

Madrean Pine-Oak Woodlands



Chiricahua Mountains, photo by @Steven Prager

Key Habitat Characteristics Profile

Elevational Range ¹
4,000 – 7,200 feet
Vegetation Structure ⁷
Open forests of 20 – 30% tree cover, ≥ 50% shrub cover; small trees and bunchgrasses also part of understory Whiskered Screech-Owl average measurements: 545 trees/ac; DBH = 11 – 12" (high amount of ≥ 14"); tree height = 43'; 16 large cavities/ac; 1,980 shrubs/ac; shrub height = 4'
Plant Species Composition ³
Evergreen oaks (Emery, Mexican blue, gray, Toumey), alligator and one-seed junipers; pine or aspen at higher elevations; sycamore, mountain mahogany, mesquite in semi-arid grassland; ground cover grama, bluestem, beardgrass wolftail, sprangletop; also bulb and tuber-producing forbs; willows, walnut in adjacent riparian areas
Important Microhabitats ^{5,7}
Large trees and snags (DBH ≥ 14") North-facing slopes Acorn-producing oaks Nearby surface water
Fire Regime ^{5,6}
Historic frequency 4 – 9 year intervals and low severity. Currently infrequent and severe intensity.
NRCS Major Land Resource Areas
38 - Mogollon Transition 41 - SE AZ Basin & Range

Conservation Profile

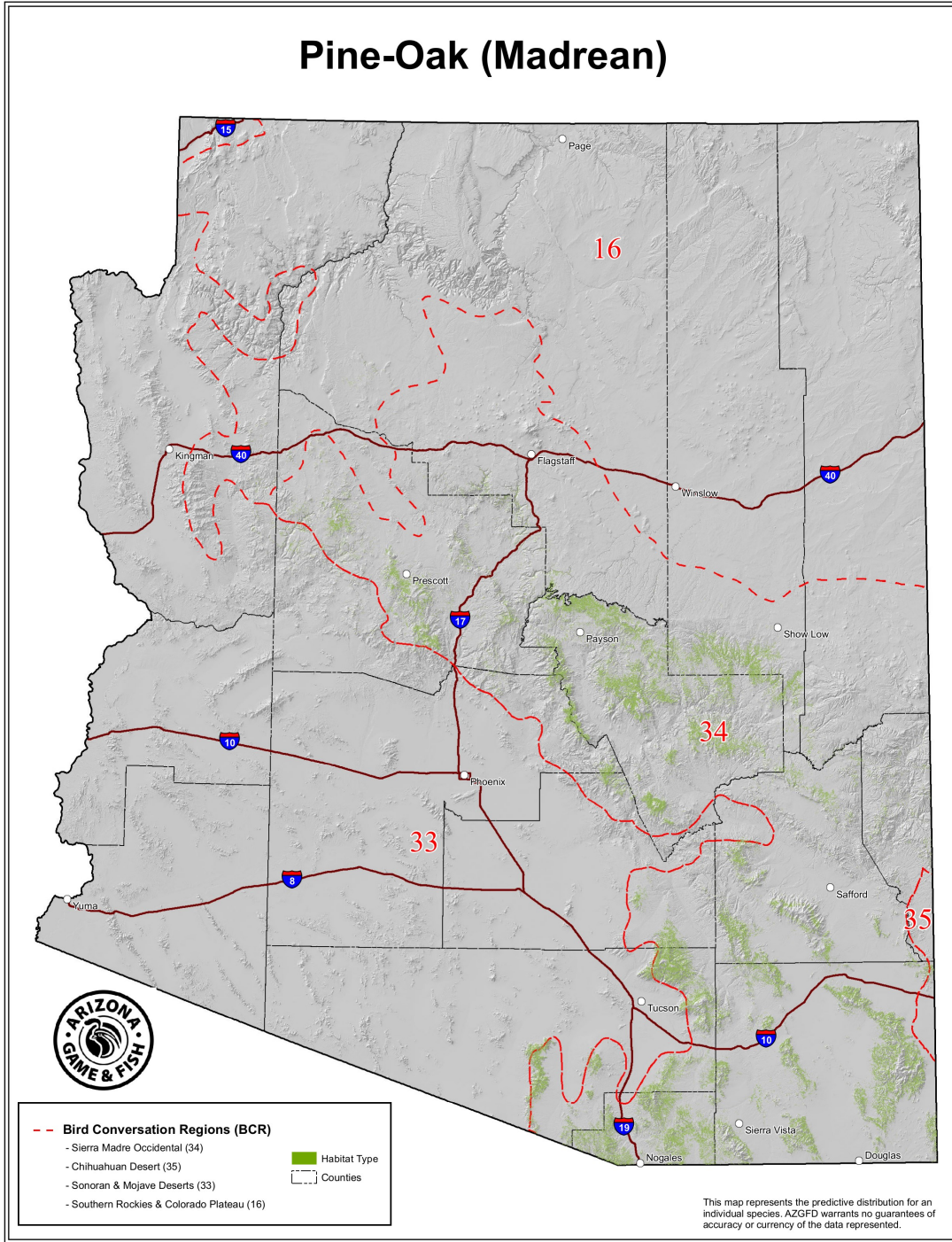
Estimated Cover in Arizona ¹	
990,989.04 ac 1.36 % of state	
Land Ownership Breakdown ¹	
Federal	66.22%
Private	3.34%
Tribal	28.41%
State	2.02%
Other	0.01%
Most Important Conservation Concerns	
Residential/commercial development Prolonged heavy grazing Climate change (drought, fire)	
Habitat Recovery Time ^{2,9}	
Dependent on moist climatic conditions; oaks more readily resprout than pine (Barton 2005); 45 years (Park 2002)	
Vulnerability to Climate Change	
Vulnerability	Moderate
Effects	Loss of plant vigor and mortalities, Increased fire frequency and intensity
Response	Conversion from pine-oak to oak woodlands

