

**New Mexico Bird Conservation Plan**  
**Pinyon Jay (*Gymnorhinus cyanocephalus*) Species Account**

**New Mexico Avian Conservation Partners (NMACP)**

**March 2020**



Photo: Cole Wolf

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**Reviewed by members of the NMACP steering committee**

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***Disclaimer: the recommendations in this species account do not necessarily reflect the positions of all NMACP steering committee members, or the agencies and organizations they represent.***

***There are numerous bird species of concern that use piñon-juniper woodlands. This account focuses solely on Pinyon Jay needs; for information regarding how to incorporate all bird species needs into piñon-juniper management, please refer to [guidelines on the NMACP website](#).***

## **Pinyon Jay**

*NMACP Level:* Species of Conservation Concern, Level 1 (SC1)

*NMACP Assessment Score:* 19 (out of 25)

*NM Stewardship Responsibility:* Score of 5 (out of 5)

*National Partners in Flight Status:* “D” Yellow Watch List

*New Mexico Bird Conservation Regions (BCRs):* 16, 18, 34, 35 (map of BCRs see: <http://nabci-us.org/resources/bird-conservation-regions-map/>)

*Primary Breeding Habitat(s):* Piñon-Juniper Woodland

*Other Habitats Used:* Ponderosa Pine Forest, Great Basin Desert Scrub

## **Summary of Concern**

A species of the Intermountain West and Southwest, the Pinyon Jay inhabits primarily piñon-juniper habitat throughout New Mexico. This species has suffered declines throughout its range over the past century and continues to show sharply negative population trends in the state and regionally. Historical impacts include clearing associated with mining and livestock grazing (Lanner 1981). Current threats include climate change impacts to piñon trees (drought, insects, disease, and reduced cone production). Tree removal, for a variety of reasons, is also a current potential threat.

## **Associated Species**

Associated species of piñon-juniper habitats include: Black-throated Gray Warbler (SC2), Black-headed Grosbeak, Bushtit (SC2), Gray Flycatcher, Gray Vireo (SC2), Great Horned Owl, Juniper

Titmouse (SC1), Mountain Bluebird (SC2), Mountain Chickadee (SC2), Plumbeous Vireo, White-breasted Nuthatch, and Woodhouse's Scrub-Jay (SC1)

## **Conservation Status**

### **New Mexico Species Assessment**

For a description of the assessment process see: <http://avianconservationpartners-nm.org/wp-content/uploads/2017/08/Revised-NM-Species-Assessment-Methodology-1.pdf>.

DISTRIBUTION 2

THREATS 5

GLOBAL POPULATION SIZE 3

LOCAL POPULATION TREND 5

IMPORTANCE OF NEW MEXICO TO BREEDING 4

COMBINED SCORE 19

The Pinyon Jay was listed as Vulnerable on the Red List of Threatened Species by the International Union for Conservation of Nature (BirdLife International 2017). The Pinyon Jay is a Species of Greatest Conservation Need for the State of New Mexico (New Mexico Department of Game and Fish 2016). It is also listed by New Mexico Avian Conservation Partners (2016) as a SC1, the highest bird conservation priority, and is a U.S. Fish and Wildlife Service Bird of Conservation Concern (U.S. Fish and Wildlife Service 2008). Pinyon Jay is ranked by Natural Heritage New Mexico as S2/S3 (meaning imperiled/vulnerable in the state; updated in 2016). Its NatureServe global rank is G3, meaning vulnerable throughout its range.

## **Distribution**

The range of the Pinyon Jay extends across much of the Intermountain West and Southwest. The species is resident from central Oregon and eastern California east, reaching the western Dakotas and eastern New Mexico; and from southern Idaho and Montana south through Utah, Wyoming, and Colorado to central portions of New Mexico and Arizona. It generally winters throughout its breeding range but irrupts into surrounding regions when pine cone crops fail (Johnson and Balda 2020). The species may be found in foothills throughout the state, in large blocks of piñon-juniper woodland habitat. It occurs in all four BCR portions of New Mexico, although a large majority of the state population is found in BCR 16 (Southern Rockies Colorado

Plateau), with very few occurrences in BCR 18 (Shortgrass Prairie) and BCR 35 (Chihuahuan Desert) (eBird 2017).

