyt 1953b, cited in [117]). In addition, groups of individuals migrate together over the Atlantic Ocean and Gulf of Mexico [8,117].

Life Span and Mortality

Life Span and Adult Survival

Little information is available on the life span of chuck-will's-widows. A banded male of unknown age was recaptured 14 years and 10 months later [12], suggesting that individuals can live at least 15 years.

Annual survival rate of adult chuck-will's-widows was modeled at 75% [13]. Individuals are probably most vulnerable to predation during primary molt in mid- to late summer [102,117], and after migratory flights [117], although no data are

available. A preponderance of subadults in museum collections suggests that subadults have greater mortality rates than adults [102].

Sources of Mortality

Predators

Little information is available on predators of chuck-will's-widows. Adults are prey to great horned owls [32] and Cooper's hawks [124]. Eggs and nestlings are likely vulnerable to the same predators as a sympatric nightjar, the eastern whip-poor-will, whose predators include snakes, birds (e.g., peregrine falcons and Cooper's hawks), mammals (e.g., striped skunks, northern raccoons, weasels, red foxes, coyotes, and domestic dogs and cats), and insects (e.g., ants) [15,17,24,26,36,39,44,113,124]. Chuck-will's-widows rely chiefly on camouflage as protection from predation [90,117].

Weather/Exposure

Chuck-will's-widows are sometimes killed by periods of prolonged cold (Weber 1940, cited in [102]).

Collisions

Chuck-will's-widows are sometimes killed by collisions with vehicles, television towers, or buildings [117].

Development and Reproduction

Chuck-will's-widows lay their two-egg clutch directly on leaf litter on the forest floor (fig. 4). Both males and females incubate eggs, but only females brood chicks. Chicks are semiprecocial [117].

Figure 4—Chuck-will's-widow eggs laid on deciduous leaf litter in Exum, North Carolina. Photo © Dick Daniels, some rights reserved (CC BY-SA 3.0 DEED).

Breeding

No information was available on the mating system of chuck-will's-widows. At the start of the breeding season, male chuck-will's-widows sing to establish a territory. Females do not sing [117]. At northern latitudes, pairs form, territories are established, and clutches are laid within about 7 to 10 days of arrival on breeding grounds, but this duration may be longer for individuals flying over the Gulf of Mexico [102]. Using published life history and trait data, Bird et al. (2020) modeled age at first breeding at 1.3 years and an average generation length of 4.1 years [13]. Subadults likely do not breed [102].

Nesting

Female chuck-will's-widows usually lay two eggs/clutch (e.g., [9,16,38,43,54,80,81,87,106,117]), but may lay one [117] to four [57] eggs/clutch. Of egg sets and nest records reported by Straight and Cooper (2020), 95% had two eggs and 5% had one [117]. They have one clutch/year [9,38,102,117]; however, if

eggs are lost, females will lay up to four additional clutches in southern breeding areas [9]. Fewer replacement clutches may occur in northern breeding areas. At the northern extremes of the species' range, replacement clutches may be impossible [102,117]. Nesting occurs as early as early March [116] and as late as early July [16,117] throughout the breeding range (table 3). Rohwer (1971) reported that latitude explained 35.6% of the variation in egg-laying dates [102].

Table 3—Earliest and latest nesting dates of chuck-will's-widows.

Region	Earliest Nesting Date	Latest Nesting Date
Southeast U.S.	3 March [116]	9 July (WFVZ, cited in [117])
Northeast U.S.	10 May (Robbins and Blom 1996a, cited in [117])	8 July (Robbins and Blom 1996a, cited in [117])
Midwest U.S.	Late April [90]	4 July [16]

Hatching and Molt

Both sexes incubate eggs [81,117]; females incubate eggs for longer periods than males, which lack a brood patch [87]. Chicks hatch after 19 to 21 days of incubation [42,54,102,117,135].

Adult annual molt appears to start during late incubation or after hatching. It peaks during the time when young become independent and continues until just before migration. Birds likely have trouble flying during the late stages of molt when they are missing much or all of their tail feathers [102].

Brooding

Both males and females feed chicks during brooding; females brood for longer periods than males [87]. Young are assumed to forage independently at around 30 days old [102].

Fledging

First flight can be as early as 15 [135], 16 [102], or 17 ([42], Stevenson and Anderson 1994, cited in [117]) days old.

Movement and Dispersal

Chicks are semiprecocial and can move from the nest within days of hatching [117]. Chicks are found increasingly farther from nest sites as they grew older [9,42,54,80,87,135]. For example, in Desoto County, Mississippi, 1- to 3-day-old chicks were found about 2 m away from their nest and 7-day-old chicks were found

about 5 m away [135]. In Ohio, chicks moved from nests 2 to 5 days after hatching and moved farther away from nests with increasing age; young were 30 m away at 10 days old and 62 m at 16 days old [87]. In Summerville, South Carolina, 1- and 2-day-old chicks were found about 3 m from their nest and 3- and 4-day-old chicks were found about 8 m from their nest [54]. Chicks are assumed to remain with adults at least until they can forage independently, at about 30 days old [26,102].

Reproductive Success

Little information on reproductive success of chuck-will's-widows is available in the literature. From 2002 to 2005, in thinned oak-hickory stands on the Tennessee National Wildlife Refuge, modeled average nest survival was 44% for four chuck-will's-widow nests, with a daily nest survival rate of 0.98 [121]. In mixed hardwood forests in Ohio from 2011 to 2012, four of six chuck-will's-widow nests survived [87].

Activity and Habitat

Chuck-will's-widows remain inactive at roost sites during the day and forage for flying insects primarily at twilight and on moonlit nights [26,117].

Diet and Foraging

Chuck-will's-widows primarily forage on flying insects. They hunt primarily in continuous flight, flying back and forth usually close to the ground but up to about 20 m (i.e., by screening or hawking). They may also forage by flying short distances from the ground or from low perches (i.e., by sallying) [6,26,35,49,52,58,81,117]. They have been observed foraging on the ground during periods of rapid tail molt when maneuvering for flying insects is likely difficult [77,103,117]. Chuck-will's-widows usually forage at dawn and dusk, but on moonlit nights they may forage throughout the night. They typically forage over land but may forage over water during migration [117].

Diet

Chuck-will's-widows are primarily insectivores [117] that eat a variety of "medium-sized to fairly large" [81] insects, including beetles, moths, flying ants, grasshoppers, locusts, crickets, cicadas, damselflies, dragonflies, and flies [9,26,79,86,89,102,132]. A summary of the pooled contents of 45 stomachs collected from the United States and Ontario from March to November indicated

that the most important prey consumed were beetles (33.0% June beetles, 25.3% other scarab beetles, 4.5% longhorn beetles, 3.6% ground beetles, 1.3% click beetles, and 5.1% other beetles) and moths (12.4%). Other prey consumed included birds (7.2%), dragonflies and damselflies (4.6%), and a bivalve [9]. Birds eaten include hummingbirds, flycatchers, swallows, wrens, warblers, sparrows, and other small birds [6,9,26,86,89,102,117]. Occasionally they eat small bats [50,117] and frogs [117]. They are not known to cast pellets, but they probably do, given the presence of vertebrates in their diet [117]. They consume grit to aid in digestion [26,117].

Foraging Activity

Chuck-will's-widows are most active and forage mostly at dawn and dusk, but they may be active throughout the night on moonlit nights [29,49,54,87,117] and in the late afternoon on cloudy days (Sprunt 1954c, cited in [117]). Like eastern whip-poor-wills, chuck-will's-widows are likely visual predators that must see insects to capture them, so low light levels are required to capture prey [117].

Foraging Sites

Chuck-will's-widows forage in canopy gaps of forests, woodlands, and savannas, and along the edges of adjacent shrublands, fields, and pastures [26,81,117]. They also forage over water during migration [117].

