



Flammulated Owl, photo by ©Tommy DeBardeleben

## Breeding Habitat Use Profile

Habitats Used in Arizona	
Primary: Pine Forest Secondary: Mixed Conifer Forest	
Key Habitat Parameters	
Plant Composition	Ponderosa pine, Gambel oak, mixed stands of conifers, incl. firs, with deciduous trees, incl. aspen and various shrubs <sup>8,9</sup>
Plant Density and Size	Mixed-aged stands with dense sapling groves, multiple canopy layers, forest openings, deciduous trees or shrubs ideal; 204 trees/acre, 180 shrubs/acre, canopy height 33 feet, canopy cover 55%, 16 – 25% slopes <sup>8</sup>
Microhabitat Features	Nest tree: 35 feet tall, DBH 18 inches; near-by dense sapling groves used for roosting; nocturnal insects needed for foraging <sup>8</sup>
Landscape	Area requirements and landscape features not adequately studied; large areas of apparently good habitat unoccupied
Elevation Range in Arizona	
6,000 – 9,200 feet <sup>9</sup>	
Density Estimate	
Home Range Size: 21 – 59 acres <sup>8</sup> Density: < 1 – 3 pairs/100 acres, not incl. unoccupied areas	

## Conservation Profile

Species Concerns	
Certain Silvicultural Practices Increased Fire Frequency Climate Change (Droughts)	
Conservation Status Lists	
USFWS <sup>1</sup>	BCC List (BCR 16,34, and US)
AZGFD <sup>2</sup>	Tier 1C
DoD <sup>3</sup>	No
BLM <sup>4</sup>	No
PIF Watch List <sup>5b</sup>	Yellow List
PIF Regional Concern <sup>5a</sup>	Stewardship Species BCR 34,16
Migratory Bird Treaty Act	
Covered	
PIF Breeding Population Size Estimates <sup>6</sup>	
Arizona	Not given
Global	12,000 ●
Percent in Arizona	Not given
PIF Population Goal <sup>5b</sup>	
Prevent Decline	
Trends in Arizona	
Historical (pre-BBS)	Unknown
BBS <sup>7</sup> (1968 – 2013)	Not given
PIF Urgency/Half-life (years) <sup>5b</sup>	
Insufficient Data	
Monitoring Coverage in Arizona	
BBS <sup>7</sup>	Not adequate
AZ CBM	Not covered
Associated Breeding Birds	
Broad-tailed Hummingbird, Acorn Woodpecker, Hairy Woodpecker, Plumbeous Vireo, Steller's Jay, Pygmy Nuthatch, Olive Warbler, Grace's Warbler	