## **Population Size**

Partners in Flight estimates the Pinyon Jay global population at 760,000 individuals, with New Mexico having approximately 29% of the global population, or 220,000 birds (95% Confidence Interval: 110,000 – 390,000; Partners in Flight 2019). These estimates are not current, are based on scant survey data, and based on available survey data, are likely over-estimates, at least the New Mexico estimate.

## **Population Trend**

The Pinyon Jay has declined dramatically over the past 50 years over most of its range. At the time of assessment, Pinyon Jay received the maximum score of five for population trend (population loss of more than 2% per year; Sauer et al. 2017). In their Landbird Conservation Plan, Partners in Flight estimated an 84% total population loss for Pinyon Jay (Rosenberg et al. 2016). Partners in Flight also estimated the Pinyon Jay population would decline by another 50% by 2035 (Rosenberg et al. 2016).

## **Threats**

The causes of Pinyon Jay decline have not been determined, but several plausible hypotheses exist. The most likely causes of Pinyon Jay decline are habitat loss and degradation due to climate change and destructive management practices. Pinyon Jay population viability is known to be tied to the availability of piñon mast crops. In years of abundant piñon cone crops, they have high reproductive success and may nest more than once (Ligon 1978, Marzluff and Balda 1992). Although Pinyon Jays also nest in non-mast years, the increased reproductive success supported by mast crops of piñon seeds contributes significantly to their population viability (Marzluff and Balda 1992). Drought negatively impacts cone production (Parmenter et al. 2018), and cone production has likely declined with drought in recent years (Redmond et al. 2012, Wion et al. 2019).

Pinyon Jays also nest in piñon trees, in areas of high canopy cover (Johnson et al. 2014) and where foliage is dense and healthy (Johnson et al. 2017a). These sites are probably preferred because they help conceal nests from predators, although more data on nest predation and habitat are needed. Climate impacts to the health and vigor of piñon trees reduce the availability of suitable nest sites for Pinyon Jays (Johnson et al. 2017a).

In addition to reduced piñon cone production and impacts to piñon health and vigor, recent climate-related impacts to piñon-juniper woodlands include large-scale mortality of piñon pines (Breshears et al. 2005, 2008) and significant reductions in canopy cover (Clifford et al. 2011). Climate models predict reduced tree growth rates and increased mortality (Williams

et al. 2010), distributional changes of piñon-juniper habitat (Cole et al. 2008), and widespread piñon and juniper mortality across the southwestern U.S. (McDowell et al. 2016).

These dramatic habitat changes are certain to impact Pinyon Jays. Significant climate-related impacts to piñon trees and associated movement of nesting colonies have been observed (Johnson et al. 2017a, K. Johnson and J. Smith unpublished). Over a nine-year period in the Oscura Mountains of New Mexico, piñon trees produced only one moderately sized cone crop (Johnson et al. 2014), and vigor of piñon trees declined, in association with decreased cool-season precipitation (Johnson et al. 2017a). Six years later, vigor had not increased (Johnson et al. 2020a).

Some management actions pose another potential threat to Pinyon Jays, including heavy woodland thinning (Johnson et al. 2018, Magee et al. 2019). Other potential threats include noise (Kleist et al. 2018) and habitat fragmentation from oil and gas activities and West Nile virus, to which species of the family Corvidae are susceptible (<https://www.cdc.gov/westnile/resources/pdfs/BirdSpecies1999-2016.pdf>).