Breeding Activities

Nesting Sites

Chuck-will's-widows are ground-nesting birds that lay eggs directly on dried leaves, pine needles, or bare ground (e.g., [9,26,54,76,87,90,91,116,117]) (fig. 3). Nests are placed in relatively dry areas [49,84]. Chuck-will's-widows typically nest in forested habitats (e.g., [9,10,15,40,76,110]). Nests may be in areas with dense understory cover [4,43,80,84,87,91,110] or in areas lacking understory cover [9,16,26,90]. Some publications describe nests as being near eastern redcedars or pines (e.g., [90]), while others describe them as being far from any tree, shrub, or log [42]. Nests are often close to forest edges (e.g., [16,90]). On occasion, chuck-will's-widows may nest in nonforested habitats. For example, in Texas, chuck-will's-widows nested in shrub or scrub habitat on rocky or sandy slopes (Oberholser 1974, cited in [117]).

Individuals appear to show a high degree of fidelity to nesting sites, and sites may be reused year after year [9,26,42,117]. For example, in South Carolina, eggs were found within 2 to 3 m of a previous year's location (Sprunt 1970, cited in [117]).

Brood-rearing Sites

Little information is available on this topic. Young may take refuge under vegetation near the nest site during the brood-rearing period [26,54].

Roosting Sites

Chuck-will's-widows typically roost during the day on low branches [15,25,42,58,117] but may roost high up in a tree [26]. They also roost on the ground [9,25,26,50,58,131], on logs [9,42], in cavities [9], or in cave entrances [96]. Harper (1938) found that chuck-will's-widows in the Okefenokee region preferred hammocks for roosting and more open habitats for foraging [49]. Chuck-will's-widows use the same roosting sites repeatedly throughout the breeding season [9,26]. During the breeding season, roosts are typically near nests [42], often in the same forest stand [15].

Area Requirements

Breeding Range

Chuck-will's-widows are typically territorial during the breeding season. Males sing from a variety of perches along a regular route to establish territories. It is unclear to what extent these are defended [117]. Fitch (1958) reported that a chuck-will's-widow territory that included 16 singing perches covered 9.6 ha but expressed some doubt that all the records pertained to the same individual [41]. No other information was available in published literature on territory or home range sizes.

Wintering Range

No information is available on this topic.

Landscape Composition and Habitat Structure

Breeding Range

Studies on the chuck-will's-widow breeding range indicate that chuck-will's-widows prefer landscapes with intermediate forest cover (e.g., [30,90,123]), and are usually absent from large areas of dense forest [90], preferring more open habitat than the sympatric eastern whip-poor-will [30,117,123]. They prefer a

mosaic of forests and open areas [30,90], and commonly use edge habitats (e.g., [9,45,99,109]). In oak-hickory, pine-oak, and mixed-oak woodland communities of the Ozark Highlands of Missouri, chuck-will's-widows were most abundant (>2 birds/point) in landscapes with intermediate forest cover (50%–70%); abundance decreased to <0.6 birds/point as forest cover approached 0% and 100%. Abundance also decreased from 2.6 birds/point to 0.2 birds/point as hardwood basal area increased from 0.4 m^2/ha to 9.3 m^2/ha [123]. In Kentucky, chuck-will's-widows occur in semi-open and open landscapes with scattered tracts of forest [90]. In Georgia, chuck-will's-widows were more abundant in a landscape with 49% forest and 51% openings than a landscape with 92% forest and 8% openings [30]. They may occur in suburban areas if enough forest cover is present [26,117]. In Georgia, chuck-will's-widow densities were similar between suburban areas, pasture, and pine-hardwood forest [29].

Understory density varies in forests used by chuck-will's-widows. In the Southeast, Hamel (1992) stated that they favor pine, hardwood, and mixed woods with a "light to moderate understory" (Hamel 1992, cited in [81]), and in Kentucky, chuck-will's-widows are common in relatively dry forests where the understory and midstory are relatively open [90]. However, in southeastern Texas, they are found in dry woods with "much undergrowth" [84], and at the Natural History Reservation, Kansas, chuck-will's-widow activity was concentrated on south-facing slopes with medium to small trees and dense thorny undergrowth [41]. In Arkansas, chuck-will's-widows occurred in xeric post oak forests with 64% canopy cover and a "well-developed" understory layer, and in mesic "climax" oak forests with 74% canopy cover and a sparse understory layer [109].

Forests with a heterogeneous, uneven-aged structure and frequent canopy gaps appear to be preferred over forests with a homogenous, even-aged structure and a closed canopy [121]. In the Tennessee National Wildlife Refuge, no chuck-will's-widow nests were recorded in mature (70- to 120-year-old), closed-canopy oak-hickory stands with an even-aged structure, but four nests were recorded in thinned oak-hickory stands with greater structural complexity and canopy gaps [121]. In eastern Texas, from 1990 to 1995, chuck-will's-widows were infrequent overall, but they were most abundant in early successional, uneven-aged loblolly

pine stands and late successional uneven-aged stands. They were absent from even-aged stands of all ages, from seedling to late-successional stages [122].

Wintering Range

Little information was available on this topic. In Hispaniola, chuck-will's-widows were captured in desert thorn scrub with an average canopy cover of 22% and maximum height of 6 m [67]. In the Bahamas, they occur in 20- to 25-year-old pinelands with 10- to 20-cm DBH Caribbean pines [35].

Fire Ecology and Management

Fire-caused Mortality

No information is available in the published literature on fire-caused mortality of chuck-will's-widows. Once chuck-will's-widows can fly, direct fire-caused mortality is unlikely. However, because chuck-will's-widows nest directly on the ground, eggs and nestlings are vulnerable to even low-intensity surface fire.

Fire Effects on Chuck-will's-widows

Little information is available on chuck-will's-widow's use of burned areas on its breeding or wintering ranges. What data are available suggest that chuck-will's-widows use burns at least within the first 3 to 5 years after fire [55,63] but may avoid nesting in frequently burned areas [63], and too much burned area on the landscape may be detrimental [123]. From 2000 to 2008, chuck-will's-widows were observed in burned stands in a 16- to 19-year-old pine plantation in east-central Mississippi, but they were not observed in stands that were treated with herbicide or burning+herbicide, or in untreated, control stands. Stands were burned during the dormant season (January-March) in 2000, 2003, and 2006, and herbicide was applied in 1999. Treatments were intended to reduce the hardwood midstory [55]. At Fort Bragg Military Reservation in the Sandhill region of North Carolina, chuck-will's-widows were present (albeit rare) in both burned and "suppressed" longleaf pine and loblolly pine sites from 1994 to 1996, but nests were found in only one suppressed site. Burned stands were relatively open and grassy and had experienced one or more prescribed growing-season fires and regular dormant-season fires (i.e., at 5-year intervals) since the 1970s. Suppressed stands had relatively closed canopies, large saplings, and small trees and had not experienced any prescribed growing season fires and few dormant season fires (i.e., skipped

one or more 5-year rotations) during this time [63]. In oak-hickory, pine-oak, and mixed-oak woodland communities of the Ozark Highlands of Missouri, chuck-will's-widows were most abundant (>2 birds/point) in landscapes with a low proportion of burned area. Chuck-will's-widow abundance increased from 1.4 birds/point to 2.0 birds/point as the proportion of burned area increased from 0% to 25%, but then declined as the proportion increased to 100% [123].

Jackson (1988) described chuck-will's-widow as a bird endemic to fire-adapted pine-oak woodland ecosystems of the Southeast and stated that chuck-will's-widows have declined on drier sites where the lack of fire has resulted in the replacement of pines by hardwoods [56], although no data were provided, and no other studies reported this.

See Integrated Management with Fire for information on the combined effects of thinning and prescribed fire on chuck-will's-widows.

Fire Effects on Prey Abundance

Chuck-will's-widows eat most types of nocturnal flying insects, although they prefer moths and beetles (especially scarab beetles) (see Diet). No studies examined the effects of fire specifically on the insect prey of chuck-will's-widows. In general, insect populations may increase, decrease, or remain unchanged following fire; and responses of the overall insect community to fire are complex. In the short-term, fire may reduce insect abundance through direct mortality and reduction of plants required for food, shelter, and oviposition sites, or increase abundance by attracting pyrophilous insects to freshly burned areas. Over the longer-term, insect abundance may increase because of regrowth of plants that attract recolonizing insects. The effect of burning on insect diversity and abundance varies considerably depending on insect taxa (e.g., its mobility and feeding guild) and life history stage; fire frequency, severity, size, and timing; plant community; other disturbances (e.g., livestock grazing, mowing, and past land uses); and other factors (e.g., [11,19,62,85,92,97,120,130]). A literature review of fire effects on arthropods in the Great Plains found that insects in the orders Coleoptera and Orthoptera tended to respond positively to fire in the short term, while insects in the orders Lepidoptera and certain suborders of Hemiptera tended to respond negatively, but the researchers acknowledged that each order or

suborder can respond in a variety of ways and that individual species within them are also likely to respond variably. In addition, they note that long-term studies are needed. Insects in the orders Diptera, Hymenoptera, and Hemiptera, overall, showed variable responses to fire with no clear positive, negative, or neutral pattern [62].

