Draft 2026 Guidelines
Promoting Pinyon Jay Conservation in Pinyon-Juniper Woodlands
Colorado Parks and Wildlife

Purpose

This document provides an overview of the breeding ecology of the pinyon jay (*Gymnorhinus cyanocephalus*) including resources for identifying known breeding colonies, protocols for conducting surveys, and models for assessing colony-site suitability. It provides best management practices and considerations for habitat treatments in pinyon–juniper woodlands aimed at supporting pinyon jay conservation.

These guidelines are a result of collaborative work among Colorado Parks and Wildlife (CPW), the Bureau of Land Management – Colorado (BLM), and the U.S. Fish and Wildlife Service (USFWS). Contributing authors include Amy Seglund and Emily Macklin (CPW), David McNitt and Chris Keefe (BLM), and Scott Somershoe (USFWS).

These guidelines will be updated periodically as new scientific information about the species' habitat needs emerge, with particular attention to pinyon–juniper woodland treatments and management objectives.

Background

Population Trends

The North American Landbird Conservation Plan recently estimated a global population of 770,000 pinyon jays (Partners in Flight, 2024). From 1967–2015, populations declined at an annual rate of 3.69%, resulting in an estimated range-wide loss of 83.5%. Current trends suggest that global populations may decrease by an additional 50% by 2035 (Rosenberg 2016; Partners in Flight, 2024). The pinyon jay is currently being considered for listing under the U.S. Fish and Wildlife Endangered Species Act with a listing decision expected in 2028.

Habitat Associations for Breeding

In Colorado, pinyon jays are year-round residents of pinyon-juniper woodlands dominated by pinyon pine (*Pinus edulis*) and juniper (*Juniperus osteosperma, J. monosperma, J. scopulorum*). These woodlands account for approximately 21% of the states' forested landscape and occur primarily in arid regions between 1,493 and 2,438 m (4,900–8,000 ft) but may extend up to 2,743 m (9,000 ft) https://csfs.colostate.edu/colorado-forests/forest-types/pinon-juniper-woodlands/). These woodlands transition from grasslands or shrublands at low elevations, to greater juniper abundance and pinyon pine dominating at the highest elevations (Muldavin and Triepke 2020).

Recent occupancy and breeding surveys conducted by CPW in western Colorado found that pinyon jay occupancy begins to decline at elevations above 2,300 -2400 m (7,545- 8000 ft). Selection for lower elevations may reduce breeding jay exposure to late-winter snow events that can cause nest failure or abandonment, provide access to suitable cache sites, and position colonies closer to spring insect emergence that coincides with nestling and fledging development.

