2026 Pinyon Jay Survey Protocol

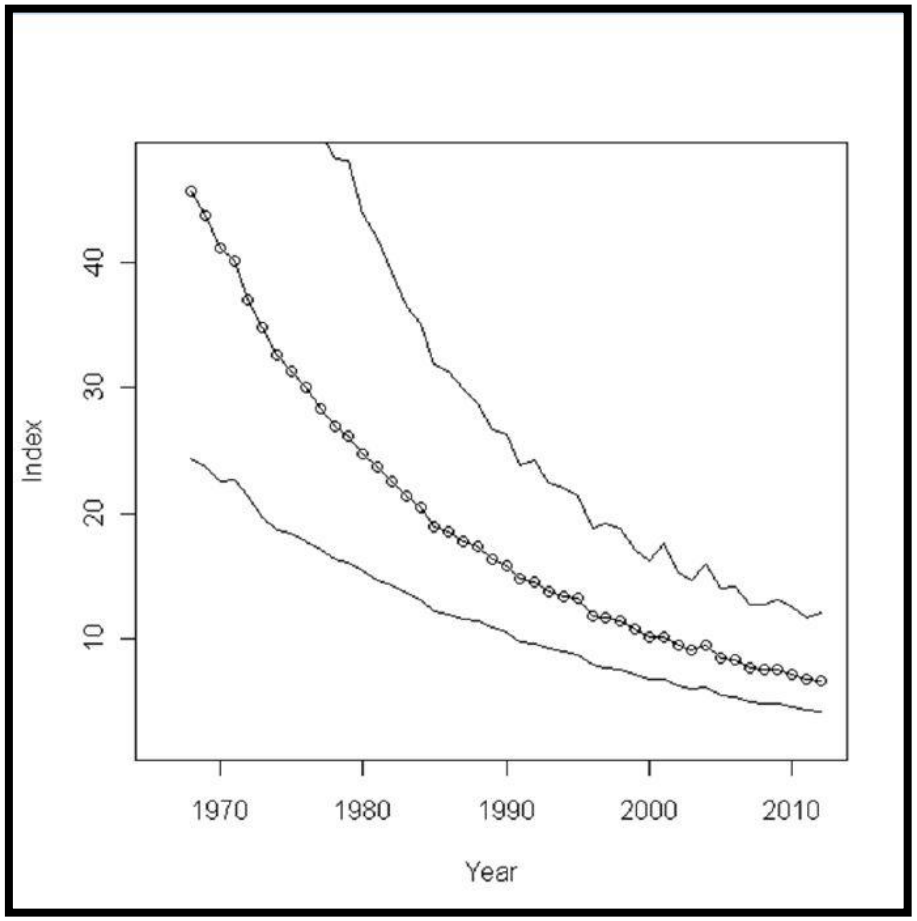
Colorado Parks and Wildlife

LIVE LIFE OUTSIDE

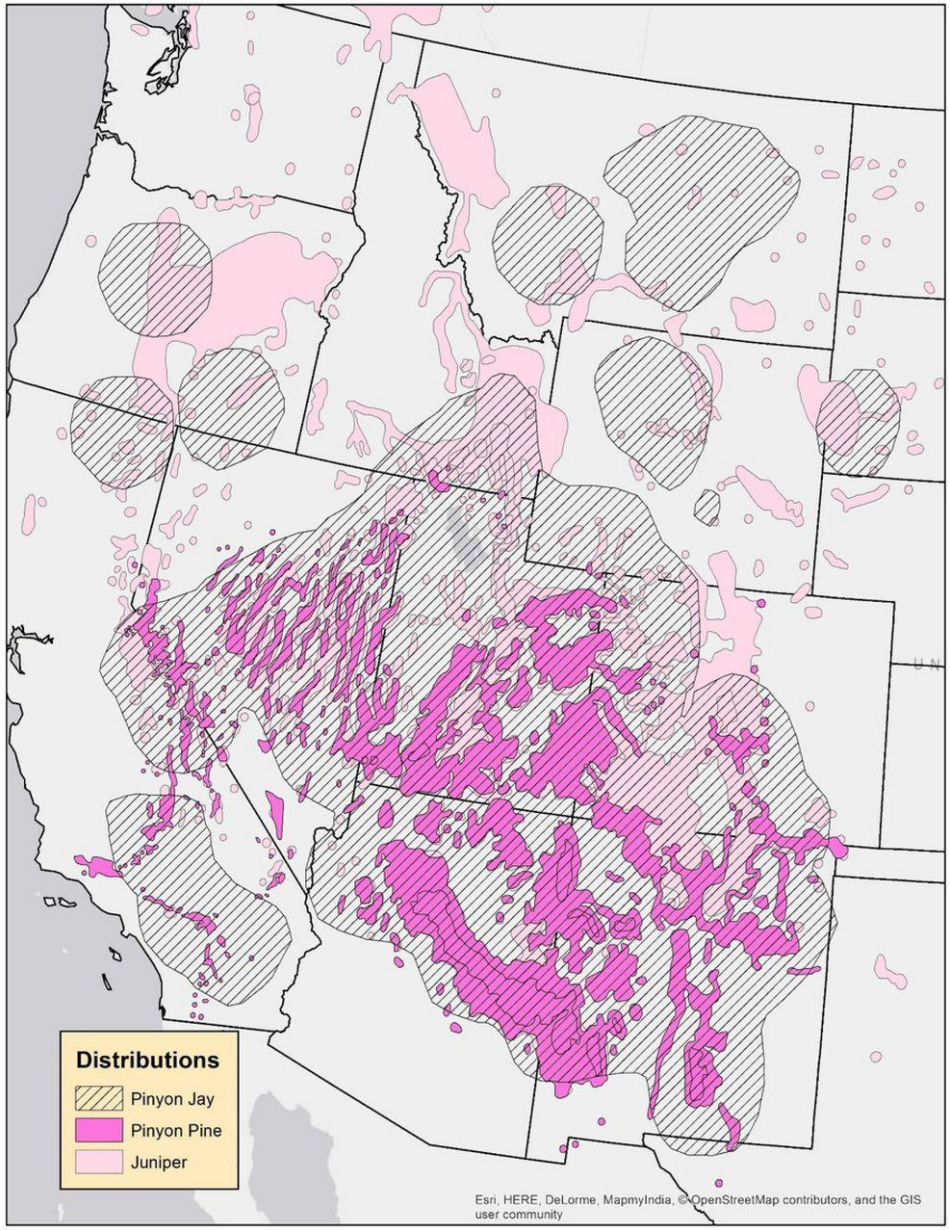
Pinyon Jay Appearance

- Sharply pointed bill
- Entirely blue except for white chin
- Immature birds a duller blue/grey
- Shorter tail as compared to other jay species

Why are surveys needed?



- Breeding Bird Surveys (BBS) over the past 50 years indicate steep population decline
- Ranked as a Species of Greatest Conservation Concern (Tier 1) in Colorado's 2025 State Wildlife Action Plan
- 12-month status review for listing under the USFWS Endangered Species Act. Decision due in 2028.



John D. Boone, Chris Witt, Elisabeth M. Ammon 2021

Range

- Pinyon-Juniper woodlands occur in arid regions at elevations typically from 4,900 to 8,000 feet in CO
- 21% of the forested landscape in CO
- Transition from grasslands or shrublands at lower elevations
- Pinyon jays uniquely adapted to a mutualistic relationship with the Pinyon Pine tree (*Pinus edulis*)

Conservation Concerns

Woodland management

- Sage-grouse
- Big Game
- Fuels Reduction
- Forage Production
- Ecosystem Restoration

Climate change

- Long term drought
- Insect outbreaks
- Loss of mast crops

Nest Predator

- common raven

Pinyon Jay Life History

- Member of the Corvid Family – the Blue Crow
- Highly intelligent and clever birds
- Very vocal with complex communication
- In Colorado is a resident jay of Pinyon Pine-Juniper Woodland
- Highly social; spends life in flocks
- Uniquely adapted to a mutualistic relationship with the Pinyon Pine tree (*Pinus edulis*)

Co-evolved with Pinyon Pine

Pinyon Jay Morphological Adaptations

- Expandable esophagus to hold up to 56 pinyon pine nuts. A Scrub-Jay can only hold 3–5.
- Large pointed bills for opening cones
- The pinyon jay bill is featherless at its base (genus *Gymnorhinus* – naked nose). All other corvid species nares covered by bristle-like feathers.

Pinyon Pine Adaptations

- Large wingless seeds require dispersal by animals
- Seeds are highly nutritional
- Cones open upwards for easy access
- Cones take 3 years to mature
- Trees can produce mast crops every 7 to 10 years – making this unpredictable resource

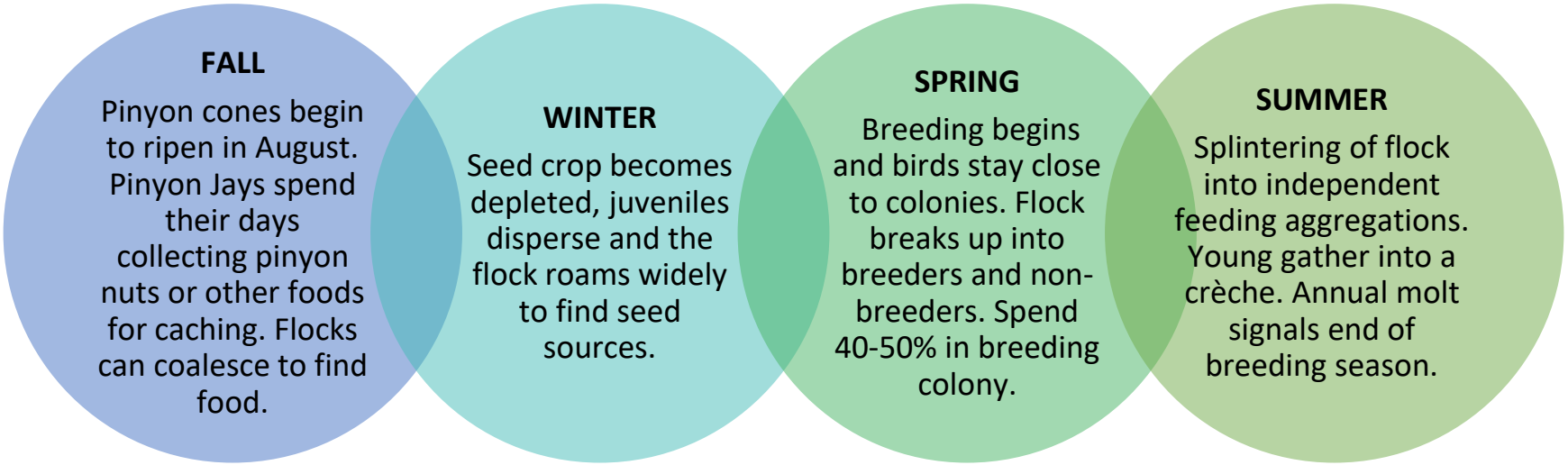
Pinyon Jay
Behavioral Adaptations

- Long distance dispersal of seeds
- An Individual jay can cache more than 20,000 seeds in a single season
- Incredible spatial memory can recover 95% of seeds cached
- The remaining 5% germinate and can grow new trees