Although many studies have examined effects of burning on insects, these studies often combine guilds such as ground-dwelling and flying insects (e.g., Coleoptera) or diurnal and nocturnal insects (e.g., Lepidoptera) into one category, and thus, include taxa that are not readily available to chuck-will's-widows or other nocturnal insectivores, like bats [92]. For more information on how fire effects nocturnal flying insects, see the literature reviews in table A3.

Fire Regimes

Chuck-will's-widows occur in a variety of plant communities in the eastern United States (see Plant Communities and Site Characteristics) that historically had varied fuel structures and fire regimes. For example, historical fire frequency estimates based on LANDFIRE succession modeling range from 2 to 11 years in longleaf pine ecosystems to 117 years in South Florida hardwood hammocks to 454 years in northern mixed hardwoods [64]. Search FEIS for fire regime information on plant communities in which chuck-will's-widows may occur in the United States.

Fire Management Considerations

Forested landscapes with a small proportion of burned areas may benefit chuck-will's-widows, but landscapes with a large proportion of burned area may harm them [123]. For example, in the Ozark Highlands, chuck-will's-widow abundance increased as the proportion of area burned on the landscape increased from 0% to 25%, but their abundance declined as the proportion increased to 100% [123] (see Fire Effects on Chuck-will's-widows).

No information is available about how fire timing affects chuck-will's-widows. Because Chuck-will's-widow nest directly on the ground, eggs and nestlings are likely vulnerable to even low-intensity surface fire, which suggests that prescribed fires that occur during the peak breeding season (March to early July, depending on location) may harm Chuck-will's-widows. Chuck-will's-widows may renest after

disturbances that occur early in the breeding season (see Nesting). However, no information is available on renesting rates following prescribed fires.

Little information is available about how fire frequency effects chuck-will's-widows. Very frequent fire (less than a 3- to 5-year interval) that creates savanna-like conditions in oak or pine stands may be detrimental to chuck-will's-widows [65,66,74] (see below).

Integrated Management with Fire

While research is lacking, researchers suggest silvicultural treatments to maintain or enhance chuck-will's-widow habitat in upland oak stands in the Southern Piedmont. In this region, silvicultural treatments such as the "shelterwood-burn method" that are aimed at favoring oak dominance while creating uneven-aged stands are more likely to benefit chuck-will's-widows than clearcutting, because the former provides complex vertical structure, whereas clearcutting results in even-aged stands [65,66] (see Landscape Composition and Habitat Structure); however, no data are available on the use of such treated stands by chuck-will's-widows. On Pushmataha Wildlife Management Area in southeastern Oklahoma, Breeding Bird Surveys from 1994 to 2009 indicated that chuck-will's-widow populations declined following landscape-level application of treatments to restore oak savannas, oak woodlands, pine-bluestem woodlands, and pine savannas. Treated stands were first thinned to favor either oak or pine canopy dominance, and then burned in the late dormant season (late February–early April) at 1-year to 4-year intervals for 26 years. The researchers noted that chuck-will's-widow populations showed declines at the regional scale, which likely influenced the local population trends they observed in treated stands [74].

Restoration treatments may have benefited chuck-will's-widows in fire-excluded longleaf pine sandhill forests of Florida. In fire-excluded longleaf pine sandhill stands on the Elgin Airforce Base, breeding bird assemblages on treated plots were more similar to fire-maintained reference plots (burned at least every 3 years) than were assemblages on untreated (fire-excluded) plots after restoration treatments to reduce midstory hardwoods and canopy cover (prescribed fire, herbicides, and/or mechanical felling-girdling). Chuck-will's-widow's contribution to this pattern was minor, and only detectable in the first of 2 years, because they had low relative abundance, overall, compared to most of the other 26 species

included in analyses. The authors recommend prescribed burning for maintaining breeding bird habitat in these longleaf pine sandhill forests [95].

Prey Management

No information is available on the effects of prescribed fire—alone or in combination with other forest management techniques—specifically on chuck-will's-widow prey. A literature review of fire effects on arthropods in the Great Plains concluded that burning to maximize heterogeneity on the landscape—with a mosaic of burned areas and unburned areas (refugia)—would promote the highest number of arthropod species [62]. A literature review on fire effects on insects also suggested that spatiotemporal variation in the application of fire and other disturbances within ecosystems could create and maintain diverse habitat niches and therefore insect species diversity [120]. Prescribed burning combined with silvicultural techniques such as clearcutting or thinning that results in abundant and diverse woody and herbaceous vegetation in various stages of succession may increase the abundance and diversity of moths and other prey important to chuck-will's-widows [92,118,119,136]. More information is needed on this topic.

Nonfire Management Considerations

The chuck-will's-widow is a bird of conservation concern in many areas of the United States because populations appear to be declining mostly due to loss and alteration of habitat and declining insect prey.

US Federal Legal Status

None [127]

Other Conservation Status

As of 2021, the chuck-will's-widow is a bird of conservation concern in the following Bird Conservation Regions in the continental United States according to the U.S. Fish and Wildlife Service [126]:

- West Gulf Coastal Plain/Ouachitas
- Southeastern Coastal Plain
- Appalachian Mountains
- Piedmont

NatureServe Status

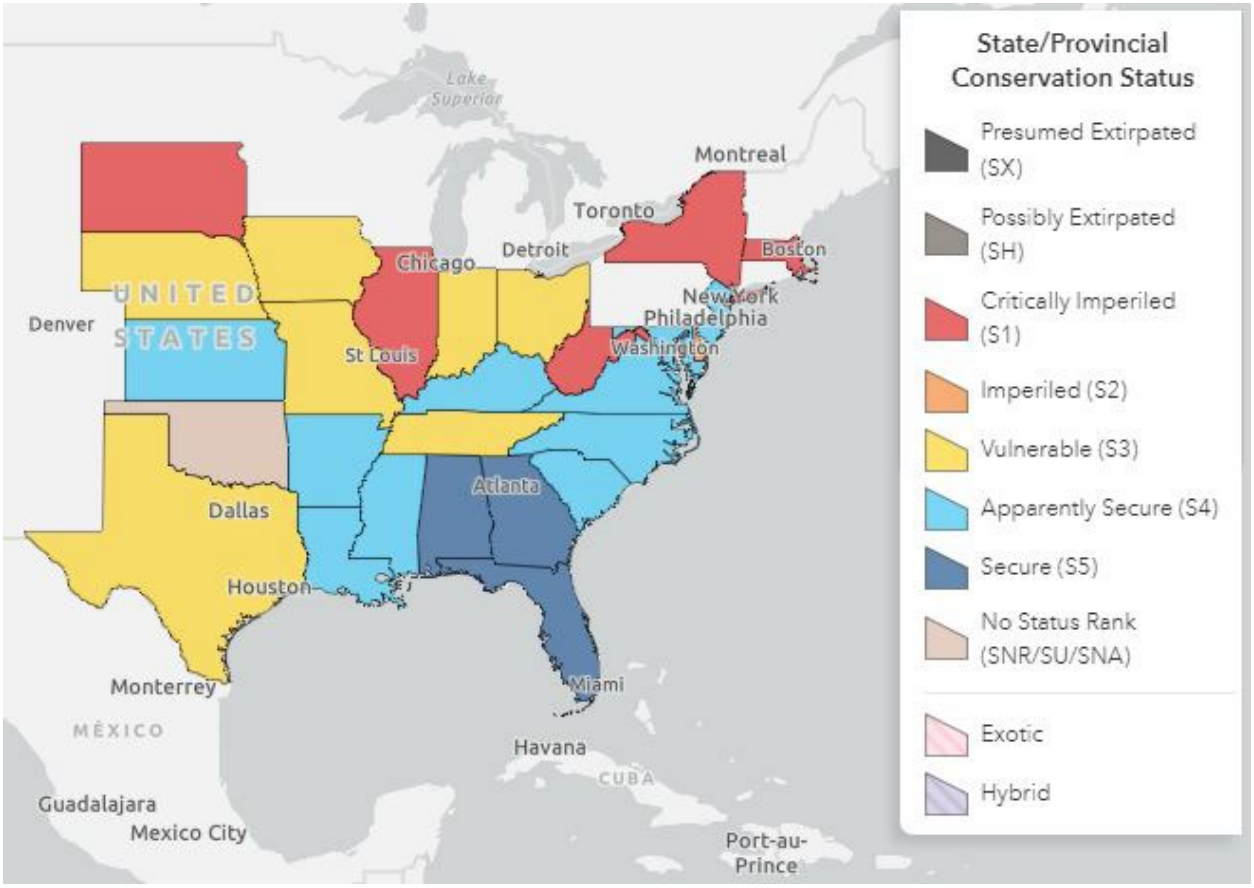

Figure 5—State conservation status according to NatureServe [82].