Breeding

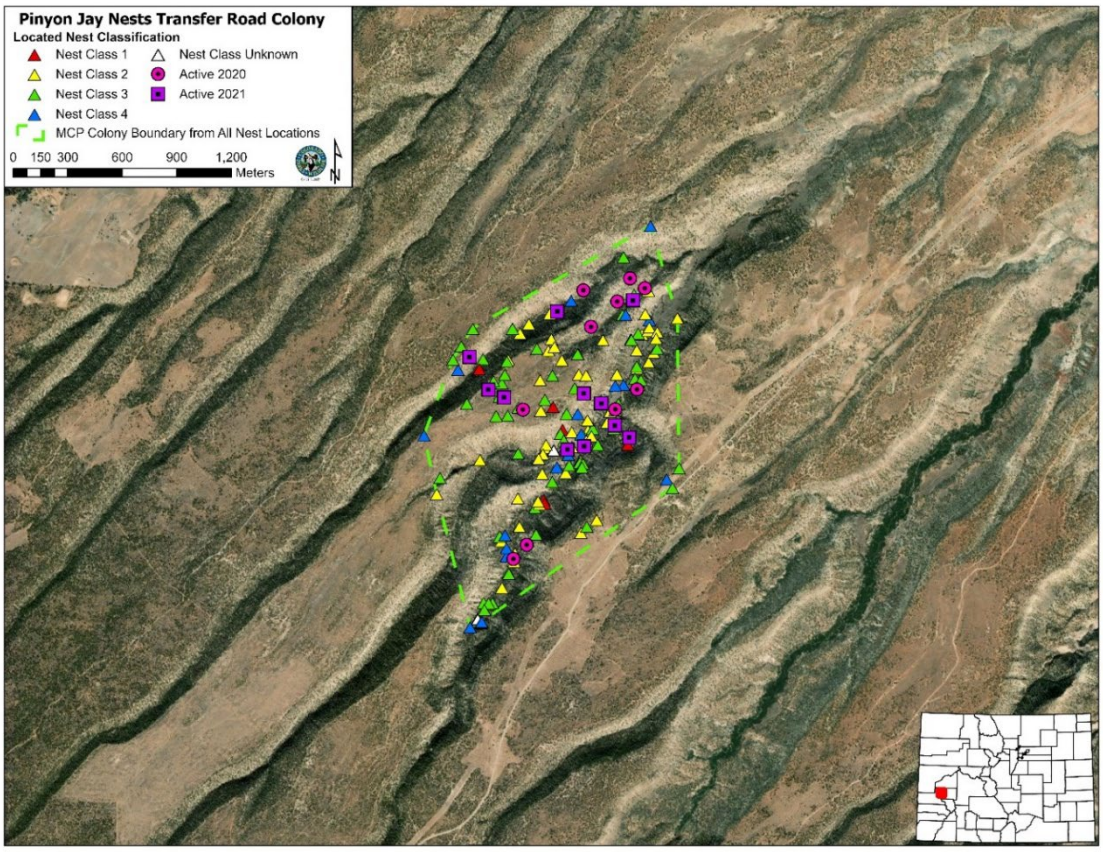
Pinyon jays are highly social birds that form flocks throughout the year, with flock size and number varying by season. During the breeding season, however, adults spend approximately 40–50% of their

time within breeding colonies (Marzluff and Balda, 1992). In Colorado, pinyon jays are early nesters, initiating breeding as early as mid-February with most of the pairs in a colony typically done nesting by late May. Breeding may start later, around early March, at higher elevations ≥ 2300 m (>8000 ft) (Seglund, A and Macklin, E., pers. Comm. 2025).

Colonies in Colorado have been found to contain 1–26 active nests (not all active simultaneously) and are commonly associated with flocks of 20–100 individuals, including both breeding adults and non-breeding sub-adults.

Colonies are important conservation units because pinyon jays exhibit strong site fidelity to breeding locations, even though colony boundaries and nest locations shift among years (Figure 1). Active breeding areas within colonies can range from <1 ha to approximately 200 ha, (2.5 to 494 acres) while the broader colony footprint—encompassing historical and newly established nest areas—can extend up to 650 ha (1606 acres) (Seglund et al. 2021).

Figure 1. Example of nest location shifts within a pinyon jay breeding colony. Nest classification definitions are described in the CPW survey protocol.



Nest Trees

Since 2019, CPW, in collaboration with BLM and USFWS, has surveyed and mapped 154 pinyon jay breeding colonies statewide (as of 2025). Colonies were identified by locating both active nests (female incubating, eggs present, or nestlings present) and old nests (older than one year at the time of discovery). From this effort, researchers documented 531 active nests and 3627 old nests.

Nest heights ranged from 1 to 24 ft above ground, with an average height of 6.6 ft. Nest trees ranged from 4.5 to 38 ft tall, with an average height of 12.85 ft (Seglund, A., pers. comm. 2024). Nest and tree heights in the Royal Gorge area were like CPW findings. Nest heights ranged from 5 to 9 ft, with a median height of 6.5 ft, while tree heights ranged from 4 to 32 ft, with median heights of 13 ft for juniper and 16 ft for pinyon pine (Macklin, E., pers. comm. 2025).