## Natural History Profile

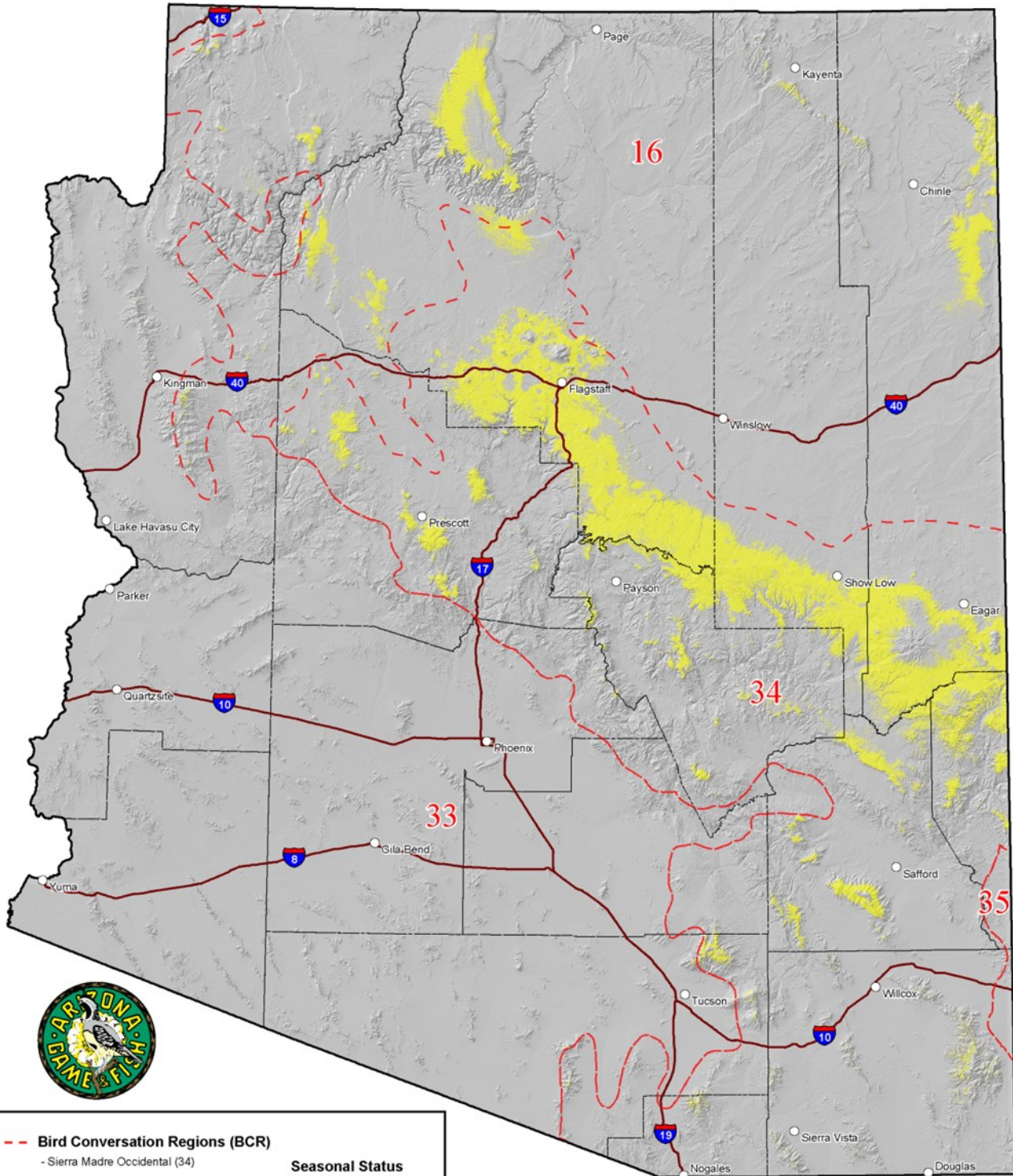
Seasonal Distribution in Arizona	
Breeding	Mid-March – July <sup>9</sup>
Migration	March – April; August – October <sup>8,9</sup>
Winter	Absent
Nest and Nesting Habits	
Type of Nest	Tree cavity <sup>8</sup>
Nest Substrate	Pine, oak, aspen, sycamore, cypress <sup>9</sup>
Nest Height	10 – 40 feet, occasionally as high as 100 feet <sup>8,9,10</sup>
Food Habits	
Diet/Food	Insects, especially moths <sup>8</sup>
Foraging Substrate	Foliage from trees and shrubs



Confidence in Available Data: ● High ● Moderate ○ Low ^ Not provided

Last Update: April 2023

# Distribution of Flammulated Owl



**-- Bird Conservation Regions (BCR)**

- Sierra Madre Occidental (34)
- Chihuahuan Desert (35)
- Sonoran & Mojave Deserts (33)
- Southern Rockies & Colorado Plateau (16)

**Seasonal Status**

- Breeding Only
- Counties

This map represents the predictive distribution for an individual species. AZGFD warrants no guarantees of accuracy or currency of the data represented.

SPECIES ACCOUNT ● FLAMMULATED OWL *Otus flammeolus*



# General Information

## Distribution in Arizona

In Arizona, Flammulated Owls occur mostly in the ponderosa pine zone of the central, northeastern, and southeastern regions of the state, and in scattered locations of the northwest (Wise-Gervais 2005). While this species primarily inhabits ponderosa pine, it may also range into higher elevations where it uses mixed conifer stands (Wise-Gervais 2005). Flammulated Owls are migratory and winter in Mexico and Central America, but little is known about their distribution and ecological requirements during migration (Linkhart and McCallum 2013).