NatureServe (2023) lists the status of the chuck-will's-widow as secure (G5) because it is widespread, populations are large, and observed population declines are not believed to be sufficiently rapid to justify a listing of Vulnerable. As of 2023, the chuck-will's-widow is considered critically imperiled in South Dakota, Illinois, West Virginia, New York, and Massachusetts and vulnerable in Nebraska, Iowa, Missouri, Indiana, Ohio, Tennessee, and Texas (fig. 5) [82]. Information on state-level protection status of animals in the United States and Canada is available at NatureServe, although recent changes in status may not be included.

IUCN Red List of Threatened Species

Near Threatened [14]

Population Trends

Chuck-will's-widow populations [14,82]—and aerial insectivorous bird populations in general [83,114]—appear to be declining. Based on data from the North American Breeding Bird Survey (1966–2015), chuck-will's-widow populations have experienced an annual survey-wide decline of –2.26% [105]. Projected trends, based on Breeding Bird Survey data (1966–2008) and regional forest inventory data (1963–2006), predict increases in chuck-will's-widow numbers of >25% in 14 ecoregions, decreases of >25% in 2 ecoregions, and no change (within 25%) in 7 ecoregions by 2040. The ecoregions predicted to experience the greatest declines were in the Boston Mountains and Ozark Highlands areas of Arkansas and Oklahoma and the Mississippi River Valley area of Kentucky and Tennessee [125]. However, this study did not examine the effects of prey abundance or other variables likely to affect chuck-will's-widow populations in the future.

Threats

Primary threats to chuck-will's-widow populations include loss and alteration of forested habitat on wintering and breeding ranges and declining insect prey [82,93,117,125]. Other factors possibly include increasing urbanization [31,117] and climate change [51].

Other Management Information

Little information is available on habitat management effects on chuck-will's-widows. In Alachua, Florida, chuck-will's-widows used stands of 20- to 25-year-old slash pine plantations with experimentally added snags (4.2 pairs/km^2) but did not use stands without added snags (0 pairs/km^2) [18], suggesting that the snags benefitted the birds, perhaps by adding perches or structural complexity. Chuck-will's-widows have been observed perching on branches in piles of downed wood in regenerating clearcuts [45]. Chuck-will's-widows nested in thinned oak-hickory stands on the Tennessee National Wildlife Refuge, but no nests were found in untreated, control stands that had a closed canopy and even-aged structure [121].

Management Under a Changing Climate

Little information was available on climate change effects on chuck-will's-widows. Hitch and Leberg (2007) found a northward shift in distribution of the breeding ranges of 26 southern breeding bird species—including chuck-will's-widow—from

Breeding Bird Surveys over 26 years (from 1967–1971 to 1998–2002), a result attributed to climate warming. They found a mean northward shift in distribution for chuck-will's-widows of 14.8 km but the difference was not statistically significant [51].

Appendix

Table A1—Common and scientific names of animals mentioned in this review organized by class. Links go to FEIS Species Reviews. Species not native to North America are indicated with an asterisk.

Class	Common Name	Scientific Name
Amphibian	frogs	order Anura
Bird	chuck-will's-widow	*Antrostomus carolinensis*
Bird	Cooper's hawk	*Accipiter cooperii*
Bird	eastern whip-poor-will	*Antrostomus vociferus*
Bird	flycatchers	family Tyrannidae
Bird	great horned owl	*Bubo virginianus*
Bird	hummingbirds	family Trochilidae
Bird	nightjars	*Caprimulus* spp. and *Antrostomus* spp.
Bird	peregrine falcon	*Falco peregrinus*
Bird	sparrows	family Passerellidae and family Passeridae
Bird	swallows	family Hirundinidae
Bird	warblers	family Parulidae and family Peucedramidae
Bird	wrens	family Troglodytidae
Insect	ants	family Formicidae
Insect	ants, bees, sawflies, and wasps	order Hymenoptera
Insect	beetles	order Coleoptera
Insect	cicadas	order Cicadidae
Insect	cicadas, aphids, planthoppers, leafhoppers, assassin bugs, bed bugs, and shield bugs	order Hemiptera
Insect	click beetles	family Elateridae
Insect	crickets, grasshoppers, and locusts	order Orthoptera
Insect	dragonflies and damselflies	order Odonata
Insect	flies	order Diptera
Insect	flying ants	suborder Apocrita, order Hymenoptera
Insect	ground beetles	family Carabidae
Insect	June beetles	*Phyllophaga* spp.
Insect	longhorn beetles	family Cerambycidae
Insect	moths and butterflies	order Lepidoptera
Insect	scarab beetles	family Scarabaeidae
Mammal	bats	order Chiroptera
Mammal	coyote	*Canis latrans*
Mammal	domestic dog	*Canis lupus familiaris*
Mammal	domestic cat	*Felis catus*
Mammal	northern raccoon	*Procyon lotor*
Mammal	red fox	*Vulpes vulpes*
Mammal	striped skunk	*Mephitis mephitis*

Class	Common Name	Scientific Name
Mammal	weasels	*Mustela* spp.
Reptile	snakes	suborder Serpentes, order Squamata

Table A2—Common and scientific names of plants mentioned in this review and organized by life form. Links go to FEIS Species Reviews.

Life Form	Common Name	Scientific Name
Graminoid	broomsedge bluestem	*Andropogon virginicus*
Graminoid	bluestem	*Andropogon* spp.
Graminoid	cane	*Arundinaria* spp.
Shrub	American holly	*Ilex opaca*
Shrub	bear oak (a.k.a., scrub oak)	*Quercus ilicifolia*
Shrub	holly	*Ilex* spp.
Shrub	mangrove	*Avicennia* spp., *Conocarpus* spp., and/or *Rhizophora* spp.
Shrub	northern bayberry	*Morella pensylvanica*
Shrub	woolly beachheather	*Hudsonia tomentosa*
Shrub	palmetto	*Sabal* spp.
Tree	ash	*Fraxinus spp.*
Tree	bald cypress	*Taxodium distichum*
Tree	Caribbean pine	*Pinus caribaea*
Tree	eastern redcedar	*Juniperus virginiana*
Tree	flowering dogwood	*Cornus florida*
Tree	hickory	*Carya* spp.
Tree	juniper	*Juniperus* spp.
Tree	loblolly pine	*Pinus taeda*
Tree	longleaf pine	*Pinus palustris*
Tree	oak	*Quercus spp.*
Tree	northern red oak	*Quercus rubra*
Tree	pine	*Pinus* spp.
Tree	pitch pine	*Pinus rigida*
Tree	post oak	*Quercus stellata*
Tree	sand live oak	*Quercus geminata*
Tree	sand pine	*Pinus clausa*
Tree	sassafras	*Sassafras albidum*
Tree	shortleaf pine	*Pinus echinata*
Tree	slash pine	*Pinus elliottii*
Tree	sweetgum	*Liquidambar styraciflua*
Tree	white oak	*Quercus alba*
Vine or liana	eastern poison-ivy	*Toxicodendron radicans*
Vine or liana	greenbriar	*Smilax* spp.

Table A3—Selected literature reviews with information on how fire affects some nocturnal flying insects.