Bird Relationships Profile

Representative Bird Species with Accounts	
Montezuma Quail Whiskered Screech-Owl Arizona Woodpecker Buff-breasted Flycatcher	
Other Associated Breeding Bird Species ⁴	
Gould's Wild Turkey, Montezuma Quail, Northern Goshawk, Band-tailed Pigeon, Mountain Pygmy-Owl, Mexican Spotted Owl, Whiskered Screech-Owl, Mexican Whip-poor-will, Acorn Woodpecker, Hairy Woodpecker, Gray Vireo, Hutton's Vireo, Mexican Jay, Bridled Titmouse, Black-throated Gray Warbler, Hepatic Tanager	
AZ Stewardship Responsibility ¹	
Elegant Trogon, Blue-throated Mountain-gem, Rivoli's Hummingbird, Arizona Woodpecker, Buff-breasted Flycatcher, Dusky-capped Flycatcher, Sulphur-bellied Flycatcher, Eastern (Azure) Bluebird, Mexican Chickadee, Yellow-eyed Junco	



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Habitat Codes Included in Madrean Pine-Oak

Arizona Breeding Bird Atlas

- FME, FMO

USGS Southwestern ReGAP

- Madrean Pine-Oak Forest and Woodland
- Madrean Encinal



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General Information

Habitat Importance

Madrean pine-oak and Madrean encinal woodlands are Whiskered Screech-Owl and Montezuma Quail habitats, for which Arizona holds a significant portion of the U.S. population (Corman and Gervais-Wise, 2005, Latta et al. 1999). They are also the primary habitat types for Arizona Woodpeckers and Buff-breasted Flycatchers; almost all of the U.S. populations of these species are located in Arizona. The Madrean pine-oak woodland landscape is usually interspersed with montane riparian ecosystems, which makes the entire landscape diverse and rich in bird species (McPherson and Weltzin 1992). It is also among the least altered landscape of the large landscape cover types in Arizona (AGFD 2012).

Distribution in Arizona

Madrean pine-oak and encinal woodlands are distributed throughout southeastern Arizona, where they are found in the montane slopes of the Sky Islands and large mountain ranges. Madrean pine-oak habitat also extends within the Mogollon Transition of central Arizona from southeast to northwest (Schussman and Gori 2006).

Habitat Description

At low elevations, Madrean pine-oak occurs in open stands of evergreen oak species with junipers and pinyon pine intermixed. At higher elevations, evergreen oaks co-dominate with pines, particularly Apache, Chihuahua, and Arizona (ponderosa) pines. Understories are formed by bunchgrasses and low-growing shrubs such as manzanita, mountain mahogany, cliffrose, and sumacs.