Cache Sites

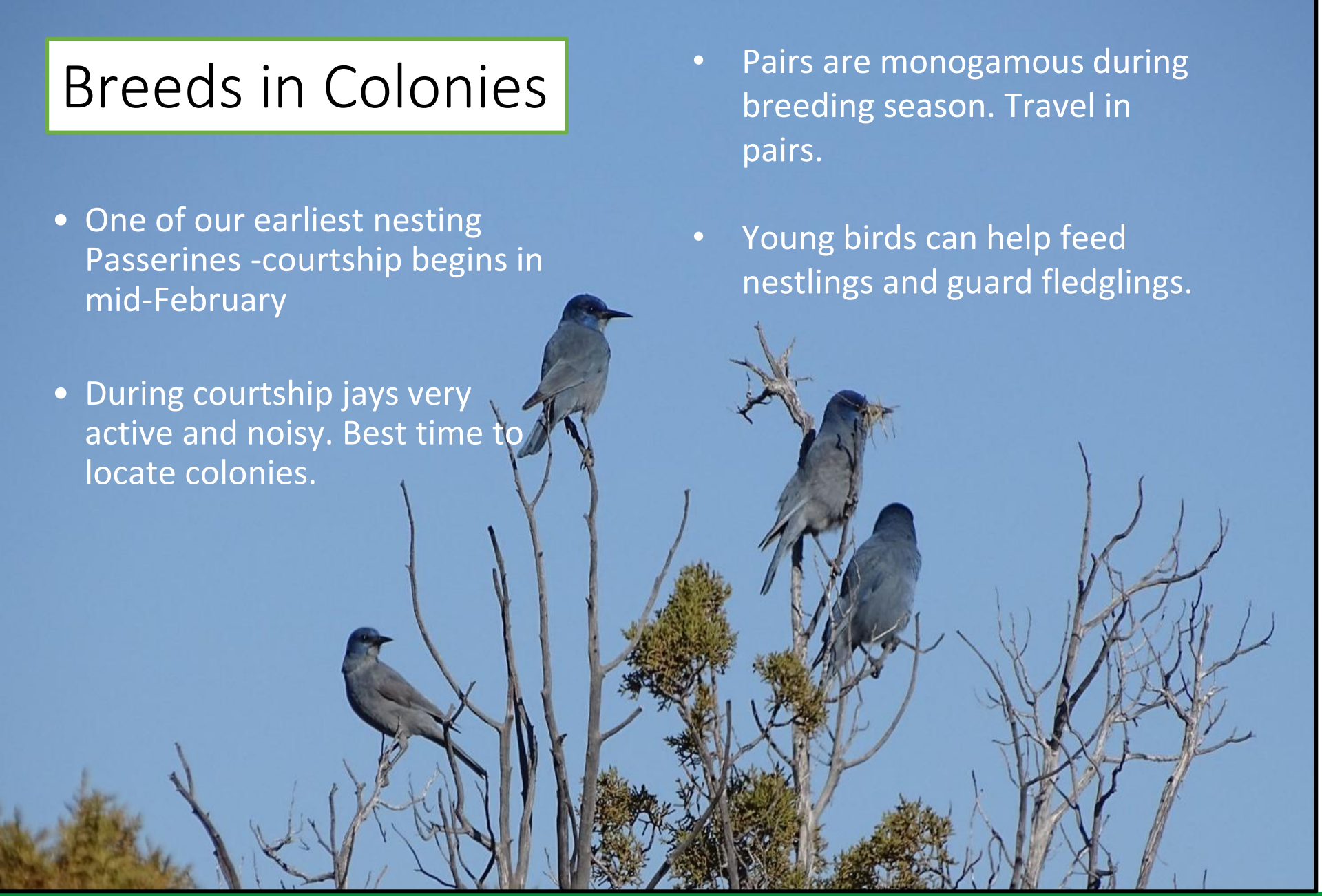
- In open sites such as grasslands, burned areas, shrublands, and sagebrush parks
- In micro habitats favorable for germination
- Can help regenerate woodlands impacted by drought, fire, insects, or clearing

Pinyon Jay Seasonal Behaviors



Breeds in Colonies

- One of our earliest nesting Passerines -courtship begins in mid-February
- During courtship jays very active and noisy. Best time to locate colonies.
- Pairs are monogamous during breeding season. Travel in pairs.
- Young birds can help feed nestlings and guard fledglings.



Breeding

- Both male and female build nest. Females line nest.
- # of eggs laid varies 2-5 depending on food availability; most commonly 4
- In poor mast years jays may forego nesting but can be found in a colony area.

Breeding

- Male will be a silent guard over female as she lays eggs
- Male feeds female near nest during incubation
- Female incubates eggs for 17 days
- Female broods for 8-10 days after which both male and female feed nestlings

Breeding

- Nestlings fledge around 22-24 days.
- Fledglings are accompanied by parents and yearlings – can make a very raucous group!
- Soon after fledging, family groups leave the colony area into the surrounding habitat

Importance of Identifying Colonies

PIJAs have high site fidelity to colony areas

- Important to map colonies to conserve, protect, and manage

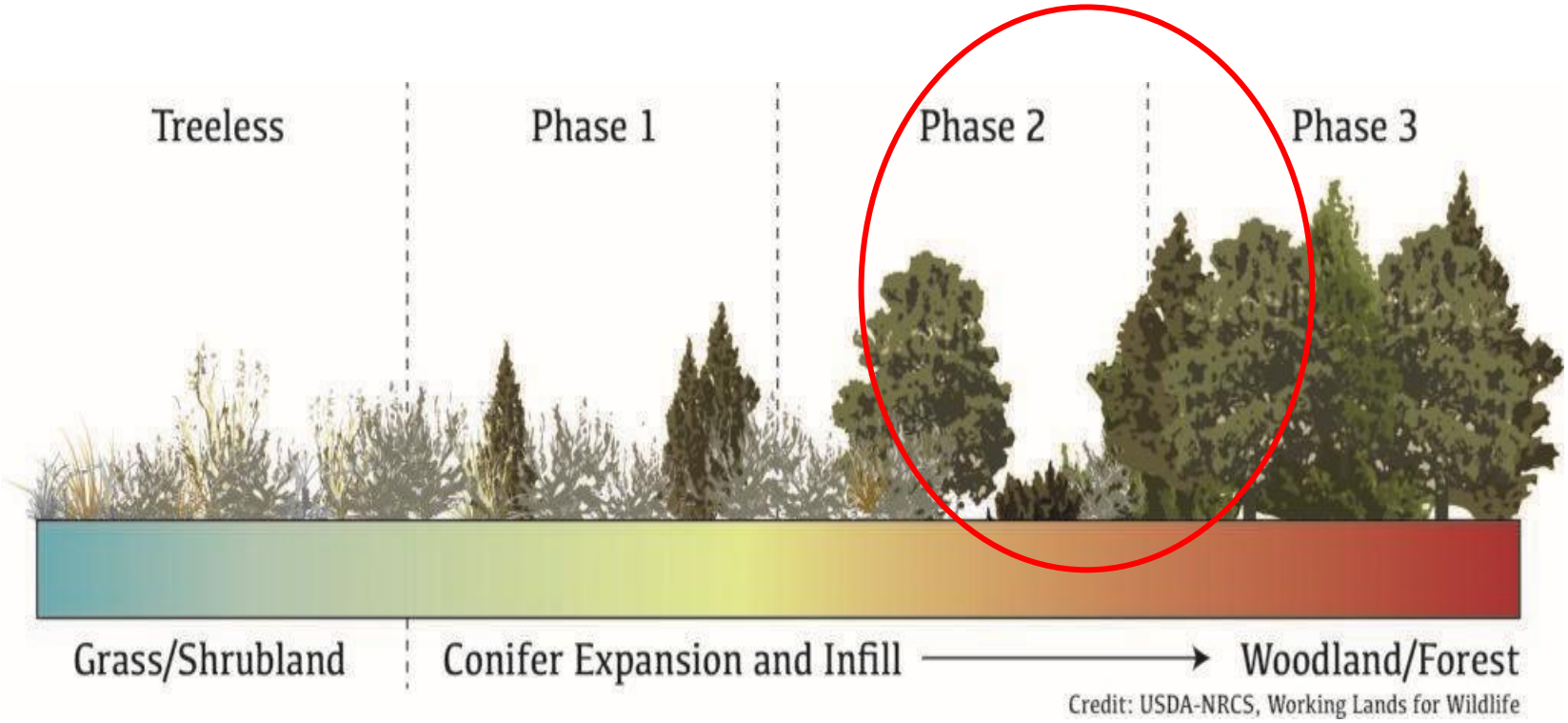
Recent Findings from New Mexico (Johnson et al. 2018)

- Reduction of tree density, canopy cover, and patch size in treated areas appeared to reduced habitat quality and resulted in pinyon jays avoiding nesting in treated areas.