Title	Reference
A global synthesis of fire effects on pollinators	[19]
A literature review of insect responses to fire, compared to other conservation managements of open habitat	[120]
A review of fire effects on bats and bat habitat in the eastern oak region	[92]
Arthropods and fire: Previous research shaping future conservation	[62]
Bats and fire: A global review	[71]
Do fire and insects interact in eastern forests?	[100]
Ecological effects of prescribed fire season: A literature review and synthesis for managers	[59], chapters therein
Fire effects on wildlife foods	[73]
First-order fire effects on animals: Review and recommendations	[37]
Increasing prevalence of severe fires change the structure of arthropod communities: Evidence from a meta-analysis	[11]
Insects, fire, and conservation	[85]
Response of grassland arthropods to burning: A review	[130]
Responses of prairie insects and other arthropods to prescription burns	[97]

References

1. Allison, Andrew. 1904. The birds of West Baton Rouge Parish, Louisiana. The Auk. 21(4): 472-484. [98272]

2. Ascanio, David; Rodriguez, Gustavo; Restall, Robin. 2017. Birds of Venezuela. In. Helm Field Guides. Dallas, TX. Helm Publishing: 222. [98279]

3. Bailey, A. M. 1934. Additional notes on the wintering birds of Chenier au Tigre, Louisiana. The Auk. 51(3): 398-400. [98321]

4. Bailey, H. B. 1883. Memoranda of a collection of eggs from Georgia. Bulletin of the Nuttall Ornithological Club. 8(1): 37-43. [98313]

5. Barrowclough, George F.; Groth, Jeff G.; Mertz, Lisa A. 2006. The RAG-1 exon in the avian order Caprimulgiformes: Phylogeny, heterozygosity, and base composition. Molecular Phylogenetics and Evolution. 41(1): 238-248. [98259]

6. Baumgartner, Frederick M.; Baumgartner, A. Marguerite. 1992. Oklahoma bird life. Norman, OK: University of Oklahoma Press. 443 p. [25637]

7. Beehler, Bruce M.; Evans, Middleton; Robbins, Chandler S. 2019. Birds of Maryland, Delaware, and the District of Columbia. Baltimore, MD: Johns Hopkins University Press. 480 p. [98275]

8. Below, Theodore H.; Anderson, Beverly J.; Douglas, John L. 1996. Field notes on chuck-will's-widow migration. Florida Field Naturalist. 24(2): 41-42. [98270]

9. Bent, Arthur Cleveland. 1940. Life histories of North American cuckoos, goatsuckers, hummingbirds, and their allies. Orders Psittaciformes, Cuculiformes, Trogoniformes, Coraciiformes, Caprimulgiformes, and Micropodiiformes. Bulletin of the United States National Museum. Washington, DC: Government Printing Office. 592 p. [98269]

10. Bent, Arthur Cleveland; Copeland, Manton. 1927. Notes on Florida birds. The Auk. 44(3): 371-386. [98312]

11. Bieber, Blyssalyn V.; Vyas, Dhaval K.; Koltz, Amanda M.; Burkle, Laura A.; Bey, Kiaryce S.; Guzinski, Claire; Murphy, Shannon M.; Vidal, Mayra C. 2022. Increasing prevalence of severe fires change the structure of arthropod communities: Evidence from a meta-analysis. Functional Ecology. 37(8): 2096-2109. [97839]

12. Bird Banding Laboratory. 2023. Longevity records of North American birds, [Online]. Version 2023.1. Laurel, MD: USGS, Eastern Ecological Science Center. Available: https://www.pwrc.usgs.gov/BBL/Bander_Portal/login/Longevity_main.php. [98120]

13. Bird, Jeremy P.; Martin, Robert; Akcakaya, H. Resit; Gilroy, James; Burfield, Ian J.; Garnett, Stephen T.; Symes, Andy; Taylor, Joseph; Sekercioglu, Cagan H.; Butchart, Stuart H. M. 2020. Generation lengths of the world's birds and their implications for extinction risk. Conservation Biology. 34(5): 1252-1261. [98290]

14. BirdLife International. 2020. Antrostomus carolinensis, chuck-will's-widow, [Online]. The IUCN Red List of Threatened Species 2020: e.T22689778A154067182. Available: https://dx.doi.org/10.2305/IUCN.UK.2020-3.RLTS.T22689778A154067182.en [2023, June 28]. [98081]

15. Bjorklund, Richard; Bjorklund, Eric. 1983. Notes on the behavior and nesting of Caprimulgrids in the Sand Ridge State Forest. Illinois Audubon Bulletin. 4(207): 21-28. [98288]

16. Brush, Tim. 1990. Chuck-will's-widow nesting in eastern Iowa. Iowa Bird Life. 60(4): 107-108. [98293]

17. Cade, Tom J.; Martell, Mark; Redig, Patrick; Septon, Greg; Tordoff, Harrison. 1996. Peregrine falcons in urban North America. In: Bird, David M.; Varland, Daniel

E.; Negro, Juan Jose, eds. Raptors in human landscapes: Adaptations to built and cultivated environments. San Diego, CA: Academic Press: 3-13. [71307]

18. Caine, Linda A.; Marion, Wayne R. 1991. Artificial addition of snags and nest boxes to slash pine plantations. Journal of Field Ornithology. 62(1): 97-106. [61176]

19. Carbone, Lucas M.; Tavella, Julia; Pausas, Juli G.; Aguilar, Ramiro. 2019. A global synthesis of fire effects on pollinators. Global Ecology and Biogeography. 28(10): 1487-1498. [97848]

20. Carter, William A. 1967. Ecology of the nesting birds of the McCurtain Game Preserve, Oklahoma. The Wilson Bulletin. 79(3): 259-272. [65476]

21. Chavarria-Duriaux, Liliana. 2018. Birds of Nicaragua: A field guide. Ithaca, NY: Cornell University Press. 480 p. [98099]

22. Chesser, R. T.; Billerman, S. M.; Burns, K. J.; Cicero, C.; Dunn, J. L.; Hernandez-Banos, B. E.; Jimenez, R. A.; Kratter, A. W.; Mason, N. A.; Rasmussen, P. C.; Remsen, J. V., Jr.; Winker, K. 2022. Checklist of North and middle American birds, [Online]. Chicago, IL: American Ornithological Society (Producer). Available: http://checklist.americanornithology.org/taxa. [97323]

23. Chesser, R. Terry; Banks, Richard C.; Barker, F. Keith; Cicero, Carla; Dunn, Jon L.; Kratter, Andrew W.; Lovette, Irby J.; Rasmussen, Pamela C.; Remsen, J. V., Jr.; Rising, James D.; Stotz, Douglas F.; Winker, Kevin. 2012. Fifty-third supplement to the American Ornithologists' Union check-list of North American birds. The Auk. 129(3): 573-588. [97906]

24. Cink, C. L.; Pyle, P.; Patten, M. A. 2020. Eastern whip-poor-will (Antrostomus vociferus), version 1.0, [Online]. In: Rodewald, P. G., ed. Birds of the World. Ithaca, NY: Cornell Lab of Ornithology, (Producer). Available: https://doi.org/10.2173/bow.whip-p1.01. [2023, January 11]. [97580]

25. Clark, Gary; Clark, Kathy Adams. 2022. Book of Texas birds. W. L. Moody Jr. Natural History Series, Vol. 63. College Station, TX: Texas A&M University Press. 512 p. [98284]

26. Cleere, Nigel. 1998. Nightjars: A guide to the nightjars, nighthawks, and their relatives. New Haven, CT: Yale University Press. 320 p. [98263]

27. Cleere, Nigel. 2010. Nightjars, potoos, frogmouths, oilbird, and owlet-nightjars of the world. Princeton, NJ: Princeton University Press. 320 p. [98324]

28. Conner, Richard N.; Rudolph, D. Craig; Walters, Jeffrey R. 2001. The red-cockaded woodpecker: Surviving in a fire-maintained ecosystem. Austin, TX: University of Texas Press. 363 p. [43656]

29. Cooper, Robert J. 1981. Relative abundance of Georgia Caprimulgids based on call-counts. Wilson Bulletin. 93(3): 363-371. [97919]