From CPW surveys in western CO and around San Luis Valley, most nests (77%) were in juniper (Juniperus spp.), while 23% were found in pinyon pine; one nest was documented in ponderosa pine (Pinus ponderosa). In contrast, within the BLM Royal Gorge Field Office, where pinyon pine is the dominant tree species, 81% of nests were placed in pinyon pine and 19% in juniper, with two nests in ponderosa pine (Macklin, E., pers. comm. 2024).

Overall, these patterns suggest that pinyon jays select nest sites based on tree species availability, branch structure and foliage density.

Importance of Masting Trees

Pinyon pines produce highly nutritious nuts in large crops that historically occur within stands or regions at irregular intervals. Trees produce 1-3 crops every 10 years (Forcella 1981) with highest cone production occurring once every 4-7 years (O'Connell and Frey 2023). The ability of pinyon jays to find and cache ripe pinyon pine seeds in fall may have an influence on pinyon jay population viability (Marzluff and Balda 1992).

Pinyon jay nest productivity has been measured to be higher in good pinyon pine masting years and lower in non-masting years (Ligon 1978, Marzluff and Balda, 1992). Pinyon jays will forego breeding in low resource years, or conversely, may nest during any month of the year in years with abundant cone crops. Adult survivorship is also highest after moderate cone crops (Marzluff and Balda 1992).

Masting events are likely impacted by climate change due to increases in fall temperature and reduction in moisture resulting in fewer, less robust, masting events. Less seed production could negatively impact pinyon jays that rely on pinyon pine seeds for critical nutrition (Redmond et al. 2012). Although omnivorous, pinyon jays do primarily rely on seeds (including pinyon pine) during critical periods of winter and breeding which they cache for later consumption (Johnson and Balda, 2020). Because pinyon jays cache pinyon nuts during fall when seeds are ripe, breeding colonies do not need to be located near masting trees, which often occur at higher elevations with greater pinyon tree dominance and mesic conditions.

Pinyon Jay Resources

Resources provide guidance to implement Best Management Practices (BMPs) for woodland treatments in pinyon-juniper woodlands to protect breeding pinyon jays during the sensitive reproductive season. All resources are available at CPW Github.

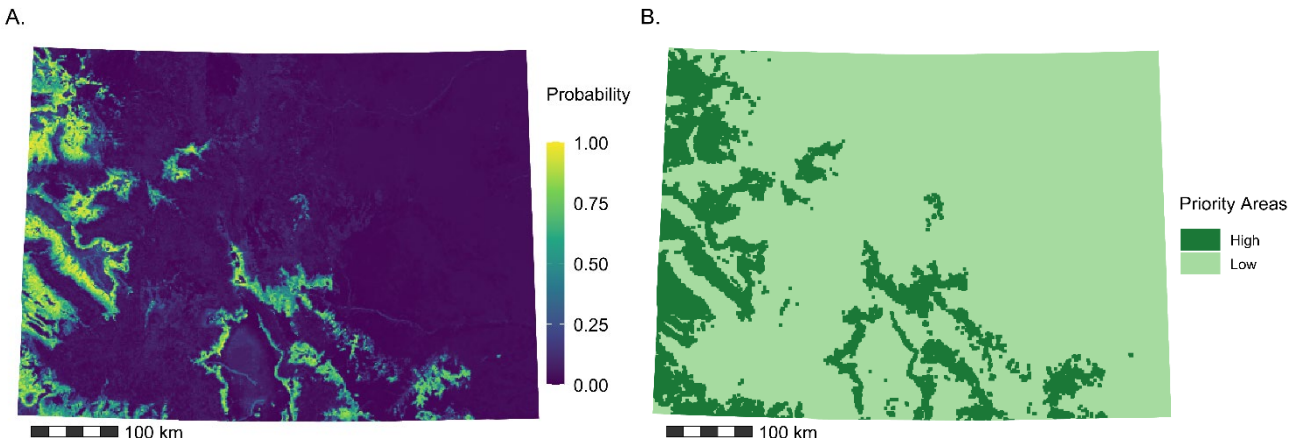
Colony-Site Suitability Model

Through a collaborative effort between CPW, BLM, and South Dakota State University, a statewide predictive model of colony-site suitability was developed based on colony locations identified across Colorado between 2019-2024 (Macklin 2025). This cross-validated model achieved an accuracy of 88.33%, correctly classifying colony sites and comparable background locations in the testing dataset 88.3% of the time. The model is available in both raster and vector (polygon) formats:

PIJA CO Colony Suitability Raster: Predicts probability of colony-site suitability on a 0-1 scale (Figure 2A). The objectively determined maxSSS threshold (Liu et al. 2016), which balances correctly identified colony sites with minimizing false positives, is 0.41 (41% probability of colony-site suitability), indicating that cells with a predicted suitability of ≥ 41% are classified as suitable habitat for pinyon jay colonies.

PIJA CO Priority Areas Vector: Provides binary values that represent colony-site suitability (Figure 2B). High priority areas support breeding colonies, whereas Low priority areas are not suitable.

Figure 2. ***Colony-Site Suitability Model*** *as a probability raster (A) and binary vector (B) using colony locations identified across Colorado between 2019-2024.*



CPW Survey Protocol for Locating Pinyon Jay Colonies

CPW has developed a survey protocol and training PowerPoint to help land managers identify pinyon jay breeding colonies prior to implementing woodland treatments.

CPW Field Trainings

CPW provides in-field training sessions at the beginning of the breeding season (typically early March) to train biologists and land managers on techniques to survey pinyon jays and identify breeding behaviors. For training details in 2026, contact Amy Seglund amy.seglund@state.co.us

Colony and Nest Shapefile

CPW maintains annually updated shapefiles of known active and old nest locations in Colorado (named PIJA CO Nests 2026) and colonies (PIJA CO Colonies 2026), incorporating data from CPW surveys and partner agencies. These shapefiles are available on the CPW Github.

Best Management Practices (BMPs)

Land managers should consider pinyon jay conservation alongside other land use objectives such as hazardous fuels reduction, big game and sage-grouse management and woodland health improvement. In instances where pinyon-juniper removal is necessary to meet primary objectives, attempt to analyze impacts to pinyon jay breeding habitat and provide appropriate secondary objectives for pinyon jay conservation.

As new science emerges and more habitat management information is gathered, these guidelines will be periodically revisited to make necessary adjustments to reflect the evolving scientific understanding of the species and pinyon-juniper woodlands, particularly associated habitat interactions.

Decision Checklist

Begin by reviewing the decision tree (Figure 3). It helps users apply BMPs by identifying priority areas for pinyon jay conservation using the colony-site suitability model, survey protocols and available CPW colony and nest shapefiles.

High Priority Areas

A treatment polygon is considered in a High Priority conservation area if any of the following apply:

- Intersects or is adjacent to a cell with ≥ 0.41 suitability threshold in the colony-site suitability raster format or defined as High Priority polygons in colony-site suitability vector format.
- Intersects or is adjacent to known pinyon jay colonies or nests based on CPW shapefiles.
- Breeding pinyon jays are detected within or adjacent to the treatment polygon after implementing CPW survey protocol.

Treatment Considerations for High Priority Areas

Timing Limitations

Do not conduct treatments during the sensitive breeding season in High Priority Areas

- Treatments < 8,000 ft elevation: **Feb. 15 – May 31**
- Treatments ≥ 8,000 ft elevation: **Mar. 1 – May 31**

Pre-Treatment Surveys

If timing limitations cannot be applied and/or if local land managers want to determine if pinyon jays are in an area to better tailor their treatments with jays in mind, trained surveyors should conduct pre-treatment surveys following the provided CPW survey protocol.

- Surveys must be completed in the spring prior to proposed treatment implementation.
- To confirm non-use by breeding pinyon jays, surveys must include three visits spaced 7-10 days apart in March and April.

If neither timing limitations nor three pre-treatment surveys are feasible, contact CPW for site specific guidance. Document when guidelines were not followed to inform future adjustments as needed.