## Ecology and Habitat Requirements

Pinyon Jays are so named because of their evolved mutualism with piñon pine trees. Piñon trees produce mast crops of piñon seeds, which provide critical nutrition that enhances Pinyon Jay reproductive success and survival (Ligon 1978, Marzluff and Balda 1992). Because piñon pines produce large, wingless seeds, they are dependent on birds for seed dispersal (Lanner 1996). Although Pinyon Jays are omnivorous, their morphology and physiology are evolved to facilitate the collection, caching, and retrieval of the seeds of piñon pines (*Pinus edulis*, *P. monophylla*). An expandable esophagus provides capacity of up to 50 seeds per trip (Ligon 1978), and a long, chisel-shaped bill facilitates opening piñon seeds (Johnson and Balda 2020). Balda (1987) estimated that a single Pinyon Jay caches about 2,600 seeds in a single autumn. Ligon (1978) estimated a flock of 250 could cache 4.5 million seeds in one autumn. Cached seeds are recovered with a high degree of accuracy and consumed through the winter and early spring (Johnson and Balda 2020). The Pinyon Jay's extraordinary physiological and behavioral dependence on piñon seeds is exemplified by reversal of gonadal regression in winter and breeding behavior in 10 months of the year, stimulated by abundant piñon seeds (Ligon 1978). Although Pinyon Jays will nest in spring in the absence of abundant piñon seeds, spring breeding events based on insects have not been shown to be as productive as those supported by a large piñon crop. Pinyon Jays are not only the piñon tree's most important long-distance seed disperser, their caching can also enhance the tree's resilience to climate impacts: a Pinyon Jay flock is capable of re-planting a woodland (Ligon 1978) decimated by fire, drought, or insect pests.

The Pinyon Jay is a highly social, cooperative breeder that nests in loose colonies in the same general location every year. Nesting colonies average 11 pairs (range 2-32, Marzluff and Balda 1992). Pinyon Jays are monogamous, and divorce is rare (Marzluff and Balda 1992). Pinyon Jays have been reported to nest in every month of the year except December and January, in response to abundant green piñon cones (fall), cached seeds (late winter, early spring), or insects (spring, summer) (Ligon 1971, 1978; Marzluff and Balda 1992), although

autumnal breeding has only been documented near Magdalena, NM (Bailey 1928, Ligon 1971). Birds usually raise only one successful clutch per year but will re-nest multiple times if nesting attempts fail.

Pinyon Jays form large wintering flocks of up to several hundred individuals, although in recent years reports of winter flocks larger than 100 birds have been increasingly rare (<https://ebird.org/home>). Home ranges are quite large, covering 3000 – 5000 ha (Johnson et al. 2014, 2015, 2016, 2020b). When winter food is scarce, they may wander widely outside their home ranges (Johnson and Balda 2020) and may defer breeding when food is inadequate (Ligon 1978).

Throughout its range, the species inhabits mainly piñon-juniper habitats, although it also occurs in ponderosa pine (*P. ponderosa*) woodlands (Marzluff and Balda 1992, Johnson and Balda 2020). In New Mexico, Pinyon Jays are associated primarily with Colorado piñon (*Pinus edulis*). In the Great Basin, they are associated with single-leaf piñon (*P. monophylla*), nest in piñon-juniper/sagebrush (*Artemisia* spp.) habitat, and forage in transition zones in piñon-juniper/sagebrush woodlands (Boone et al. 2018). In the Four Corners area (NW New Mexico), *J. monosperma* may be replaced by Utah juniper (*J. osteosperma*), and Pinyon Jays there nest in both piñon and juniper trees (Johnson et al. 2015). They are also reported to nest in sagebrush (*Artemisia* spp.), scrub oak (*Quercus* spp.), chaparral, ponderosa pine (*P. ponderosa*), and Jeffrey pine (*P. jeffreyi*) habitats (Johnson and Balda 2020).