30. Cooper, Robert J. 1982. Range expansion of the whip-poor-will in Georgia. The Oriole. 47(1&2): 1-9. [98066]

31. Curnutt, John L. 1989. Breeding bird use of a mature stand of Brazilian pepper. Florida Field Naturalist. 17(3): 53-76. [55866]

32. DeLotelle, Roy S.; Epting, Robert J.; Costa, Ralph; Leonard, David; Morris, Vincent; NeSmith, Katy. 2018. The red-cockaded woodpecker in south central Florida: Ecology, habitat, and behavior. Florida Scientist. 81(4): 126-156. [98289]

33. Dickson, James G.; Thompson, Frank R., III; Conner, Richard N.; Franzreb, Kathleen E. 1993. Effects of silviculture on neotropical migratory birds in central and southeastern oak pine forests. In: Finch, Deborah M.; Stangel, Peter W., eds. Status and management of neotropical migratory birds: Proceedings; 1993 September 21-25; Estes Park, CO. Gen. Tech. Rep. RM-229. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station: 374-385. [24663]

34. Dyer, Dale; Howell, Steve N. G. 2023. Birds of Costa Rica. Princeton, NJ: Princeton University Press. 456 p. [98318]

35. Emlen, John T. 1977. Land bird communities of Grand Bahama Island: The structure and dynamics of an avifauna. Ornithological Monographs. No. 24: 1-129. [98298]

36. English, Philina A.; Nocera, Joseph J.; Green, David J. 2018. Nightjars may adjust breeding phenology to compensate for mismatches between moths and moonlight. Ecology and Evolution. 8(11): 5515-5529. [97818]

37. Engstrom, R. Todd. 2010. First-order fire effects on animals: Review and recommendations. Fire Ecology. 6(1): 115-130. [82000]

38. Erichsen, W. J. 1919. Some summer birds of Liberty County, Georgia. The Auk. 36(3): 380-393. [98310]

39. Errington, Paul L. 1933. Food habits of southern Wisconsin raptors. Part II. Hawks. The Condor. 35(1): 19-29. [61995]

40. Ferguson, D. E. 1967. A possible case of egg transport by a chuck-will's-widow. The Wilson Bulletin. 79(4): 452-453. [98311]

41. Fitch, Henry S. 1958. Home ranges, territories, and seasonal movements of vertebrates of the Natural History Reservation. University of Kansas Publication: Museum of Natural History. 11(3): 63-326. [98065]

42. Ganier, Albert F. 1964. The alleged transportation of its eggs or young by the chuck-will's-widow. Wilson Bulletin. 76(1): 19-27. [98261]

43. Golsan, Lewis S.; Holt, Ernest G. 1914. Birds of Autauga and Montgomery Counties, Alabama. The Auk. 31(2): 212-235. [98308]

44. Grahame, Elora R. M.; Martin, K. D.; Gow, E. A.; Norris, D. R. 2021. Diurnal and nocturnal habitat preference of eastern whip-poor-wills (Antrostomus vociferus) in the northern portion of their breeding range. Avian Conservation & Ecology. 16(2): 14. [97863]

45. Grodsky, Steven Mark. 2016. How good is downed wood? Avian and invertebrate use of harvest residues and the implications of forest-based bioenergy. Raleigh, NC: North Carolina State University. 171 p. Dissertation. [98306]

46. Hall, George A. 1983. West Virginia birds: Distribution and ecology. Carnegie Museum of Natural History Species; Publication No. 7. Pittsburgh, PA: Carnegie Museum of Natural History. 180 p. [97920]

47. Hamilton, Terrell H. 1962. The habitats of the avifauna of the mesquite plains of Texas. The American Midland Naturalist. 67(1): 85-105. [98323]

48. Han, Kin-Lan; Robbins, Mark B.; Braun, Michael J. 2010. A multi-gene estimate of phylogeny in the nightjars and nighthawks (Caprimulgidae). Molecular Phylogenetics and Evolution. 55(2): 443-453. [98260]

49. Harper, Francis. 1938. The chuck-will's-widow in the Okefinokee region. The Oriole. 3(2): 9-15. [98297]

50. Hilty, Steven L. 2003. Birds of Venezuela. 2nd ed. Princeton, NJ: Princeton University Press. 776 p. [98376]

51. Hitch, Alan T.; Leberg, Paul L. 2007. Breeding distributions of North American bird species moving north as a result of climate change. Conservation Biology. 21(2): 534-539. [98084]

52. Holden, Fenn M. 1964. Observations of a chuck-will's-widow flycatching. Cornell Laboratory of Ornithology Newsletter. 32: 9. [98316]

53. Howell, Steve N. G.; Dyer, Dale. 2023. Birds of Belize. Princeton, NJ: Princeton University Press. 304 p. [98101]

54. Hoyt, Sally F. 1953. Incubation and nesting behavior of the chuck-will's-widow. The Wilson Bulletin. 65(3): 204-205. [98295]

55. Iglay, Raymond Bruce. 2010. Effects of prescribed fire and selective herbicide (Imazapyr) on biodiversity in intensively managed pine stands of Mississippi. Starkville, MS: Mississippi State University. 319 p. Dissertation. [95653]

56. Jackson, Jerome A. 1988. The southeastern pine forest ecosystem and its birds: Past, present, and future. In: Jackson, Jerome A., ed. Bird Conservation 3. Madison, WI: The University of Wisconsin Press. 119-159. [98282]

57. Kelley, Alice H. 1983. Birds of S.E. Michigan and S.W. Ontario: Notes on the years 1975-1981. The Jack-Pine Warbler. 61(1): 3-12. [98291]

58. Kirkconnell, Arturo; Bradley, Patricia E.; Rey-Millet, Yves-Jacques. 2020. Birds of Cuba: A photographic guide. Ithaca, NY: Cornell University Press. 384 p. [98273]

59. Knapp, Eric E.; Estes, Becky L.; Skinner, Carl N. 2009. Ecological effects of prescribed fire season: A literature review and synthesis for managers. Gen. Tech. Rep. PSW-GTR-224. Albany, CA: U.S. Department of Agriculture, Forest Service, Pacific Southwest Research Station. 80 p. [79558]

60. Komar, Oliver. 1998. Avian diversity in El Salvador. The Wilson Bulletin. 110(4): 511-533. [98278]

61. Kopman, H. H. 1915. List of the birds of Louisiana. Part VI. The Auk. 32(1): 15-29. [98319]

62. Kral, Katherine C.; Limb, Ryan F.; Harmon, Jason P.; Hovick, Torre J. 2017. Arthropods and fire: Previous research shaping future conservation. Rangeland Ecology & Management. 70(5): 589-598. [95135]

63. Krieger, Sharlene Marie. 1997. Abundance, habitat associations, and nest success of passerines within a fire maintained longleaf pine (Pinus palustris) ecosystem. Raleigh, NC: North Carolina State University. 78 p. Thesis. [62074]

64. LANDFIRE. 2020. Biophysical settings models and descriptions, [Online]. Washington, DC: U.S. Department of Agriculture, Forest Service; U.S. Department of the Interior; U.S. Geological Survey; Arlington, VA: The Nature Conservancy, (Producers). Available: http://www.landfirereview.org/search.php [2022, February 2]. [96496]

65. Lanham, J. Drew; Keyser, Patrick D.; Brose, Patrick H.; Van Lear, David H. 2002. Management options for songbirds using the oak shelterwood-burn technique in upland forests of the southeastern United States. In: Ford, W. Mark; Russell, Kevin R.; Moorman, Christopher E., eds. The role of fire in nongame wildlife management and community restoration: Traditional uses and new directions: Proceedings of a special workshop; 2000 December 15; Nashville, TN. Gen. Tech. Rep. NE-288. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northeastern Research Station: 65-72. [41559]

66. Lanham, J. Drew; Keyser, Patrick D.; Brose, Patrick H.; Van Lear, David H. 2002. Oak regeneration using the shelterwood-burn technique: Management options and implications for songbird conservation in the southeastern United States. Forest Ecology and Management. 155(1-3): 143-152. [45949]

67. Latta, Steven C.; Rimmer, Christopher C.; McFarland, Kent P. 2003. Winter bird communities in four habitats along an elevational gradient on Hispaniola. The Condor. 105(2): 179-197. [98302]