Autonomous Recording Units (ARUs) – ARUs are currently being evaluated as an experimental tool for detecting pinyon jay presence. However, ARUs have not been found to be an appropriate method for confirming breeding activity (Macklin, E., pers. Comm. 2026). If in the future breeding behavior can be discerned with acoustic data, ARUs will be incorporated into CPW's survey protocol.

Low Priority Areas

A treatment is considered in a Low Priority conservation area if any of the follow apply:

- Intersects raster cell(s) < 0.41 and is not adjacent to any cells ≥ 0.41 or does not intersect with a high priority polygon
- No past evidence of breeding, and lacking other evidence of suitable breeding habitat

No timing limitations nor pre-treatment surveys are necessary in low priority areas, though surveys are encouraged if feasible in areas where pinyon or juniper are present.

*Figure 3. **Decision Tree** illustrates implimentation of best management practices for proposed woodland treatments.*

Treatment Polygon

Low Priority Areas:

- Intersects raster cell(s) **< 0.41** and **is not adjacent** to any cells **≥ 0.41**
- Does not intersect with a **high priority** polygon
- No evidence of breeding based on CPW colony and nest shapefile

- No timing limitations
- No pre-treatment surveys needed, but encouraged if pinyon or juniper is present

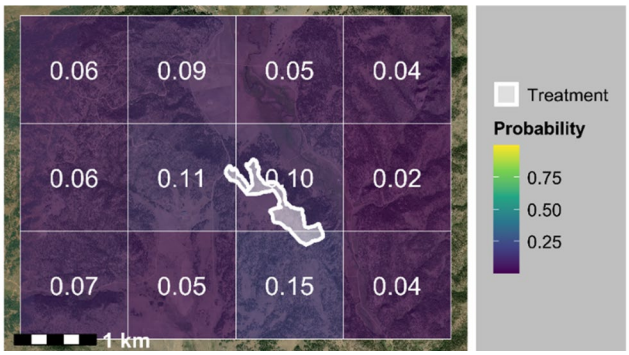
High Priority Areas:

- Intersects or **is adjacent** to raster cells **≥ 0.41**
- Intersects with a **high priority** polygon
- Intersects known colonies or nests from CPW nest and colony shapefile
- Breeding pinyon jays are located during a pre-treatment survey

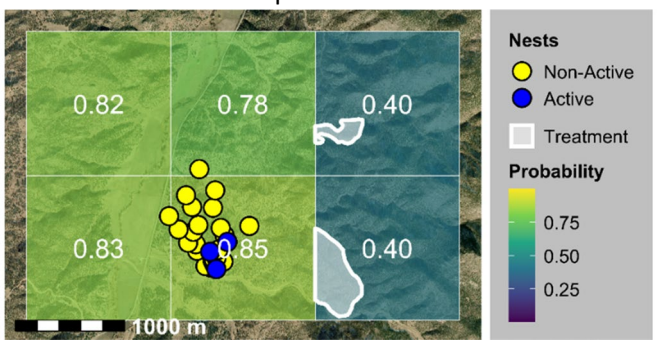
1. **Timing limitations** are highly recommended
   - Treatments < 8,000 ft: **Feb. 15 – May 31**
   - Treatments ≥ 8,000 ft: **Mar. 1 – May 31**
2. **Pre-treatment surveys:** If timing limitations are not feasible, trained surveyors should conduct pre-treatment surveys the spring prior to implementation following the CPW survey protocol to locate colonies
   - If no breeding activity is detected after following CPW survey protocol, timing limitations can be lifted

Follow treatment considerations for breeding pinyon jays regardless of detections or breeding activity

Example Scenario



Example Scenario



Exceptions to BMPs

Wildland-Urban Interface (WUI)

In the WUI, BLM priorities focus on protecting human communities and infrastructure. Conservation of natural and cultural resources is a secondary objective, with human health and safety and cost(s) taking precedence.

If timing allows, and the treatment polygon intersects high priority cells (**≥ 0.41**) or is in or adjacent to a mapped colony area, pre-treatment surveys and/or BMP timing limitations should be attempted.