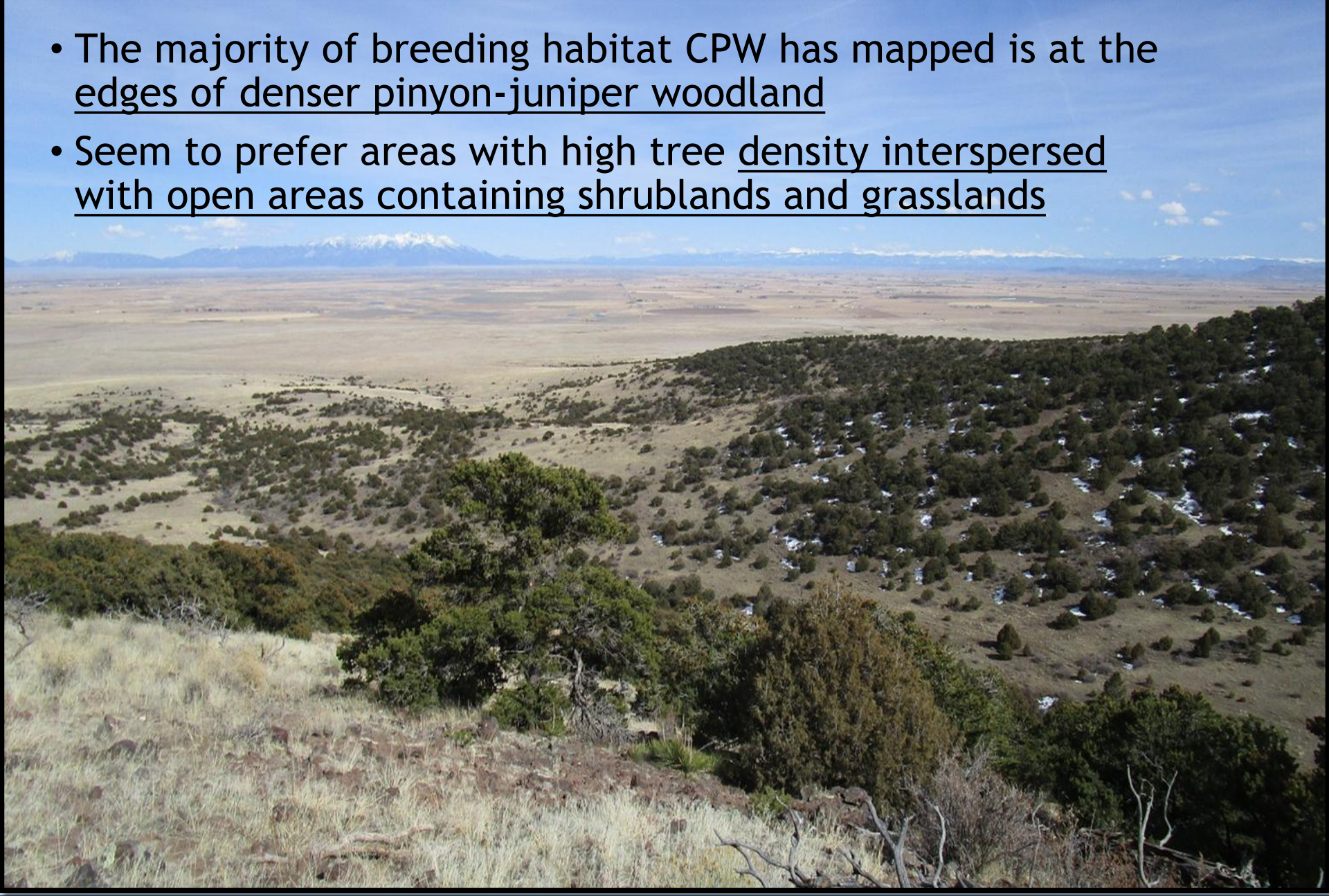
- Pinyon jays did nest near treatment polygons suggesting they avoided treated areas but do prefer to stay in traditional colonies if suitable habitat remains

- The increase in fragmentation and reduction of patch size exacerbated the edge effect possibly increasing risk of predation on nests

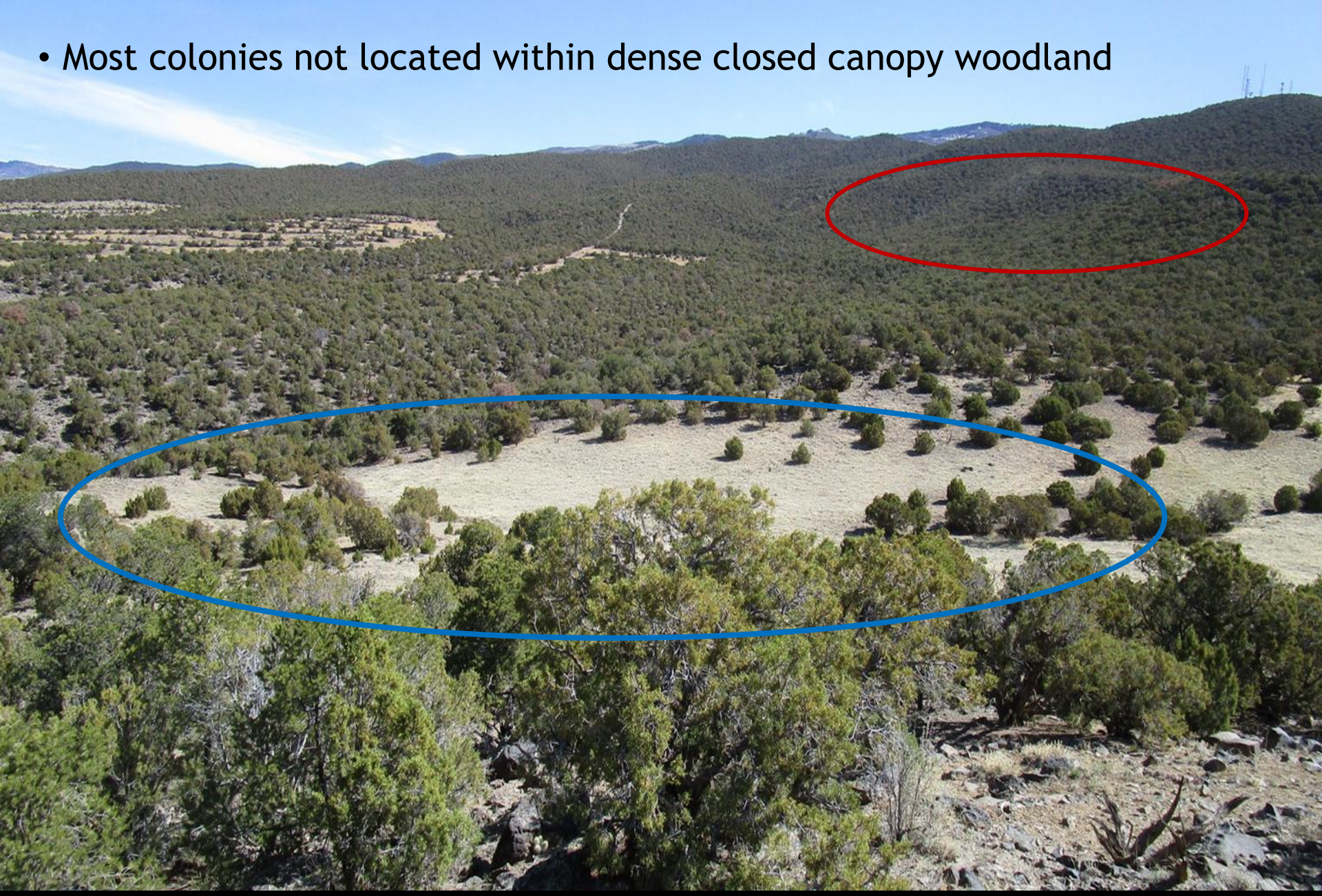
Where We Find Pinyon Jay Colonies



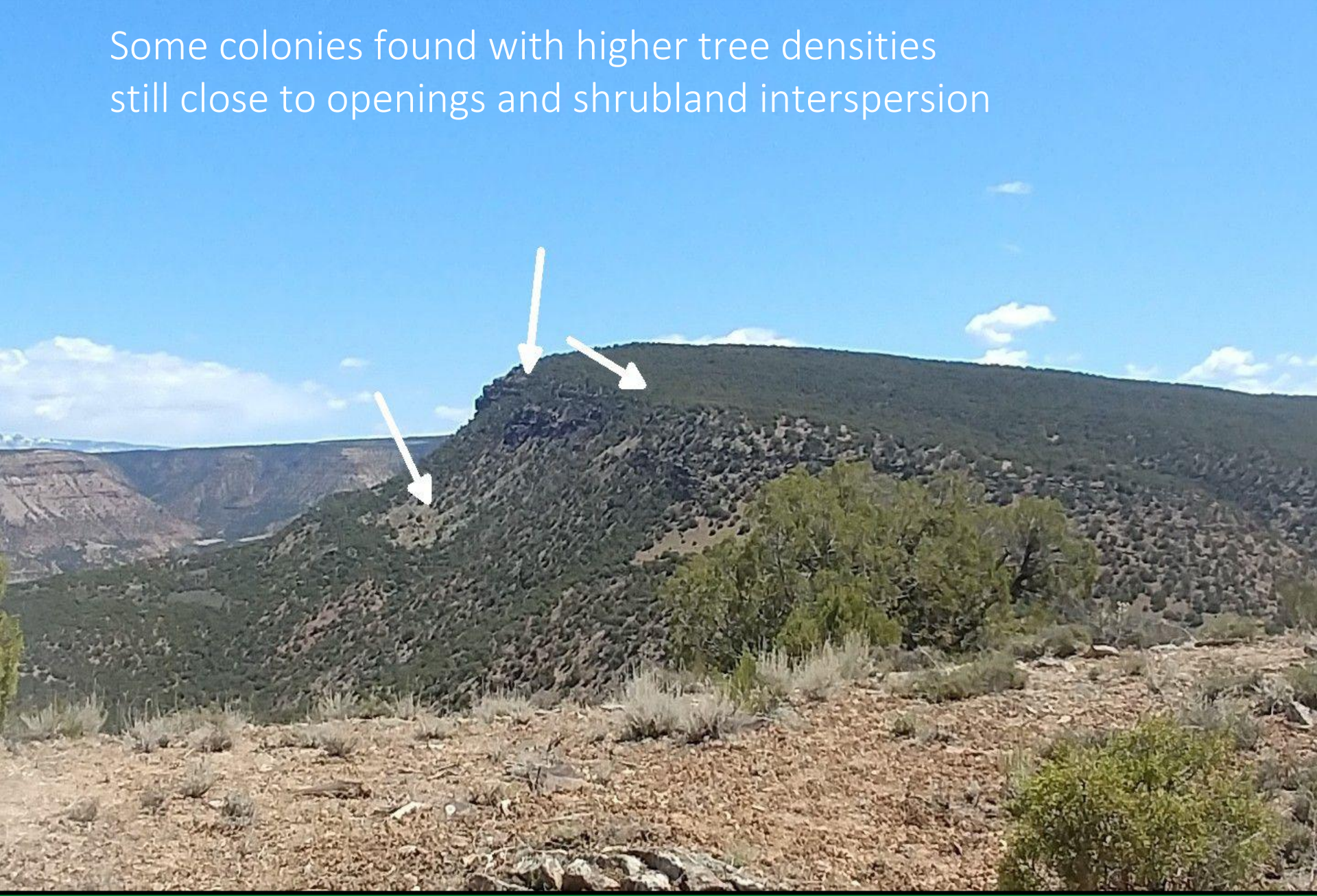
- The majority of breeding habitat CPW has mapped is at the edges of denser pinyon-juniper woodland
- Seem to prefer areas with high tree density interspersed with open areas containing shrublands and grasslands