In New Mexico, nesting areas are typically mid-aged to mature stands of piñon-juniper vegetation (Johnson et al. 2014, 2015, 2016). Pinyon Jays nest in larger-than-average piñon and juniper trees and in areas of relatively high canopy cover and tree density (Johnson et al. 2014, 2015; Johnson and Sadoti 2019). In New Mexico, they use juniper woodland and savanna primarily in winter and, to a lesser extent, grassland.

## Habitat Management

Appropriate management of piñon-juniper woodlands may depend upon the type of woodland. Based on historical disturbance regimes, Romme et al. (2009) identify three main types of piñon-juniper woodland:

- 1.) Persistent piñon-juniper woodlands** range from sparse to dense tree cover, and the canopy can be dominated by piñon, juniper, or both. Persistent piñon-juniper woodlands are often found in rugged upland areas with rocky and coarse-textured soils that do not typically support extensive ground cover plant communities
- 2.) Piñon-juniper savannas** have low to moderate tree density, and the canopy can be dominated by piñon, juniper, or both. They have a dense, nearly continuous grass and forb understory and are generally found on deeper, coarse to fine-textured soils.
- 3.) Wooded shrublands** have variable tree density, from very sparse to relatively dense, and shrubs are the dominant understory plants. Shrubs in the understory can include

sagebrush (*Artemisia* spp.), rabbitbush (*Chrysothamnus* and *Ericameria* spp.), and mountain mahogany (*Cercocarpus* spp.).

Few studies have investigated the effects of thinning (in any woodland type) on piñon-juniper birds (reviewed by Bombaci and Pejchar 2016). Even fewer studies have looked at the effects of various levels of thinning on bird communities. Gallo and Pejchar (2017) found that high levels of thinning (where unthinned sites had 90% higher tree cover than thinned sites) had significant effects on avian community structure. Magee et al. (2019) found that Pinyon Jay occupancy decreased locally in piñon-juniper woodland treated to reduce canopy cover from 36% to 5%. Another study found that Pinyon Jays avoided nesting within parts of a known colony site in persistent piñon-juniper woodland after the colony site was significantly thinned (87% reduction of trees per acre). However, a few birds continued nesting in untreated woodland adjacent to the treated area (Johnson et al. 2018). Based on the above-mentioned research, as well as recent habitat studies of Pinyon Jays (Johnson et al. 2014, 2015), it appears moderate to heavy woodland thinning has negative impacts on the quality of Pinyon Jay habitat.

Tree health is an important aspect of Pinyon Jay habitat. Scientific information regarding thinning impacts on tree health offers mixed results (Greenwood and Weisberg 2007, Roundy et al. 2014, Morillas et al. 2017), and response of trees may depend upon woodland type. In New Mexico, in persistent piñon-juniper woodlands, thinning may not help, and may even harm the health of remaining trees by increasing evapotranspiration (Morillas et al. 2017).

Many piñon-juniper management projects are conducted based on the assumption that piñon-juniper woodlands are invasive and expanding. While this was true in some areas in the past, and may be true in some areas today, as a whole this expansion has decreased or ceased (Kerr 2007, Miller et al. 2008, Sankey and Germino 2008). Additionally, climate change models predict a large-scale piñon-juniper die off in the future (Williams et al. 2010, McDowell et al. 2016).

## **NMACP Habitat Management Recommendations**

As outlined in the Habitat Management Section above, the best available science suggests removal of trees in piñon-juniper woodlands negatively impacts woodland birds, including Pinyon Jay. Additionally, some science suggests thinning may not improve tree health in piñon-juniper woodlands in New Mexico. The results of this research, combined with science that suggests piñon-juniper expansion has largely ceased and climate change will likely result in significant loss of piñon-juniper woodlands, compels NMACP to recommend careful assessment of the necessity of thinning in areas used by Pinyon Jays. If tree removal must occur, the following recommendations are provided as ways to potentially minimize negative impacts on Pinyon Jay populations. Recommendations are based on direct evidence from scientific literature, as well as inferences based upon this scientific literature and Pinyon Jay ecology. Recommendations will be refined and updated as more information becomes available in the future.