Some bird species, such as Whiskered Screech-Owl, Arizona Woodpecker, and Buff-breasted Flycatcher, prefer to be close to montane riparian areas that feature sycamore and deciduous understory shrubs (Corman and Gervais-Wise 2005).



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Conservation Concerns 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	Details	Threat Level
Residential and Commercial Development: <ul style="list-style-type: none"> Housing and urban areas 	<ul style="list-style-type: none"> Exurban, suburban, and urban development 	Medium
Natural System Modifications: <ul style="list-style-type: none"> Fire and fire suppression Loss of grass cover 	<ul style="list-style-type: none"> Disrupted fire regime Prolonged heavy grazing 	Medium
Climate Change: <ul style="list-style-type: none"> Ecosystem encroachment Changes in precipitation and hydrological regimes (drought) 	<ul style="list-style-type: none"> Transition in type of dominate oaks and loss of pine 	High

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

Based on the habitat needs of the four representative bird species reviewed to create this account, the conservation concerns of Madrean pine-oak woodlands are a mix of topics which affect different species in different ways. Unlike other habitat types, there appear to be few concerns that tie all bird species together, which may also be evidence that this ecosystem is less impacted than others in the state. We focus our recommendations on the concerns of climate change (drought) and urban/rural developments, as these were the only ones that ranked moderately high for all species considered. Fire is also addressed within these two concerns.

Residential and Commercial Development:

- Housing and urban areas

Urbanization is a current threat to the oak woodlands of southeastern Arizona cover (Stromberg et al. 2020). It is also a conservation issue for other species that occupy areas that are targeted for exurban, suburban, and urban development.

Recommended Actions:

- In key conservation areas for Montezuma Quail, explore options for setting large oak-grassland areas aside for open space and creating greenbelts near current urban and rural developments.
- Encourage city planning strategies that emphasize infill development over expansive development.
- Determine how development plans by counties that have Madrean pine-oak woodlands may affect important habitat and promote measures for minimizing impacts.



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Natural System Modifications:

- Fire and fire suppression
- Loss of grass cover

Historic overgrazing by livestock had the greatest adverse impact to Montezuma Quail populations (Brown 1979). Bristow and Ockenfels (2004) reported that Montezuma Quail selected areas with higher grass canopy and more trees than randomly available. Cover associated with bunch grasses was used more frequently than at random sites. Reduction in low intensity surface fires has led to major changes in the Madrean pine-oak forests. The increases in stand density (more trees/acre), the ratio of pines:oaks (more oaks), and the abundance of fire intolerant species are direct effects that are likely to continue (Barton 2005).

Recommended Actions:

1. Oak woodland habitats should contain a minimum tree canopy of 26% and 51-75% grass canopy cover at 8 inches in height for optimum Montezuma Quail habitat. (Bristow and Ockenfels 2004).
2. Consider reintroduction of wildland fire under low to moderate fire severity conditions (Barton 2005). Fifteen year fire return interval would achieve the best balance between growing new trees and maintaining stand growth processes (Park 2002).

Climate Change:

- Ecosystem encroachment
- Changes in temperature and hydrological regimes (drought)

The bird species reviewed to create this account reach the northern edge of their global range in Arizona, which makes them candidates for distributional changes in response to climate change. The overall prediction of most climate models is a northward and upward retreat of vegetation cover classes. Northward expansions of some bird species ranges may already be happening. More immediate effects of prolonged droughts and decreased precipitation may include the loss of vigor in all tree species, particularly those associated with water supplied from winter rainfall. Montezuma Quail uses plants that are the result of a successful growing season, and they rely on dense vegetation cover for nesting and roosting. Whiskered Screech-Owls not only depend on the continued recruitment of sycamore trees, but also associated shrubs and trees that provide insect productivity for foraging (Corman and Gervais-Wise 2005).

Recommended Actions:

1. Delineate areas occupied by any of the priority species, as well as potentially suitable areas that could be restored by effective conservation planning.
2. Develop population assessment and monitoring protocols that take into account possible distributional changes due to climate change.
3. Evaluate land uses that may compound the effects of prolonged drought on sycamore-pine-oak interface areas.
4. Determine options for reducing land use impacts, particularly during periods of drought.



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