- Most colonies not located within dense closed canopy woodland



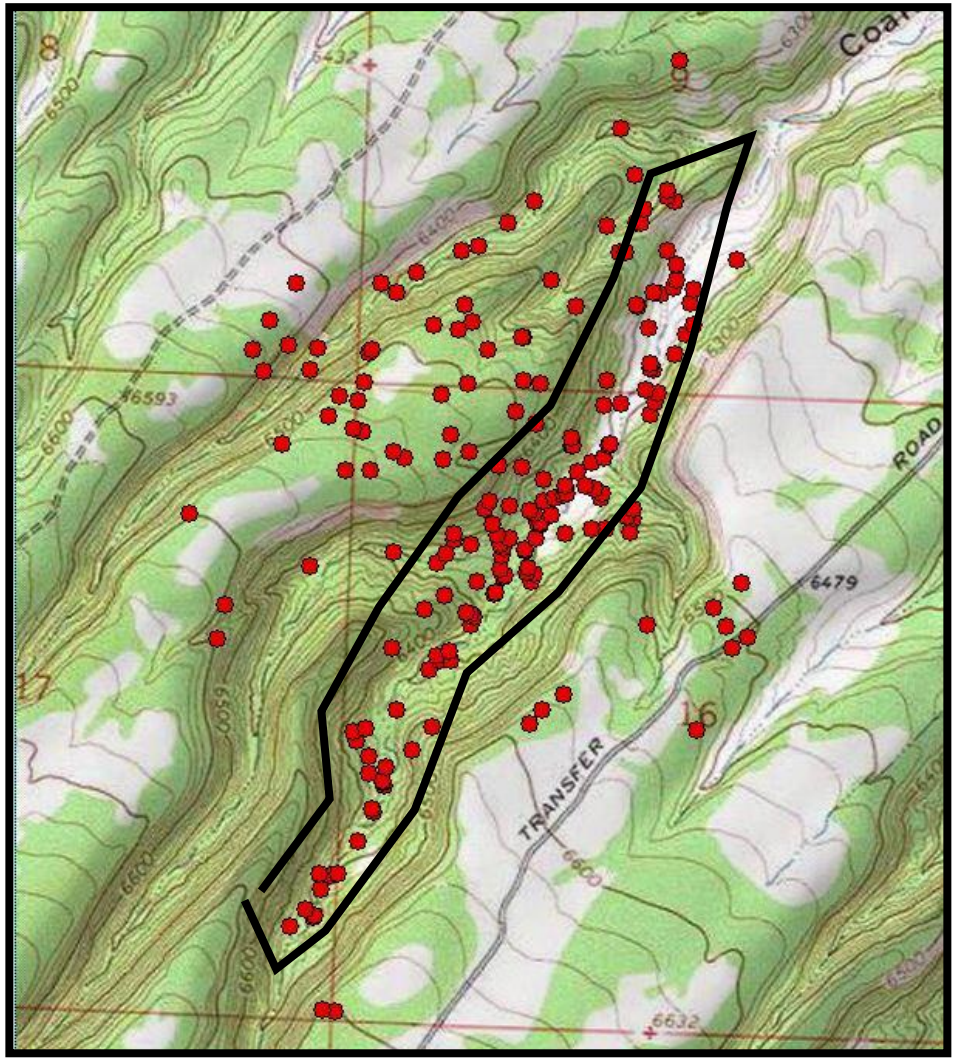
Some colonies found with higher tree densities still close to openings and shrubland interspersion