Because Pinyon Jay flocks use a variety of habitats within their very large home ranges, management of all piñon-juniper woodlands in New Mexico should consider Pinyon Jay habitat requirements (for example, Johnson et al. 2014, 2015, 2016; Johnson and Sadoti 2019). A few of the main recommendations contained in these studies are summarized here, but the cited documents contain additional site-specific recommendations.

Most of the following management recommendations are compiled from suggestions by the Pinyon Jay Multi-State Working Group in their Conservation Strategy for the Pinyon Jay (Somershoe et al. 2020); numerous members of the NMACP steering committee are also members of the Pinyon Jay Multi-State Working Group.

## **Recommendations**

### **Woodland Thinning-General Considerations for all Projects**

- Prior to woodland thinning for any reason, determine if Pinyon Jays are using a proposed treatment or development area by conducting standardized and statistically robust surveys (Petersen et al. 2014; additional information in Somershoe et al. 2020). If Pinyon Jays are using the area for nesting, seed caching, or foraging, avoidance of treatments in these areas is recommended.
- If a Pinyon Jay nesting colony is located, avoid habitat treatments (i.e., clearcutting, thinning, herbicides, burning, etc.) within the nest colony site. It is preferable to avoid treating within colony sites which were active during the preceding breeding season and at any known, inactive nest sites for up to 10 years or more, as jays may return to historical nest colony sites as resources in home ranges change (Marzluff and Balda 1992, Johnson et al. 2018a). A 500 m buffer is recommended to allow for colony shift to suitable habitat around the colony site (Johnson et al. 2017a, 2018). If treatment is necessary within a known nesting colony, assess surrounding woodlands for potential of the colony to shift to a nearby location of similar habitat quality. If adequate nesting habitat exists nearby, avoid thinning in these surrounding areas. If surrounding areas do not contain adequate nesting habitat, the necessity of thinning within the nesting site should be assessed.
- If treatments or development must be implemented in areas used by Pinyon Jays, avoid thinning during the Pinyon Jay breeding season, which runs from approximately early March to late May. Note, however, that Pinyon Jay breeding can occur at almost any time of the year, so clearance surveys, to determine if the birds are breeding, are essential.
- If treatments or development must be implemented in areas used by Pinyon Jays, NMACP recommends collaboration with Pinyon Jay researchers to monitor resulting woodland structure and Pinyon Jay response. This will increase knowledge of habitat use and provide valuable information to further develop and refine management recommendations. For more information regarding how to monitor for this species, contact the New Mexico Avian Conservation Partners steering committee at: <http://avianconservationpartners-nm.org/email/>.