## Habitat Description

Dry ponderosa pine forests are the primary breeding habitat of Flammulated Owls, with or without Gambel oak, but usually with patches of dense saplings or a shrub understory, forest openings, and a diversity of vegetation that supports nocturnal insects (Lesh et al. 1994, Wise-Gervais 2005, Linkhart and McCallum 2013). They also use other habitat types, including mixed conifer forests with pines, Douglas fir, white fir, and aspen. In southeastern Arizona, Flammulated Owls use Madrean and lower elevation pine-oak-cypress habitats (Wise-Gervais 2005). See Linkhart and McCallum (2013) for specific data for nesting areas of Flammulated Owls.

## Microhabitat Requirements

Flammulated Owls nest in natural or woodpecker-created cavities, and their preferred nest sites are in open, mature pine stands with an abundance of nocturnal insects nearby (Linkhart and McCallum 2013). Nest trees average 35 feet in height and 18 inches DBH (Linkhart and McCallum 2013).

Flammulated Owls roost in small, dense groves of conifers, which are usually < 330 feet from their nest (Linkhart and McCallum 2013). The key feature of the area immediately surrounding the nest appears to be a mosaic of different woody vegetation types, ages, and densities. Because of these specific nest site requirements, Flammulated Owls rarely accept artificial nest boxes (Linkhart and McCallum 2013).

## Landscape Requirements

While Flammulated Owls are generally found in ponderosa pine habitat, their presence appears to depend on a landscape-level mosaic of mixed vegetation that may include aspen, dense conifer sapling groves, shrub cover, forest openings, and open, mature pine stands (Linkhart and McCallum 2013). Large areas of ponderosa pine remain unoccupied, possibly because the necessary vegetation cover diversity is lacking. Area requirements and responses to landscape disturbances are unknown for this species.



## Conservation Issues and Management Actions

### Threats Assessment

This table is organized by Salafsky et al.'s (2008) standard lexicon for threats classifications. Threat level is based on expert opinion of Arizona avian biologists and reviewers. We considered the full lexicon but include only medium and high threats in this account.

Threat	Threat Level
<b><i>Residential and Commercial Development</i></b> <ul style="list-style-type: none"> <li>• Housing and urban areas</li> </ul>	Medium
<b><i>Biological Resource Use</i></b> <ul style="list-style-type: none"> <li>• Logging and wood harvesting</li> </ul>	High
<b><i>Human Intrusions and Disturbance</i></b> <ul style="list-style-type: none"> <li>• Recreational activities</li> <li>• Work and other activities</li> </ul>	Medium
<b><i>Natural System Modifications</i></b> <ul style="list-style-type: none"> <li>• Fire and fire suppression</li> </ul>	High
<b><i>Climate Change</i></b> <ul style="list-style-type: none"> <li>• Ecosystem encroachment</li> <li>• Changes in temperature regimes</li> <li>• Changes in precipitation and hydrological regimes</li> </ul>	High

In the following section we provide more detail about threats, including recommended management actions. Threats with similar recommended actions are grouped.

#### **Residential and Commercial Development:**

- Housing and urban areas

#### **Biological Resource Use:**

- Logging and wood harvesting

#### **Human Intrusions and Disturbance**

- Recreational activities
- Work and other activities

Forest management practices affect Flammulated Owls both positively and negatively. Management that retains areas of old-growth and results in a patchy mosaic of different tree ages and species, while also retaining undergrowth and creating openings, likely improves habitat conditions for Flammulated Owls. On the other hand, any silvicultural practice that leads to monotypic stands decreases habitat value and leads to displacement of Flammulated Owls. They appear to be sensitive to timber harvesting, as is indicated by their absence in logged sites in Arizona, while the species is present in nearby control areas (Franzreb and Ohmart 1978). Local firewood harvesting often includes cutting understory live and dead oaks that Flammulated



lated Owls frequently use for nesting and roosting sites. Living oaks may also be important cover sources for fledgling owls.

*Recommended Actions:*

1. Encourage and implement fire management and silvicultural practices that maintain or create horizontal diversity in tree and shrub species, various age classes, and tree densities in areas occupied by Flammulated Owls.
2. Use prescribed fires to restore breeding habitat in currently unoccupied areas.
3. Monitor and regulate firewood harvesting activities, particularly in areas with easy vehicular access where this activity has the potential to be excessive.