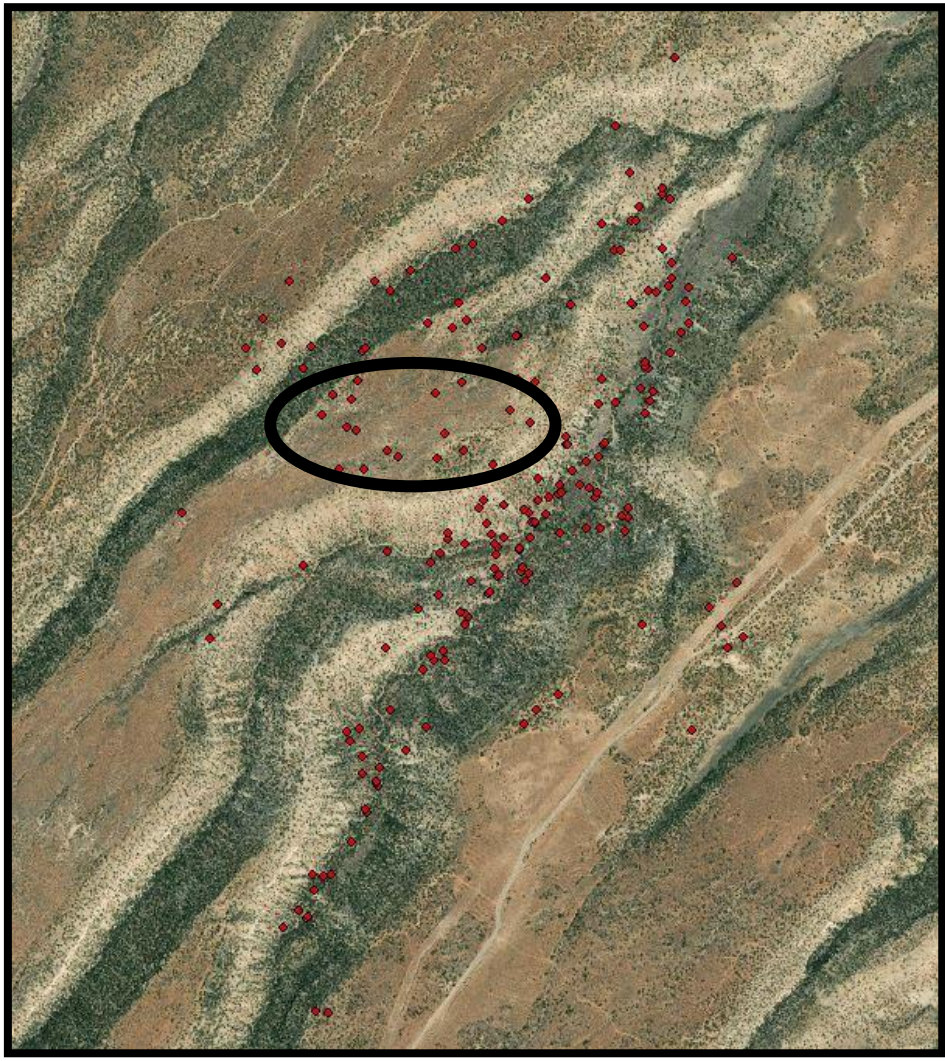


Breeding Habitat
Sample Colony Sites

Transfer Road, Montrose County

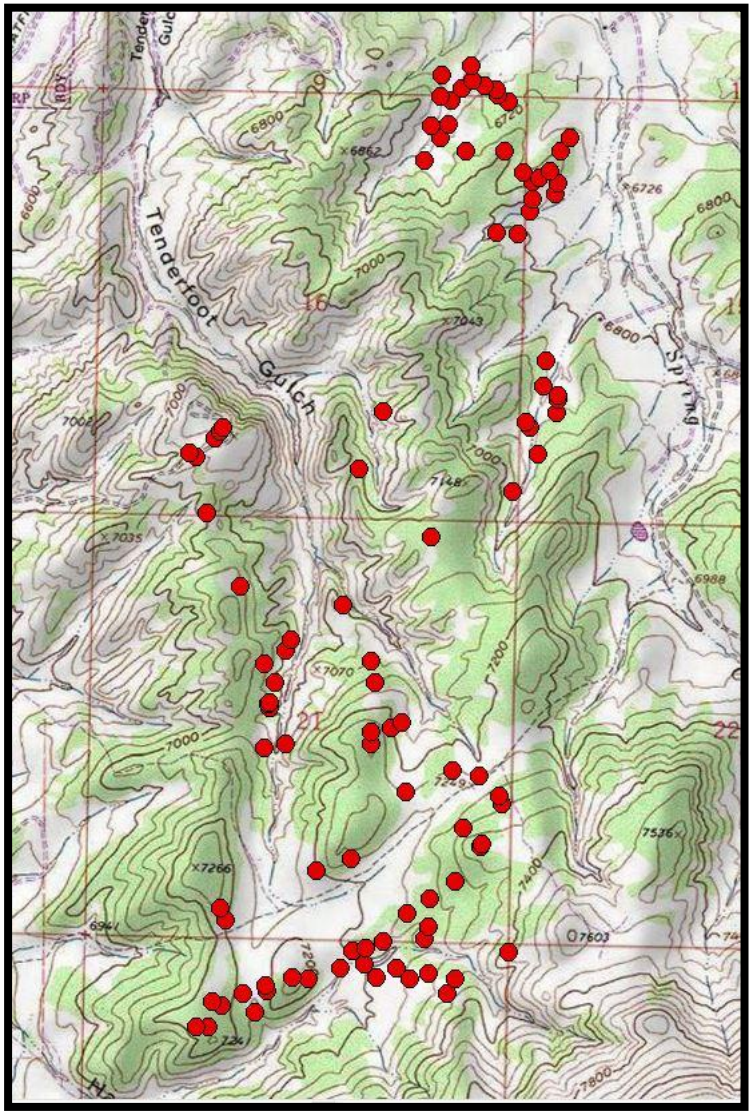
Transfer Road, Montrose County

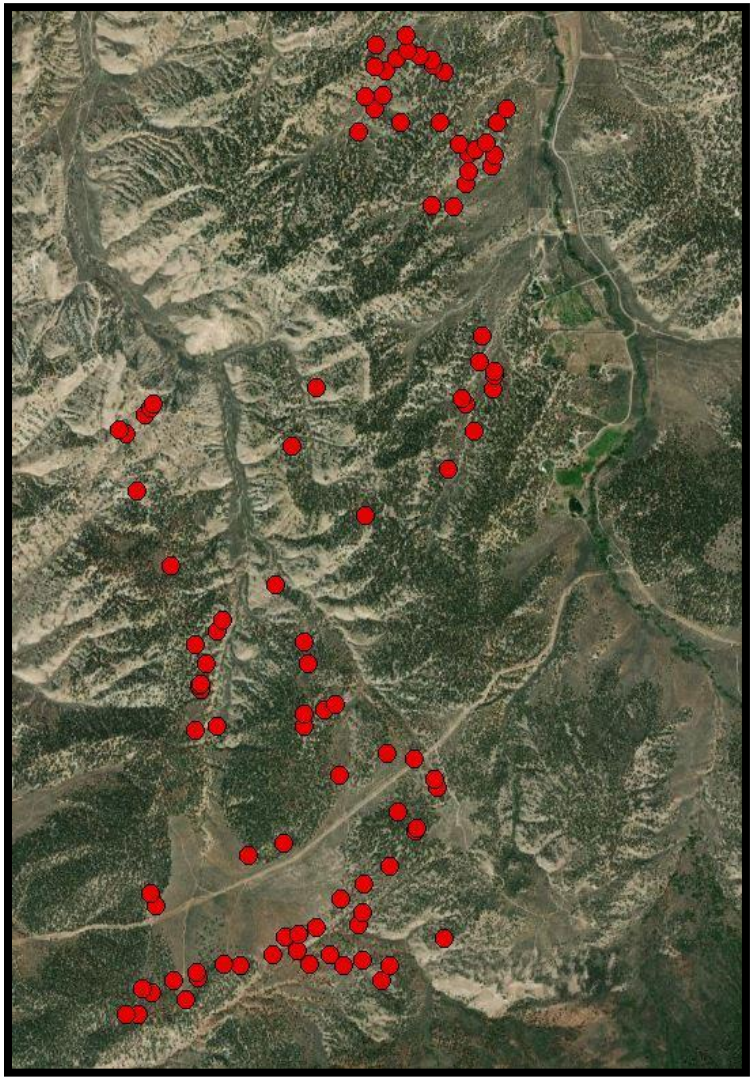




Gypsum, Eagle County

Gypsum, Eagle County





Meeker, Rio Blanco County

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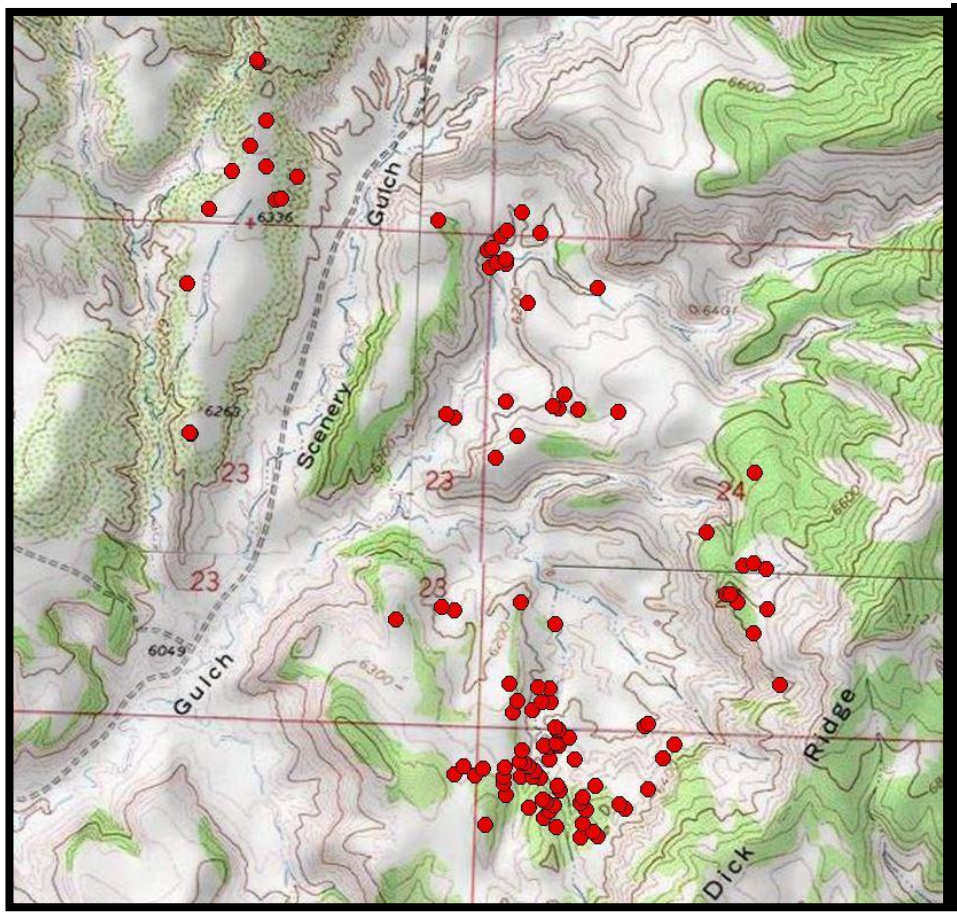

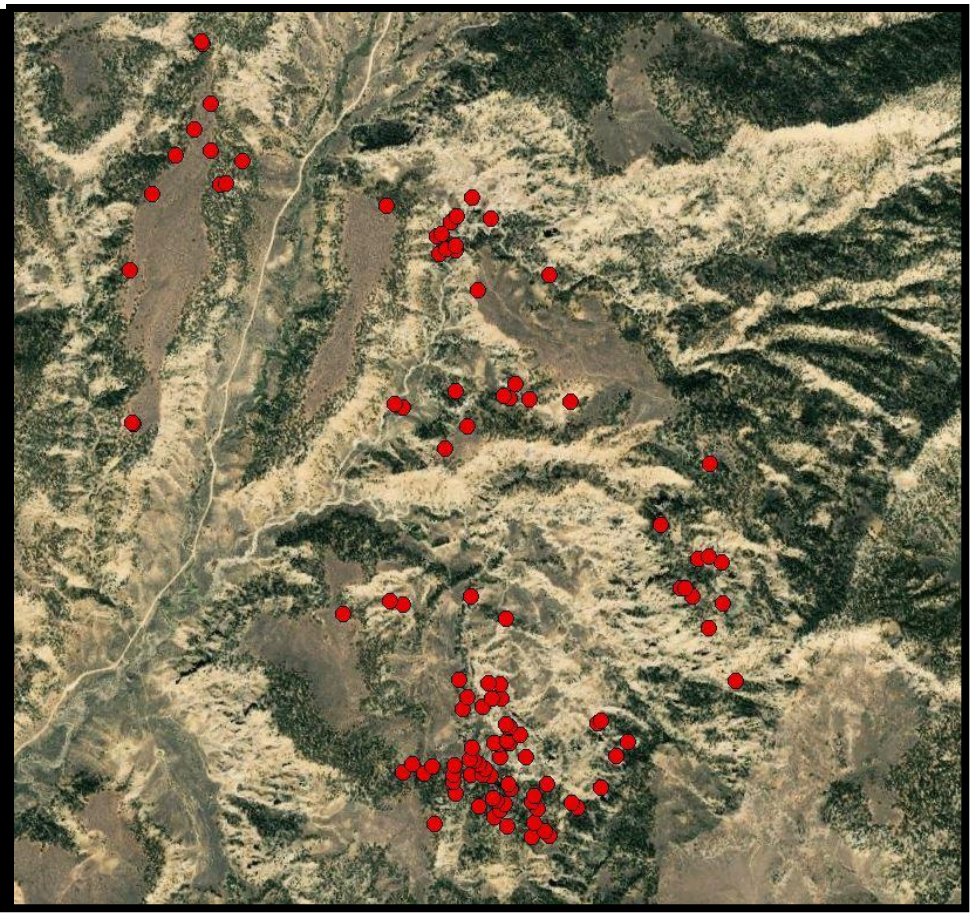

Glade Park, Mesa County

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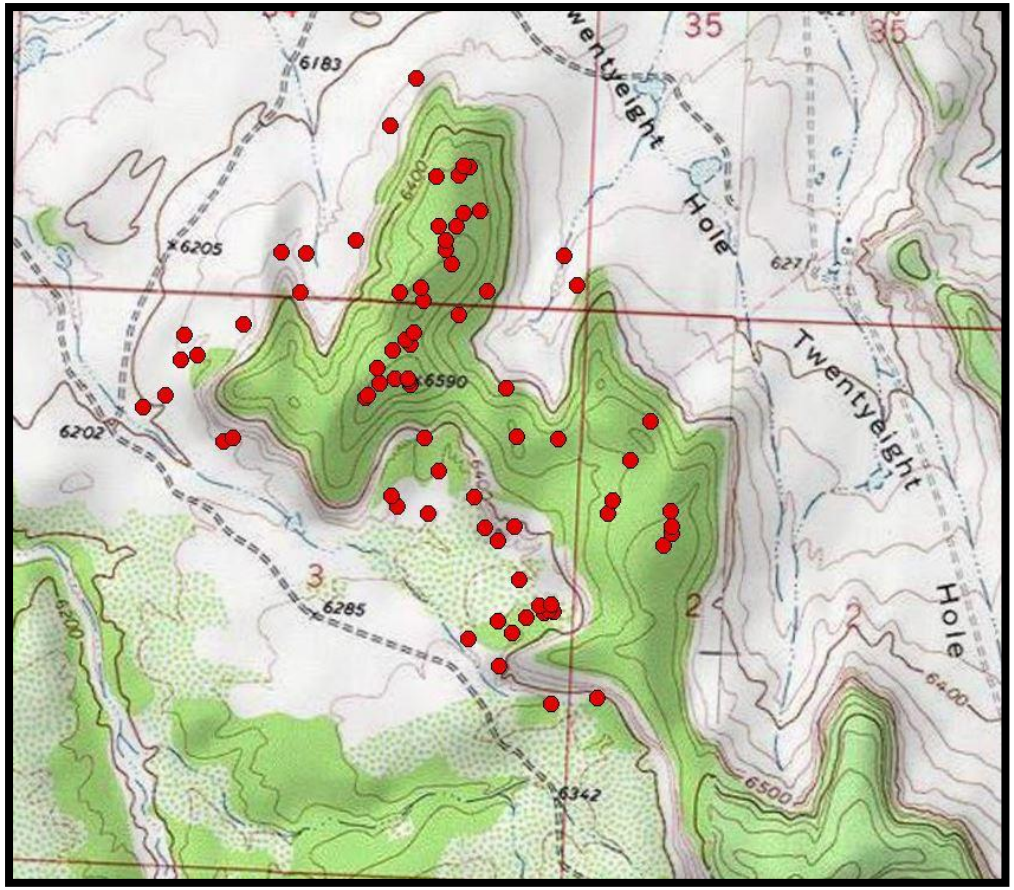
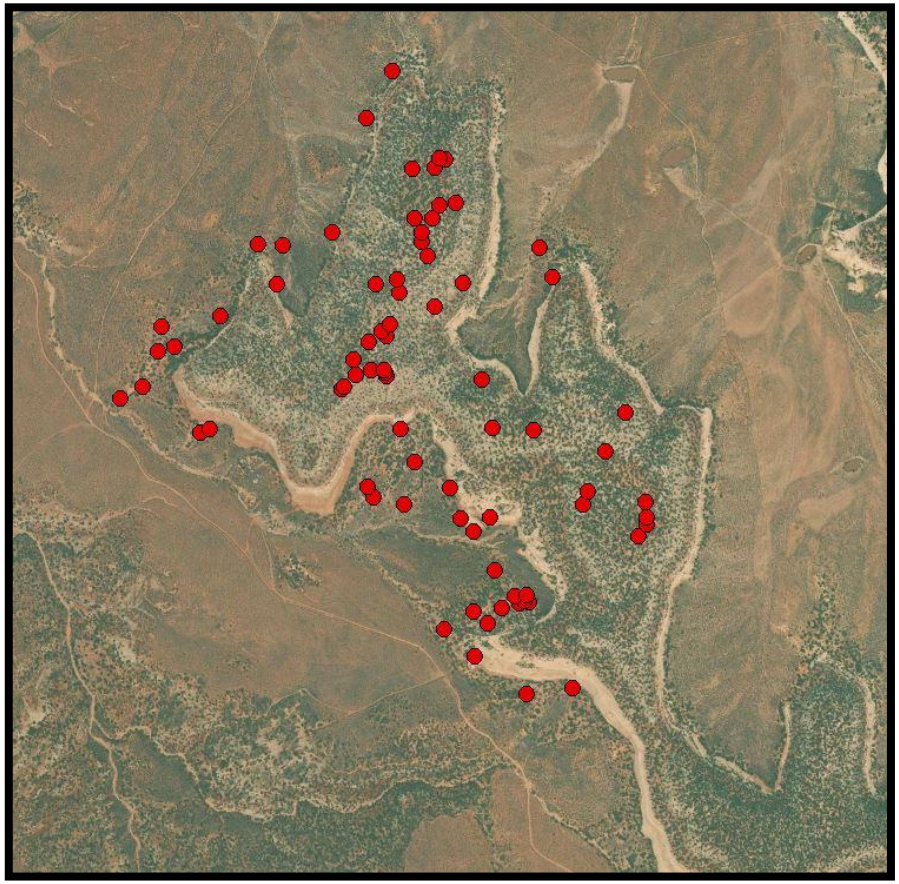