68. Latta, Steven; Rimmer, Christopher; McFarland, Kent; Gardner, Dana; MacKay, Barry Kent. 2022. Field guide to the birds of the Dominican Republic & Haiti. Princeton, NJ: Princeton University Press. 60-61. [98328]

69. Lepage, Denise. 2023. Chuck-will's-widow: Antrostomus carolinensis (Gmelin, JF 1789). In: Avibase: The world bird database, [Database]. Birds Canada (Producer). Available: https://avibase.bsc-eoc.org [2023, June 28]. [98082]

70. Levine, Emanuel. 2019. Bull's birds of New York state. rev. ed. Ithaca, NY: Cornell University Press. 648 p. [98327]

71. Loeb, Susan C.; Blakey, Rachel V. 2021. Bats and fire: A global review. Fire Ecology. 17: 1-18. [97856]

72. Loetscher, Frederick W., Jr. 1955. North American migrants in the state of Veracruz, Mexico: A summary. The Auk. 72(1): 14-54. [97915]

73. Lyon, L. Jack; Hooper, Robert G.; Telfer, Edmund S.; Schreiner, David Scott. 2000. Fire effects on wildlife foods. In: Smith, Jane Kapler, ed. Wildland fire in ecosystems: Effects of fire on fauna. Gen. Tech. Rep. RMRS-GTR-42-vol. 1. Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station: 51-58. [44448]

74. Masters, Ronald E.; Waymire, Jack R. 2012. Oak savanna restoration: Oak response to fire and thinning through 28 years. In: Dey, Daniel C.; Stambaugh, Michael C.; Clark, Stacy L.; Schweitzer, Callie J., eds. Proceedings of the 4th fire in eastern oak forests conference; 2011 May 17-19; Springfield, MO. Gen. Tech. Rep. NRS-P-102. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northern Research Station: 69-91. [87692]

75. Means, D. Bruce. 2006. Vertebrate faunal diversity of longleaf pine ecosystems. In: Jose, Shibu; Jokela, Eric J.; Miller, Deborah L., eds. The longleaf pine ecosystem: Ecology, silviculture, and restoration. Springer Series on Environmental Management. New York: Springer-Science: 157-213. [87833]

76. Mengel, Robert M. 1965. The birds of Kentucky. Ornithological Monographs. No. 3: 581 p. [24548]

77. Mengel, Robert M. 1976. Rapid tail molt and temporarily impaired flight in the chuck-will's-widow. The Wilson Bulletin. 88(2): 351-353. [98285]

78. Monroe, Burt L., Jr. 1968. A distributional survey of the birds of Honduras. Ornithological Monographs. No. 7: 458 p. [98317]

79. Morton, Eugene S. 1970. Chuck-will's-widow in Connecticut. Wilson Bulletin. 82(3): 329. [98315]

80. Muzny, Patricia L. 1982. Two concurrent nestings of chuck-will's-widows in McClain County, Oklahoma. Bulletin of the Oklahoma Ornithological Society. 15(2): 15-16. [98296]

81. NatureServe. 2023. Antrostomus carolinensis, chuck-will's-widow. In: NatureServe Explorer, [Online]. Arlington, VA: NatureServe, (Producer). Available: https://explorer.natureserve.org/Taxon/ELEMENT_GLOBAL.2.102662/Antrostomus_carolinensis. [2023, June 28]. [98083]

82. NatureServe. 2023. Antrostomus vociferus, eastern whip-poor-will. In: NatureServe Explorer, [Online]. Arlington, VA: NatureServe, (Producer). Available: https://explorer.natureserve.org/Taxon/ELEMENT_GLOBAL.2.871696/Antrostomus_vociferus. [2023 March 14]. [97799]

83. Nebel, Silke; Mills, Alex; McCracken, Jon D.; Taylor, Philip D. 2010. Declines of aerial insectivores in North America follow a geographic gradient. Avian Conservation and Ecology. 5(2): 1. [97959]

84. Nehrling, H. 1882. List of birds observed at Houston, Harris Co., Texas, and in the counties Montgomery, Galveston, and Ford Bend (continued). Bulletin of the Nuttall Ornithological Club. 7(3): 166-175. [98300]

85. New, Tim R. 2014. Insects, fire, and conservation. Chasm, Switzerland: Springer International Publishing. 208 p. [97950]

86. Northrop, John I. 1891. The birds of Andros Island, Bahamas. The Auk. 8(1): 64-80. [98299]

87. O'Connor, Ryan S.; Ritchison, Gary. 2013. Notes on the incubation, brooding, and provisioning behavior of chuck-will's-widows. The Wilson Journal of Ornithology. 125(4): 815-819. [98093]

88. Oberholser, Harry C. 1925. The relations of vegetation to bird life in Texas. The American Midland Naturalist. 9(12): 595-661. [61390]

89. Owre, Oscar T. 1967. Predation by the chuck-will's-widow upon migrating warblers. The Wilson Bulletin. 79(3): 342. [98286]

90. Palmer-Ball, Brainard L., Jr. 1996. The Kentucky breeding bird atlas. Lexington, KY: The University Press of Kentucky. 384 p. [98281]

91. Peck, George K.; James, Ross D. 1987. Breeding birds of Ontario: Nidiology and distribution. Miscellaneous Publications. Toronto, ON: Royal Ontario Museum, Publications in Life Sciences. 387 p. [23214]

92. Perry, Roger W. 2012. A review of fire effects on bats and bat habitat in the eastern oak region. In: Dey, Daniel C.; Stambaugh, Michael C.; Clark, Stacy L.; Schweitzer, Callie J., eds. Proceedings of the 4th fire in eastern oak forests conference; 2011 May 17-19; Springfield, MO. Gen. Tech. Rep. NRS-P-102. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northern Research Station: 170-191. [87698]

93. Petit, Daniel R.; Lynch, James F.; Hutto, Richard L.; Blake, John G.; Waide, Robert B. 1993. Management and conservation of migratory landbirds overwintering in the neotropics. In: Finch, Deborah M.; Stangel, Peter W., eds. Status and management of neotropical migratory birds: Proceedings; 1992 September 21-25; Estes Park, CO. Gen. Tech. Rep. RM-229. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station: 70-92. [98305]

94. Post, William; Dias, Nathan; McCallum, D. Archibald. 2003. Verification that the chuck-will's-widow occurs in winter in South Carolina. The Chat. 67(3): 100-101. [98266]

95. Provencher, Louis; Gobris, Nancy M.; Brennan, Leonard A.; Gordon, Doria R.; Hardesty, Jeffrey L. 2002. Breeding bird response to midstory hardwood reduction in Florida sandhill longleaf pine forests. The Journal of Wildlife Management. 66(3): 641-661. [42243]

96. Raffaele, Herbert A.; Wiley, James W.; Garrido, Orlando H.; Keith, Allan R.; Raffaele, Janis I. Birds of the West Indies. 2nd ed. Princeton, NJ: Princeton University Press. 288 p. [98274]

97. Reed, Catherine C. 1997. Responses of prairie insects and other arthropods to prescription burns. Natural Areas Journal. 17(4): 380-385. [27912]

98. Restall, Robin L; Rodner, Clemencia; Lentine R, Miguel. 2007. Birds of northern South America: An identification guide. New Haven, CT: Yale University Press. 880 p. [98280]

99. Ricks, Wilson E.; Cooper, Robert J.; Gulsby, William D.; Miller, Karl V. 2016. Songbird use of white-tailed deer (Odocoileus virginianus) food plots in Appalachian hardwood forests. Southeastern Naturalist. 15(1): 162-174. [98307]

100. Rieske-Kinney, Lynne K. 2006. Do fire and insects interact in eastern forests? In: Dickinson, Matthew B., ed. Fire in eastern oak forests: Delivering science to land managers: Proceedings of a conference; 2005 November 15-17; Columbus, OH. Gen. Tech. Rep. NRS-P-1. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northern Research Station: 152-157. [66407]

101. Robbins, Chandler S.; Bystrak, Danny; Geissler, Paul H. 1986. The breeding bird survey: Its first fifteen years, 1965-1979. Resource Publication 157. Washington, DC: U.S. Department of the Interior, Fish and Wildlife Service. 196 p. [24549]