Prescribed Burns

Safe and effective prescribed burns may be necessary during the timing limitation period for breeding pinyon jays. To minimize nest disturbance, burn piles and other prescribed burning locations should be sited away from identified colonies based on survey data collected at least one spring prior to burn initiation, in cells with **≥ 0.41** values, or in areas of known pinyon jay colonies.

Woodland Treatment Design Considerations

Ecological Site Descriptions (ESD)

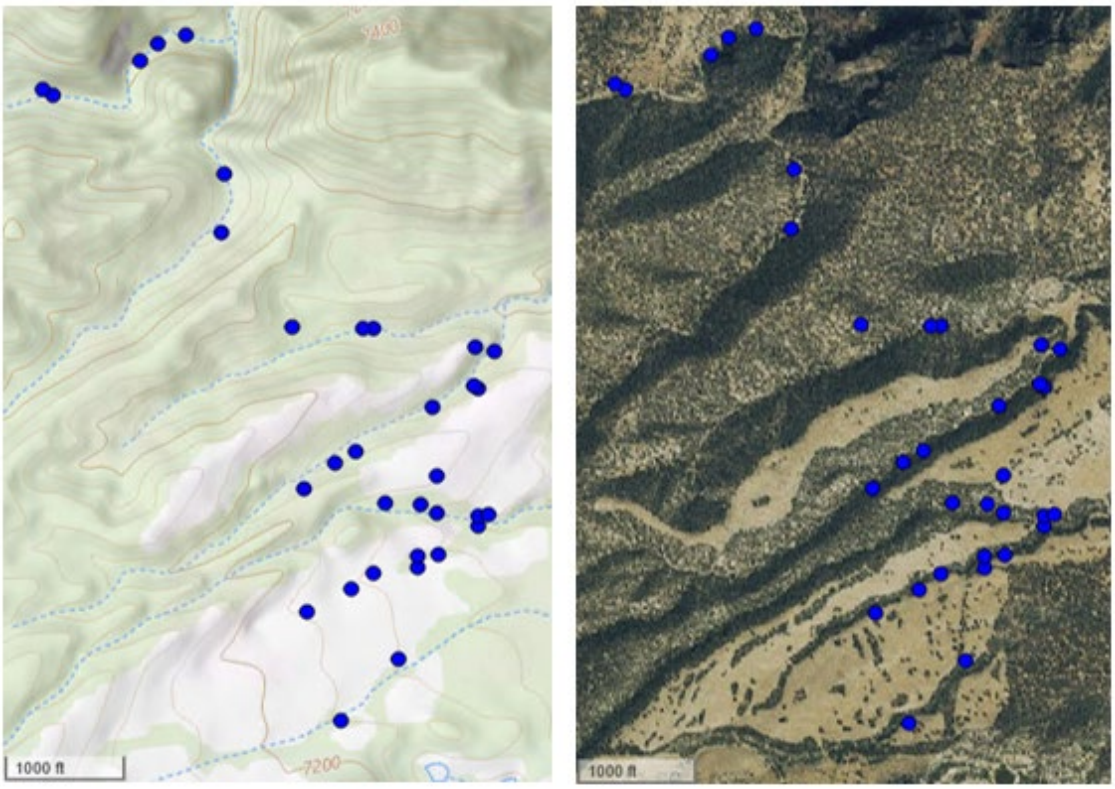
Practitioners are encouraged to use ESDs and other tools to inform treatment prescriptions. Treatments designed to benefit sagebrush-steppe should avoid areas within ESDs dominated by conifers (primarily pinyon and juniper) including those with shallow soils (<20 inches). The purpose of this conservation measure is to maintain nesting and masting trees on the landscape and to avoid focusing efforts in areas where the landscape is unlikely to support restoration/reestablishment of suitable sagebrush-steppe habitats.

Conservation of Nesting Habitat

Where thinning and woodland health treatments are conducted in High Priority conservation areas, consideration should be given to maintaining or improving nesting habitats for pinyon jays, including:

1. Treatments should be designed to limit the intensity of tree removal in areas of known pinyon jay nesting and in habitats that might be used for nesting such as drainages (Figure 4).