- Pinyon Jays use woodlands with a wide range of tree density and canopy cover, and research suggests there is no one-size-fits-all requirement for habitat needs in New Mexico. Thinning and management should therefore be based on local conditions and Pinyon Jay habitat use (Johnson and Sadoti 2019). For example, large reductions in canopy cover, based upon pre-thinning local site conditions, are discouraged. Magee et al. (2019) documented reduced local-scale Pinyon Jay occupancy after a thinning project reduced existing canopy cover by from 36% to 5%; therefore, smaller reductions in canopy cover are recommended.
- If thinning in persistent piñon-juniper woodlands or wooded shrublands, create a mosaic of treated and untreated areas, as opposed to evenly-spaced thinning. Conduct thinning (but not clearcutting) in some patches, and leave other patches completely unthinned. The optimum size of unthinned patches for Pinyon Jay is unknown, but larger is likely better. Thinning in this way better mimics how fire historically impacted the landscape in persistent piñon-juniper woodlands and wooded shrublands (Romme et al. 2009).
- If using herbicide treatments in juniper or piñon-juniper woodlands, a mosaic of treated and untreated areas better mimics the natural landscape setting than large monomorphic treatment areas. If juniper is the target species, leaving areas that contain piñon trees untreated avoids compromising piñon nut production.
- Map existing die-off areas (resulting from drought, beetle kill, or other factors), and utilize them by either expanding upon them, conducting additional thinning within them, or determining that the natural die-off was sufficient to achieve project goals without additional thinning. Doing this will help retain a mosaic of treated and untreated areas, and better mimic how fire historically impacted the landscape in persistent piñon-juniper woodlands and wooded shrublands (Romme et al. 2009).
- When thinning, leave unthinned patches in productive (seed producing) piñon woodlands containing large and old; these trees are likely of prime piñon nut producing age (see below for information regarding how to identify productive trees; Parmenter et al. 2018, Crist et al. 2019). Additionally, according to recent research, provided that sufficient suitable habitat is retained throughout the treatment area, retaining as many larger trees as possible within areas of higher tree density and/or canopy cover will likely conserve more Pinyon Jay nesting habitat than thinning all size/age classes to a uniform density; e.g., within the 25-75% quartiles of these measures at similar sites (Johnson and Sadoti 2019).
- In thinned patches, retain as many mast-producing trees as possible. Parmenter et al. (2018) identified age of *P. edulis* as an indicator of probable nut productivity. In lieu of coring trees, Parmenter et al. (2018) suggested tree size as a correlate of tree age and potential nut productivity: little to no productivity (<3.5 inches or <9 cm diameter at breast height [dbh]); medium productivity (3.5-5.9 inches or 9-15 cm dbh); and high productivity (>6.3 inches or >16 cm dbh) (Zlotin and Parmenter 2008). When conditions permit, old and very old trees likely produce more mast due to their large size and larger number of fruiting branches (Parmenter et al. 2018).

- In thinned patches, retain as many tall and densely crowned trees as possible, particularly within areas of higher tree density for nesting (Wiggins 2005, Johnson et al. 2014, 2015, Johnson and Sadoti 2019).
- Avoid preferential thinning of juniper (i.e., removal of all juniper from thinned areas), as Pinyon Jays will use juniper for nesting, especially large, densely-crowned junipers (Johnson et al. 2014).
- Lop and scatter is likely preferable over other slash management methods; this method may reduce erosion, promote healthy soils, protect the health of the remaining trees, and promote healthy invertebrate populations (Stoddard et al. 2008).
- Retain and promote native grasses, forbs, shrubs, and cryptobiotic crust in the understory, as this may provide habitat for invertebrate prey (Bombaci and Pejchar 2016).
- If cheatgrass (*Bromus tectorum*) or other invasive species occur near the treatment area, avoid treatment (and further site disturbance) or include aggressive post-treatment management and control plans (Crist et al. 2019). Cheatgrass may increase after thinning (Coop and Magee 2016), potentially decreasing invertebrate numbers and increasing fire risk. Chambers et al. (2014) recommended a minimum of 20% perennial native herbaceous cover to prevent a large increase in cheatgrass and other annual invasive plants post-treatment.
- Prescribed fire is not recommended within persistent piñon-juniper woodlands and wooded shrublands as a follow-up to thinning, because these ecosystems did not evolve with frequent, low-intensity surface fires (Baker and Shinneman 2004, Romme et al. 2009). If thinned sites must be maintained, follow-up thinning is recommended over prescribed fire.
- Pinyon Jays use natural and artificial water sources. Wildlife watering stations within 2 km of Pinyon Jay nesting colonies can support the species during drought (Peterson et al. 2014).