San Luis Valley, Rio Grande County

Colony-Site Suitability Model

Collaboration between CPW, BLM, and South Dakota State University

Model is provided in raster and vector formats to

Provides guidance on where surveys are needed if treatment polygon falls in **High Priority** habitats

Model Informed by Colonies

- Colony Site Definition

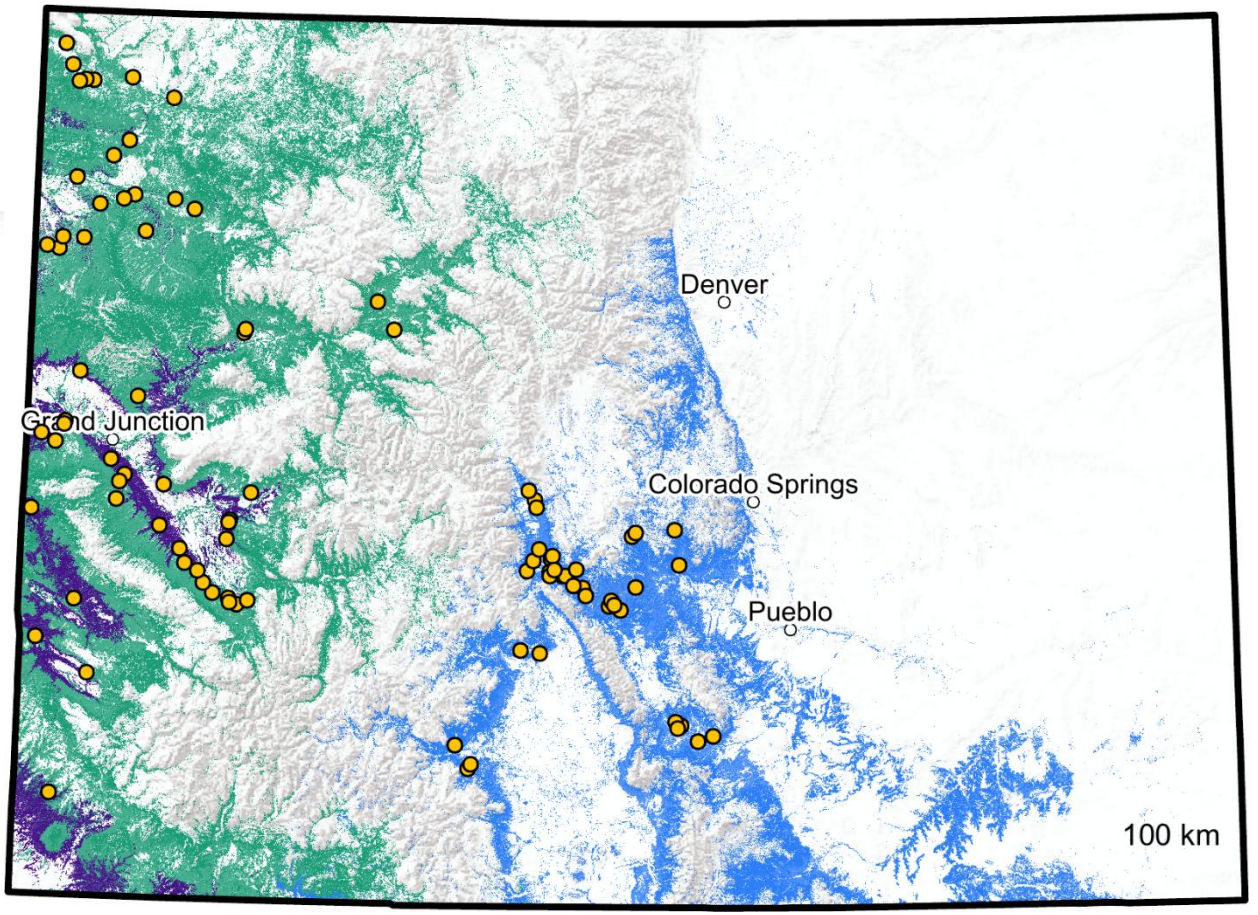
  (for model)

  - Cluster of active nests within a given year

- 1-26 active nests per colony site

- Colony sites identified across Colorado: 2019–2024

  108 colony sites



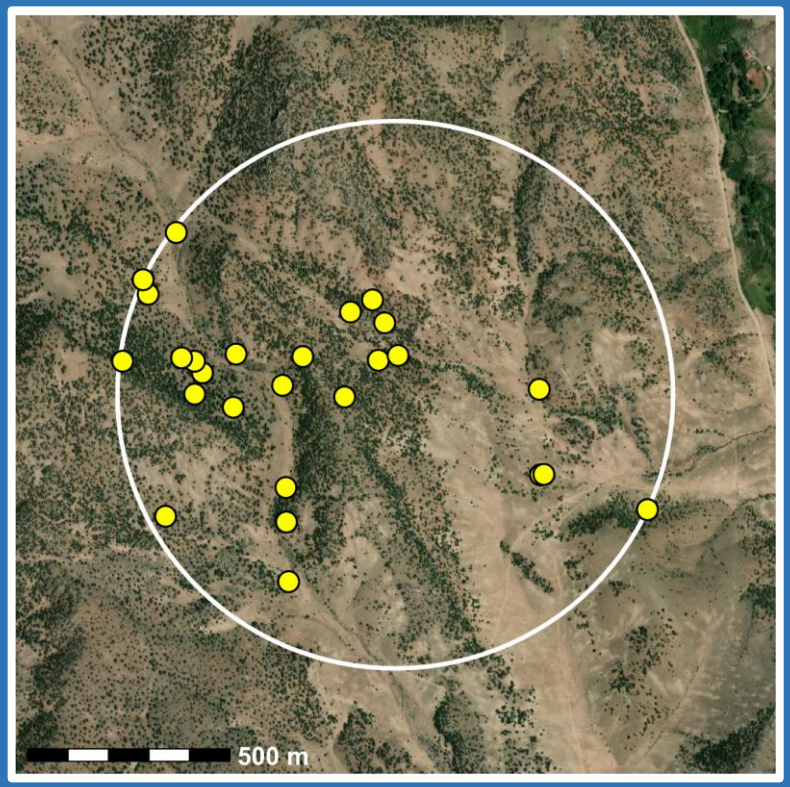
Defining Colony-Site Scale

- 22 colonies intensively studied in 2020-2021
- Minimum bound circle around nests of each colony site
  - Selected median circle
- Colony-site scale:

  656 m radius (1.3 km diameter)
- Spatial rarefaction:

  90 colony-site buffers

  90 background buffers



Model Design

- Random Forest Models
  Breiman et al., 2024
- Cross Validation
  Valavi et al., 2019
  - 5 spatial blocked k-folds
- Variable Selection
  Genuer et al., 2015
  - 17 variables considered
  - 6 variables objectively selected to inform model