Figure 4. Topographic and satellite imagery demonstrating the use of nest trees (blue dots) within drainages.



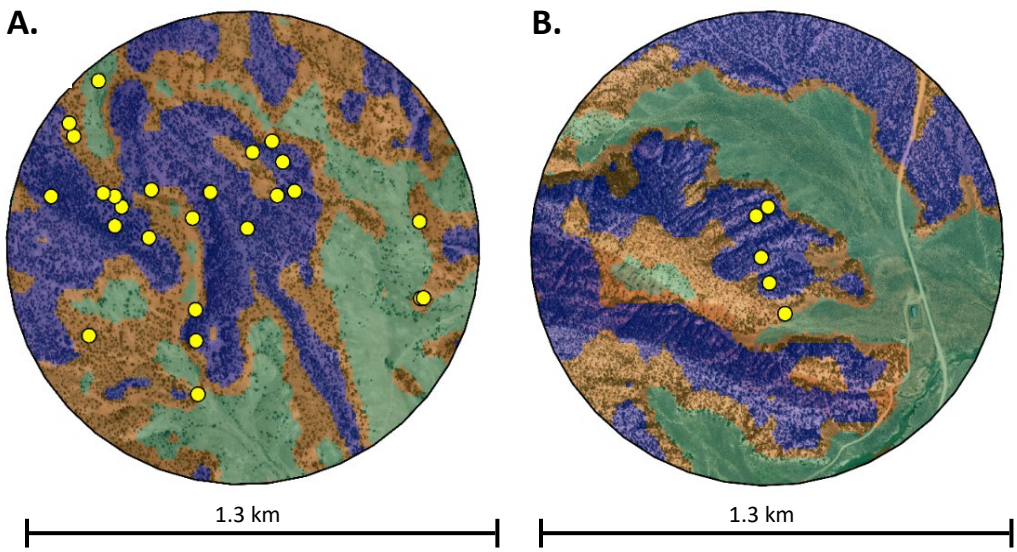
2. Because of recent long-term drought conditions throughout Colorado, die-offs of both pinyon and juniper are occurring. Live trees are struggling with trees shedding foliage. Reduced twig density may result in nests having higher predation rates due to being more visible. Promoting tree health and resiliency in hotter dry conditions is advocated.

   Pinyon jays have not been found to reuse nests, therefore, maintaining multiple clusters of healthy, densely branched pinyon and juniper trees (Figure 5) is recommended to prevent nesting trees from becoming a limiting resource for breeding pinyon jays.

Figure 5. Examples of pinyon pine and juniper nest trees with higher twig and branch density that provide sufficient cover for nests. Nests circled in red.

3. Preferred median tree cover at nest sites is 28% (range: 9%-57%) at a 30 m resolution (Rangeland Analysis Platform; Allred et al. 2021). Evidence suggests a heterogeneous mosaic of varied tree cover classes with an even distribution of low (0-15%), moderate (15-30%), and high (> 30%) tree cover patches provide the variable vegetation structure pinyon jays require for nesting, foraging, and caching activities (Figure 6, Macklin, E.D. 2025).

Figure 6. Examples of heterogeneous tree-cover classes in pinyon jay colonies showing 0–15% tree cover (green), 15–30% tree cover (orange), and > 30% tree cover (blue), with active nests (yellow dots).



4. In areas where leaving tree stands intact would impact a land manager's ability to meet objectives for removing invading conifers from areas capable of supporting sustainable sagebrush or grasslands, additional coordination with CPW is encouraged to confirm site-specific strategies that meet objectives while also maintaining suitable nesting opportunities for pinyon jay.

Monitoring Treatment Responses

Collect consistent, measurable descriptions of woodland structure and condition to evaluate how forests respond to management treatments. Record the size and location of all treatments so they can be incorporated into CPW and BLM treatment databases. Tracking treatments may help evaluate how landscape-scale woodland changes affect pinyon jay populations.

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