102. Rohwer, Sievert A. 1971. Molt and the annual cycle of the chuck-will's-widow, Caprimulgus carolinensis. The Auk. 88(3): 485-519. [98091]

103. Rohwer, Sievert; Butler, James. 1977. Ground foraging and rapid tail molt in the chuck-will's-widow. The Wilson Bulletin. 89(1): 165-166. [98287]

104. Ruelas Inzunza, Ernesto; Hoffman, Stephen W.; Goodrich, Laurie J. 2005. Stopover ecology of neotropical migrants in central Veracruz, Mexico. In: Ralph, C. John; Rich, Terrell D., eds. Bird conservation implementation and integration in the Americas: Proceedings of the 3rd international Partners in Flight conference--Vol. 2; 2002 March 20-24; Asilomar, CA. Gen. Tech. Rep. PSW-GTR-191. Albany, CA: U.S. Department of Agriculture, Forest Service, Pacific Southwest Research Station: 657-672. [63459]

105. Sauer, John R.; Pardieck, Keith L.; Ziolkowski, David J., Jr.; Smith, Adam C.; Hudson, Marie-Anne R.; Rodriguez, Vicente; Berlanda, Humberto; Niven, Daniel K.; Link, William A. 2017. The first 50 years of the North American Breeding Bird Survey. The Condor. 119(3): 576-593. [98304]

106. Saunders, Aretas A. 1908. Some birds of central Alabama. A list of the birds observed from March 7 to June 9, in portions of Coosa, Clay and Talledega counties, Alabama. The Auk. 25(4): 413-424. [98309]

107. Schroeder, Richard L.; Cable, Ted T.; Haire, Sandra L. 1992. Wildlife species richness in shelterbelts: Test of a habitat model. Wildlife Society Bulletin. 20(3): 264-273. [22439]

108. Shelton-Nix, Ericha. 2017. Birds Checklist. In: Shelton-Nix, Ericha. Alabama Wildlife. Vol. 5. Tuscaloosa, AL: The University of Alabama Press. 273. [98322]

109. Shugart, Herman Henry, Jr.; James, Douglas. 1973. Ecological succession of breeding bird populations in northwestern Arkansas. The Auk. 90(1): 62-77. [25059]

110. Sibley, David. 1997. The birds of Cape May. 2nd. ed. rev. by Elia, Vince; Sibley, David ed. Cape May, NJ: Cape May Bird Observatory, New Jersey Audubon Society. 596 p. [98064]

111. Sigurdsson, Snorri; Cracraft, Joel. 2013. The systematics and evolution of the nightjars and their allies (Aves: Caprimulgiformes). New York, NY: The City University of New York: 327 p. [98262]

112. Smith, Lora L.; Steen, David A.; Stober, Jonathan M.; Freeman, Mary C.; Golladay, Steve W.; Conner, L. Mike; Cochrane, Jessica. 2006. The vertebrate fauna of Ichawuway, Baker County, GA. Southeastern Naturalist. 5(4): 599-620. [98325]

113. Souza-Cole, Ian Francis. 2021. Understanding the diel activity patterns and determinants of abundance of the eastern whip-poor-will. Urbana, IL: University of Illinois Urbana-Champaign. 76 p. Thesis. [97836]

114. Spiller, Kimberly J.; Dettmers, Randy. 2019. Evidence for multiple drivers of aerial insectivore declines in North America. Ornithological Applications. 121(2): 1-13. [97947]

115. Stevenson, Henry M. 1957. The relative magnitude of the trans-Gulf and circum-Gulf spring migrations. The Wilson Bulletin. 69(1): 39-77. [98268]

116. Stockard, Charles R. 1905. Nesting habitat of birds in Mississippi. The Auk. 22(2): 146-158. [98292]

117. Straight, C. A.; Cooper, R. J. 2020. Chuck-will's-widow (Antrostomus carolinensis), version 1.0, [Online]. In: Poole, A. F., ed. Birds of the world. Ithaca, NY: Cornell Lab of Ornithology, (Producer). Available: https://doi.org/10.2173/bow.chwwid.01 [2023, June 28]. [98080]

118. Summerville, Keith S. 2011. Managing the forest for more than the trees: Effects of experimental timber harvest on forest Lepidoptera. Ecological Applications. 21(3): 806-816. [98054]

119. Summerville, Keith S.; Crist, Thomas O. 2002. Effects of timber harvest on forest Lepidoptera: Community, guild, and species responses. Ecological Applications. 12(3): 820-835. [98053]

120. Swengel, Ann B. 2001. A literature review of insect responses to fire, compared to other conservation managements of open habitat. Biodiversity and Conservation. 10(7): 1141-1169. [43751]

121. Thatcher, Benjamin Stephen. 2007. Evaluation of forest management to improve breeding habitat for songbirds in oak-hickory forests at Tennessee National Wildlife Refuge. Knoxville, TN: University of Tennessee. 256 p. Dissertation. [84098]

122. Thill, Ronald E.; Koerth, Nancy E. 2005. Breeding birds of even- and uneven-aged pine forests of eastern Texas. Southeastern Naturalist. 4(1): 153-176. [98301]

123. Thompson, Frank R., III; Roach, Melissa C.; Bonnot, Thomas W. 2021. Woodland restoration and forest structure affect nightjar abundance in the Ozark Highlands. The Journal of Wildlife Management. 86(2): e22170. [97810]

124. Toland, Brian. 1985. Food habitats and hunting success of Cooper's hawks in Missouri. Journal of Field Ornithology. 56(4): 419-422. [97937]

125. Twedt, Daniel J.; Tirpak, John M.; Jones-Farrand, D. Todd; Thompson, Frank R., III; Uihlein, William B., III; Fitzgerald, Jane A. 2010. Change in avian abundance predicted from regional forest inventory data. Forest Ecology and Management. 260: 1241-1250. [98303]

126. USDI, Fish and Wildlife Service. 2021. Birds of Conservation Concern 2021. 86 FR 32056. Falls Church, VA: USDI, Fish and Wildlife Service, Migratory Birds. 48 p. [97829]

127. USDI, Fish and Wildlife Service. 2022. ECOS: Environmental conservation online system, [Online]. Available: https://ecos.fws.gov/ecp0/reports/ad-hoc-species-report-input. [97326]

128. Vallely, Andrew C.; Dyer, Dale. 2018. Birds of Central America: Belize, Guatemala, Honduras, El Salvador, Nicaragua, Costa Rica, and Panama. Princeton, NJ: Princeton University Press. 584 p. [98267]

129. Veit, Richard R.; Petersen, Wayne R. 1993. Birds of Massachusetts. Natural History of New England Series. Lincoln, MA: Massachusetts Audubon Society. 514 p. [98326]

130. Warren, S. D.; Scifres, C. J.; Teel, P. D. 1987. Response of grassland arthropods to burning: A review. Agriculture, Ecosystems and Environment. 19(2): 105-130. [4350]

131. Wells, Jeffrey V.; Wells, Allison Childs; Dean, Robert. 2017. Birds of Aruba, Bonaire, and Curacao: A site and field guide. Zona Tropical. Ithaca, NY: Cornell University Press, Comstock Publishing Associates. 488 p. [98271]

132. Wetmore, A. 1968. The birds of the Republic of Panama. Part 2. Family Caprimulgidae: Goatsuckers, chotacabras y tapacaminos. Washington, DC: Washington Smithsonian Institution. 195-215. [98314]

133. Wharton, Mary E.; Barbour, Roger W. 1991. Bluegrass land and life: Land character, plants, and animals of the Inner Bluegrass Region of Kentucky: Past, present, and future. Biology. 1. Lexington, KY: The University Press of Kentucky. 307 p. [98283]

134. Whitaker, John O.; Amlaner, Charles J. 2012. Habitats and ecological communities of Indiana: Presettlement to present. Bloomington, IN: Indiana University Press. 512 p. [98320]

135. Wilson, Lawrence P. 1959. Chuck-wills-widow nestings. The Migrant. 30(4): 53-54. [98294]

136. Wilson, Michael D.; Watts, Bryan D. 2008. Landscape configuration effects on distribution and abundance of whip-poor-wills. The Wilson Journal of Ornithology. 120(4): 778-783. [97857]