**Natural System Modifications:**

- Fire and fire suppression

Fire suppression over the past 100 years in pine forests of western North America may increasingly affect owl distribution and abundance by changing habitat quality and availability (Linkhart and McCallum 2013). Flammulated Owls are less successful with nesting in areas with smaller-diameter trees, suggesting fire suppression (which encourages smaller DBH trees) may result in poorer habitat. They recolonize small, unburned islands of forest in the burn perimeter following fire, but fire resulted in loss of the most suitable habitat that likely was previously occupied (Linkhart pers. comm.)

**Climate Change:**

- Ecosystem encroachment
- Changes in temperature regimes
- Changes in precipitation and hydrological regimes

Flammulated Owls occupy habitats that are sensitive to the effects of prolonged droughts, particularly through the loss of woody species diversity and insect productivity. Some populations likely depend on deciduous woodland components, such as aspen, which are sensitive to the effects of climate change. Breeding phenology of at least some long-distance avian migrants has not kept pace with peak abundance of prey on the breeding grounds, leading to declines in reproduction and survival (Jones and Cresswell 2010).

*Recommended Actions:*

1. Conduct a comprehensive Flammulated Owl population inventory to delineate occupied areas.
2. Determine vulnerability of key habitat components to the effects of climate change and possible compounding effects of land uses.
3. Develop a strategic management plan to mitigate for these losses.

**Research and Monitoring Priorities**

1. Use call play-back methods to monitor population status. Because Flammulated Owls cannot be monitored using standard multi-species protocols, occasional population inventories with species specific



- methods are needed. Current population and trend data will guide effective conservation planning.
2. Monitor the effect of habitat improvements or changes on Flammulated Owl populations.
  3. Conduct research that clarifies Flammulated Owl landscape and vegetation requirements (e.g. Scholer et al. 2014), as well as area requirements to guide conservation strategies.
  4. Determine the extent breeding pairs (not just territorial males) occupy major forest types and age classes across Flammulated Owl range, and how demographic performance varies among forest types and age classes occupied by breeding populations.
  5. Determine how fire suppression, management activities that counter fire suppression (e.g., mechanical thinning), and altered fire regimes affect demographic performance and population dynamics of breeding populations.
  6. Determine winter range, stopover habitats, and movement patterns of migratory Flammulated Owls, and the extent of temporal and spatial variation among populations across the range.

## Literature Cited

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<sup>2</sup>Arizona Game and Fish Department. 2012. Arizona’s State Wildlife Action Plan: 2012 – 2022. Arizona Game and Fish Department, Phoenix, AZ.

<sup>3</sup>Department of Defense. 2012. DoD PIF Mission-Sensitive Priority Bird Species. Fact Sheet #11. Department of Defense Partners in Flight Program.

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<sup>8</sup>Linkhart, B.D., and D.A. McCallum. 2013. Flammulated Owl (*Otus flammeolus*), *The Birds of North America Online* (A. Poole, ed.) Ithaca: Cornell Lab of Ornithology.

<sup>5a</sup>Partners in Flight. 2019. Avian Conservation Assessment Database, version 2019. Accessed on March 31, 2020.

<sup>6</sup>Partners in Flight Science Committee. 2019. Population Estimates Database, version 3.0. Accessed on March 31, 2020.

<sup>5b</sup>Rosenberg, K.V., J.A. Kennedy, R. Dettmers, R.P. Ford, D. Reynolds, J.D. Alexander, C.J. Beardmore, P. J. Blancher, R.E. Bogart, G.S. Butcher, A.F. Camfield, A. Couturier, D.W. Demarest, W.E. Easton, J.J. Giocomo, R.H. Keller, A.E. Mini, A.O. Panjabi, D.N. Pashley, T.D. Rich, J.M. Ruth, H. Stabins,



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- <sup>1</sup>U.S. Fish and Wildlife Service. 2008. Birds of Conservation Concern 2008. United States Department of Interior, Fish and Wildlife Service, Division of Migratory Bird Management, Arlington, VA. 85 pp.
- <sup>9</sup>Wise-Gervais, C. 2005. Flammulated Owl. *In*: Arizona Breeding Bird Atlas. Corman, T.E., and C. Wise-Gervais (eds.) University of New Mexico Press. Albuquerque, NM.

### Recommended Citation

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