### **Additional Considerations for Fuels Reduction**

- Persistent piñon-juniper woodlands and wooded shrublands historically experienced high-intensity, low-frequency wildfires (Romme et al. 2009). Because of this, thinning these woodlands to reduce fire risk does not represent ecological restoration, and as mentioned previously, thinning appears to have negative impacts on woodland birds, including Pinyon Jay. Therefore, in these woodland types, we recommend fuels reduction only take place to protect human infrastructure.
- If thinning is to occur for fuels reduction, firebreaks to protect infrastructure are recommended in lieu of thinning large tracts of woodland.
- Limited research suggests retention of 15-35% canopy cover may be sufficient to stop many, but not all, piñon-juniper crown fires during extreme fire behavior (Coop and Magee 2016). Retained canopy cover of 15-35% may render a site unsuitable for Pinyon Jays; however, more research is necessary. When thinning for fuels reduction, if the entire project area to be thinned has a pre-treatment canopy cover of less than or within 15-35%, evaluate whether fuels reduction is necessary. If the entire area to be

thinned for fuels reduction has a pre-treatment canopy cover of greater than 15-35%, target retention of approximately 15-35% canopy cover in thinned patches, where possible, while retaining higher canopy cover in un-thinned patches.

### **Infrastructure and other Development**

- Provide a 0.6 mile (1 km) buffer around Pinyon Jay nest colony sites when planning development (Wiggins 2005), including energy development; e.g., oil and gas (Johnson et al. 2013, Kleist et al. 2018), wind, and solar; ORV trails; and similar ground disturbances, especially where paved roads and potential of high traffic volume and/or noise are associated with infrastructure or vehicle traffic (Johnson et al. 2013).

### **Adapting to Climate Change**

- Because of the predicted impacts of climate change on piñon-juniper woodlands, alternative nesting habitat should be maintained near existing Pinyon Jay nesting colonies. A medium-sized nesting colony requires a minimum of 50 ha of good nesting habitat (Johnson et al. 2018), and retaining similarly-sized or larger patches nearby is recommended, in case of habitat loss or degradation at a colony site
- Managing piñon-juniper woodlands in the face of climate impacts will be very challenging; one proposed approach is to manage for climate resilience. Three key strategies involved in managing for climate resilience are: 1) identify and protect patches likely to persist in the face of climate change, 2) proactively manage for resilience by maintaining ecological communities and processes and healthy soils, and 3) accept, assist, and allow for transformation in sites where transformation is inevitable (Rondeau et al. 2017).
  - Some ways to manage piñon-juniper woodlands for resilience include:
    - Favor south- and west-facing slopes for thinning, as opposed to north- and east-facing slopes, because trees on north- and east-facing slopes are projected to better survive future climate change scenarios (Rondeau et al. 2017). Colonies have been found on (north-facing) sites with lower heat load (Johnson et al. 2017b).
    - Retain trees within drainages, as these may survive drought better than drier areas.
    - Retain trees in heathier soils, as these may survive drought better than trees in poor soils.

## **Species Conservation Goals**

### **Partners in Flight Goals**

The 2016 Partners in Flight North American Landbird Conservation Plan places Pinyon Jay in the “D” Yellow Watch List category. It sets a goal of stabilizing Pinyon Jay populations in the short-

term and reclaiming a portion of the lost population within the next 30 years (Rosenberg et al. 2016).

### **NMACP Goals**

- Stop or reverse downward trends in Pinyon Jay populations
- Establish quantitative population objectives for Pinyon Jays
- Identify data gaps regarding locations of Pinyon Jay nesting colonies in the state, and conduct surveys for a full understanding of statewide population size
- Locate and monitor Pinyon Jay colony nesting sites
- Investigate reproductive success in different P-J habitat types (especially with varying tree canopy cover, tree health, elevations, and aspects)
- Investigate impacts of thinning, and tree density, on piñon pine health and cone production
- Conduct research to understand impacts on Pinyon Jays of thinning piñon-juniper woodland
- Identify and protect potential climate change refugia
- Investigate why it appears populations of many P-J priority bird species, including the Pinyon Jay, are increasing in the Gila Region (Sauer et al. 2017).

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