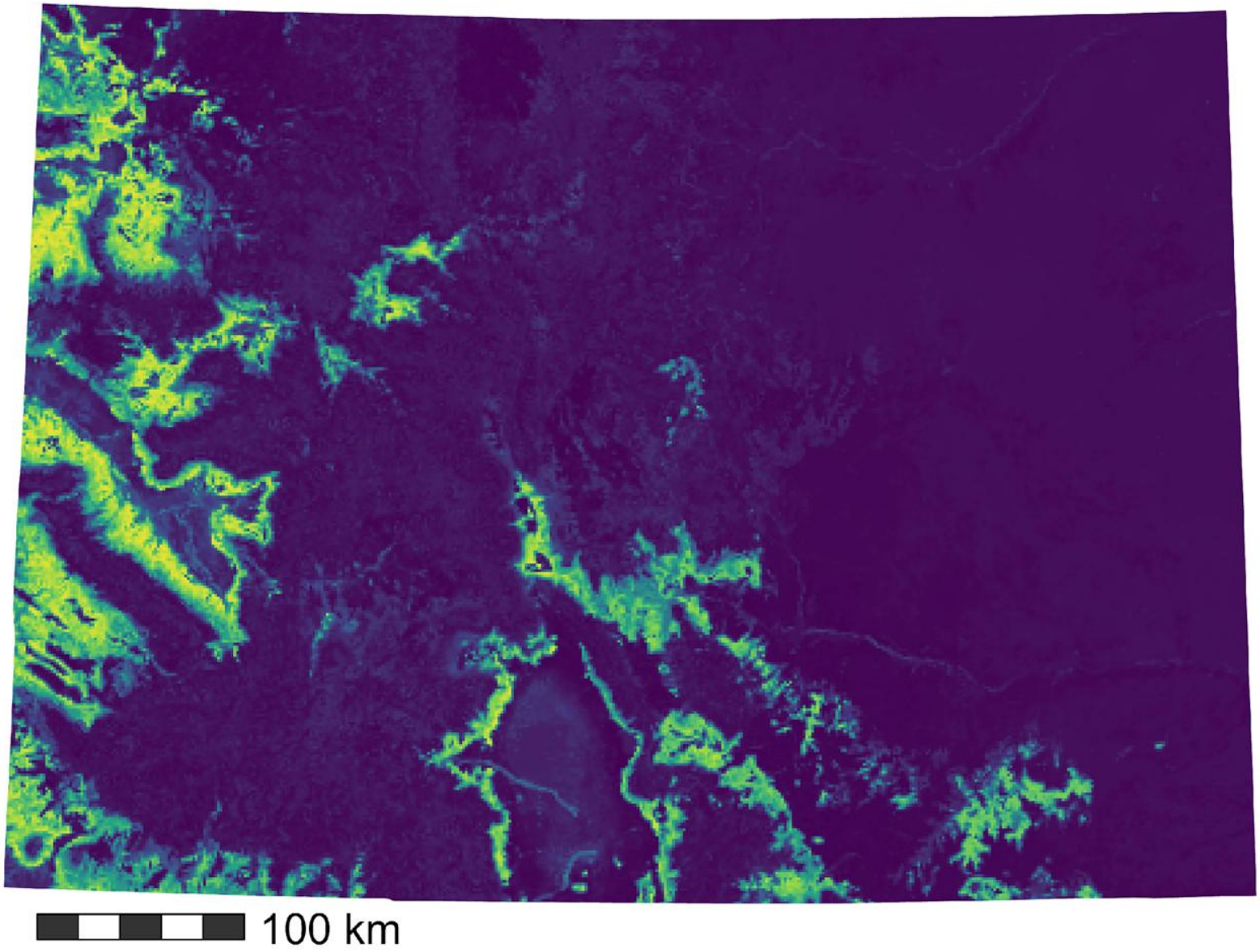
Model Results

Accuracy	Kappa	Sensitivity	Specificity
88.33%	**0.77**	**0.91**	**0.85**

- Accuracy: 88% of colony-sites and background locations correctly classified by model
- Kappa: .077

< 0	0.21 – 0.40	0.41 – 0.60	0.61 – 0.80	0.81 – 1.00
Less than chance agreement	Fair agreement	Moderate agreement	**Substantial agreement**	Almost perfect agreement

- Sensitivity
  - True Positive Rate: 91% of colony sites correctly classified by the model
- Specificity
  - True Negative Rate: 85% of background locations correctly classified by the model



Suitability Model - Raster

Suitability Threshold

- maxSSS criterion
  Liu et al., 2019

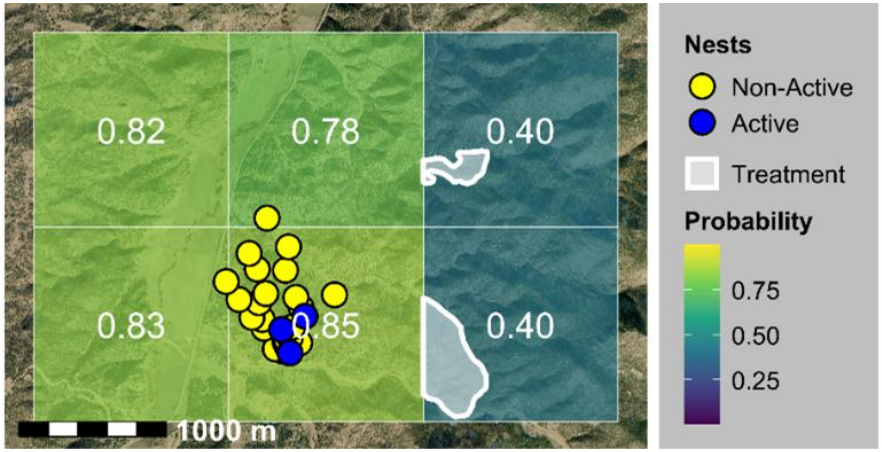
  Maximizes the sensitivity and specificity

Accuracy	Kappa	Sensitivity	Specificity
88.33%	0.77	0.91	0.85

Threshold = 0.41 (41% probability of suitability)

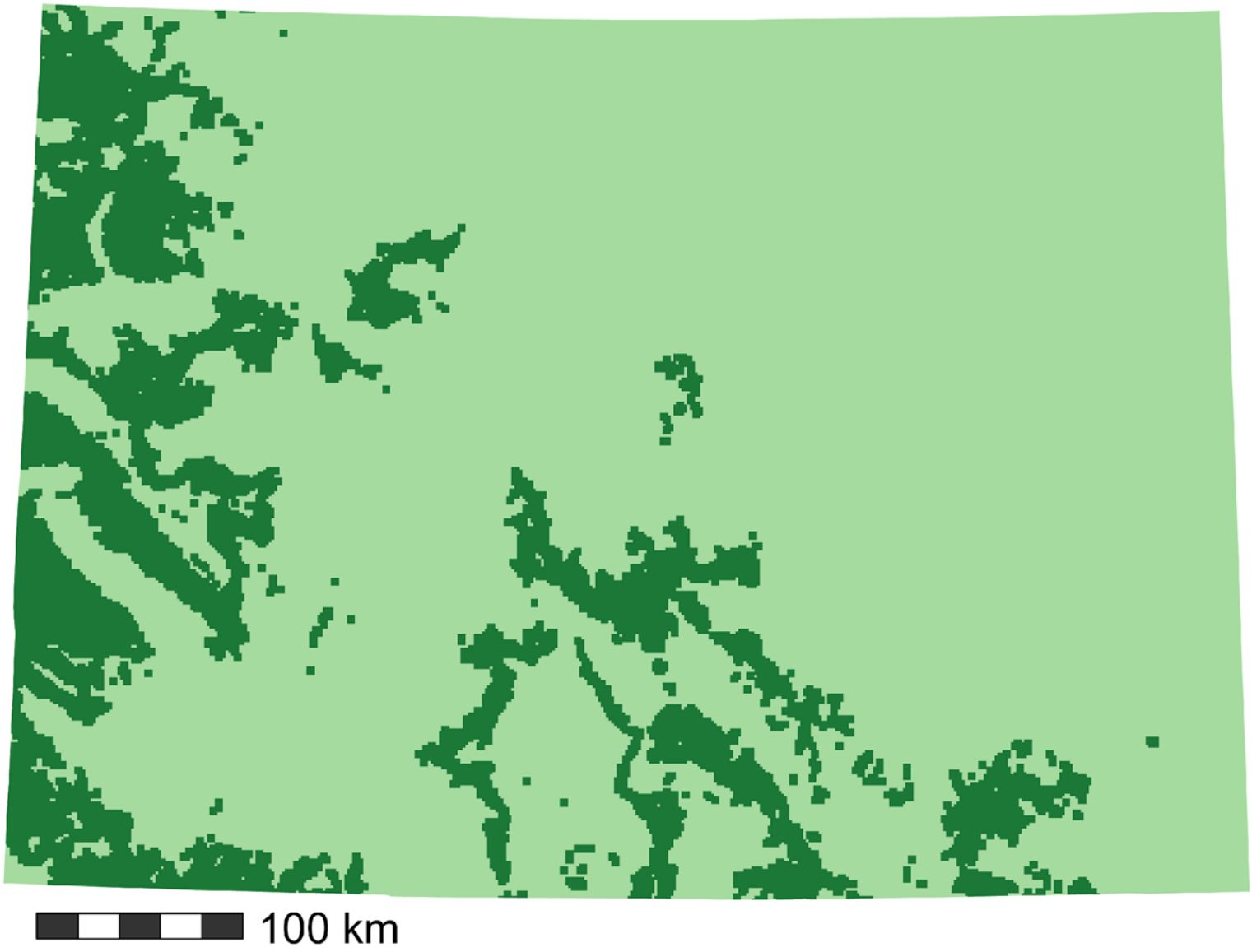
High suitability colony-site habitat

Cell ≥ **0.41** value



Low suitability colony-site habitat

Cell < **0.41** value



Suitability Model - Vector

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 vector **high priority** area
- No past evidence of breeding
- Lacking other evidence of suitable breeding habitat

- No timing limitations
- No pre-treatment surveys required, but encouraged in pinyon or juniper is present

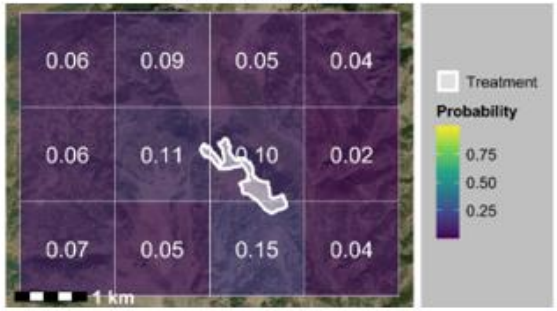
High Priority Areas:

- Intersects raster cell(s) ≥ **0.41** or **is adjacent** to any cells ≥ **0.41**
- Intersects with a vector **high priority** area
- Intersects or is adjacent to raster cells or high priority vector areas with known colonies/nests determined from overlaying treatments on the colony/nest shapefile provided by CPW
- Identified to have breeding or evidence of suitable breeding habitat

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 3 pre-treatment surveys the spring prior to implementation following the CPW survey protocol to determine breeding activity
   - If no breeding activity is detected, timing limitations can be lifted

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

Example Scenario



Example Scenario

LIVE LIFE OUTSIDE

Decision

If in High Priority Area
CPW Survey Protocol

Point Counts:

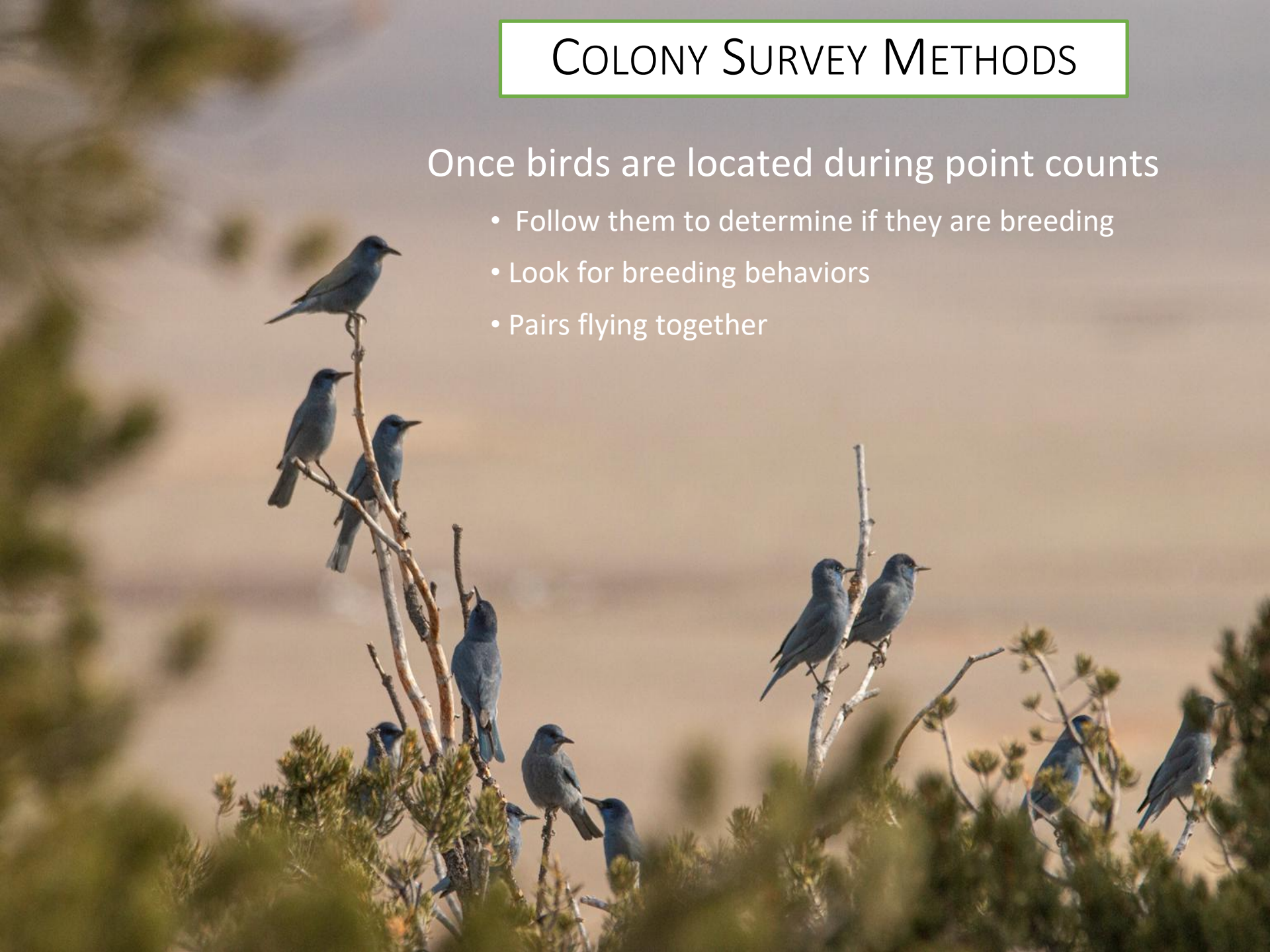
Provides a structured method to locate PIJAs

- Repeatable
- Non-biased
- Requires surveyors to stop and listen

Point Count Structure

- Start at sunrise to 30 minutes after
- 6-minute point count
- Data collection
  - Survey-level data
    - Date, wind, temp., cloud cover, precip.
    - Do not do surveys after significant snow fall, high winds, heavy rain
  - Sighting-level data
    - # of birds observed
    - Method of observation (visual/aural)
    - Behaviors observed

Colony Survey Methods



Once birds are located during point counts

- Follow them to determine if they are breeding
- Look for breeding behaviors
- Pairs flying together

Breeding Behaviors

Pair Flying Together (PF) – If you observe a pair of birds separate from a flock and fly off together, you should try and follow them to observe courtship behavior or nest building.

Mobbing (MB) – If you are at the edge or in the colony and a group of birds surrounds you (or another potential predator) and starts to make raucous warning calls, this is called mobbing. You should try to vacate to a more distant location if this happens. Helpers can be very ready to mob a potential intruder early in the breeding season and when young are fledging.

Display Flights (DF). A small group of individuals fly rapidly through and above trees, emitting loud *Krawks* as they perform steep dives and sharp turns. These flights contain yearlings and adult jays and always seem to contain one or more leaders and a group of followers. Upon landing, individuals continue to chase each other up and down through the tree branches in sharp spiral patterns before initiating another flight.

Food Transfer (FT). This involves one bird holding a piece of food, offering it to its mate and the mate accepting it. This is usually a silent exchange, and you generally observe a pair off by themselves doing this courtship behavior.

Silent Sitting (SS). Pairs leave the foraging flock and fly to a perch, where they sit silently next to one another. While sitting near one another they may alternate raising their bill upwards displaying their white-throat bib.

Stick Manipulation (SM). A male picks up a stick, a twig, or tuft of grass and if the female does not respond, he drops the material. As courtship proceeds, stick manipulation increases in frequency and becomes suggestive of nest-building. You can hear pairs in trees making soft vocalization as they begin to select a nest tree to initiate nest building.

Nest Building (NB). Once a pair has selected a tree for nesting, they get to work. They both make numerous flights back and forth to collect sticks placing them in the nest tree. This is a great time to locate a nest from a distance because they make straight flights in and out of the nest tree.

Carrying Nest Lining (CNL) – Birds will collect fine, fluffy materials in their bill to line a nest. This indicates the nest is almost complete. It normally takes 5-7 days to complete a nest and for the female to start laying a clutch.

Courtship Begging (BG). Females crouch before their males with their heads slightly extended, open bills pointed slightly upward, with wings flapping or fluttering. The begging calls can be very insistent and loud. Females can be seen flying after males as they continue to beg. Female begging will sound the same as nestling and fledgling begging, but in the early season you can assume it is most likely a female begging to her mate.

Copulation (CP). Rarely seen. The birds stay low in the tree, and you can hear a variety of low vocalizations prior to copulation.

Understanding Colony Extent

- Colonies should be surveyed a minimum of 2x times throughout breeding season focusing on:

- Early-season surveys
  - Document courtship behaviors
  - Locate pairs building nests

- Mid-season surveys
  - Look for males feeding females
  - Pairs feeding nestlings

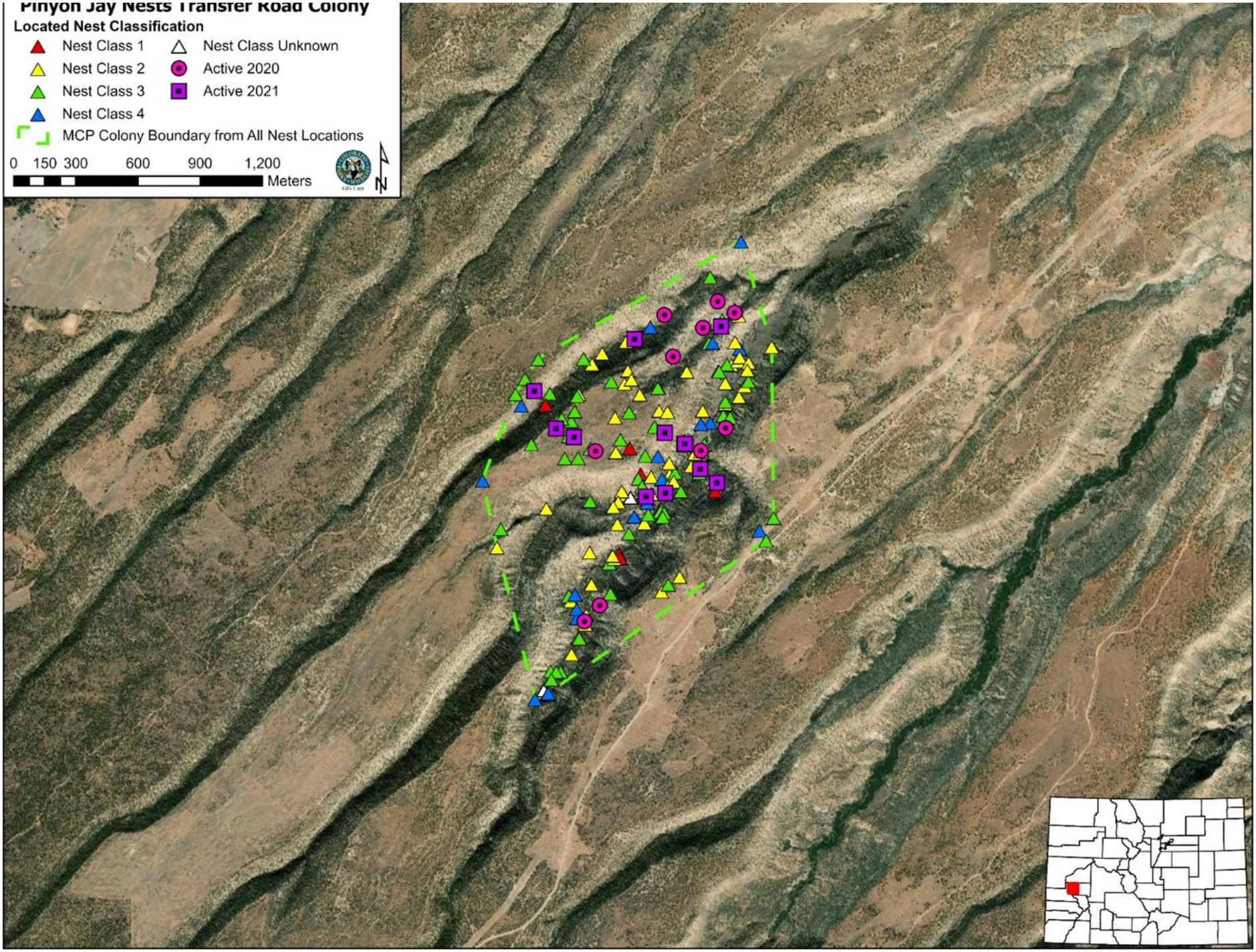
- Late-season surveys
  - Look for young sentinel jays
  - Freshly fledged young sulk low in trees
  - Late or re-nesters

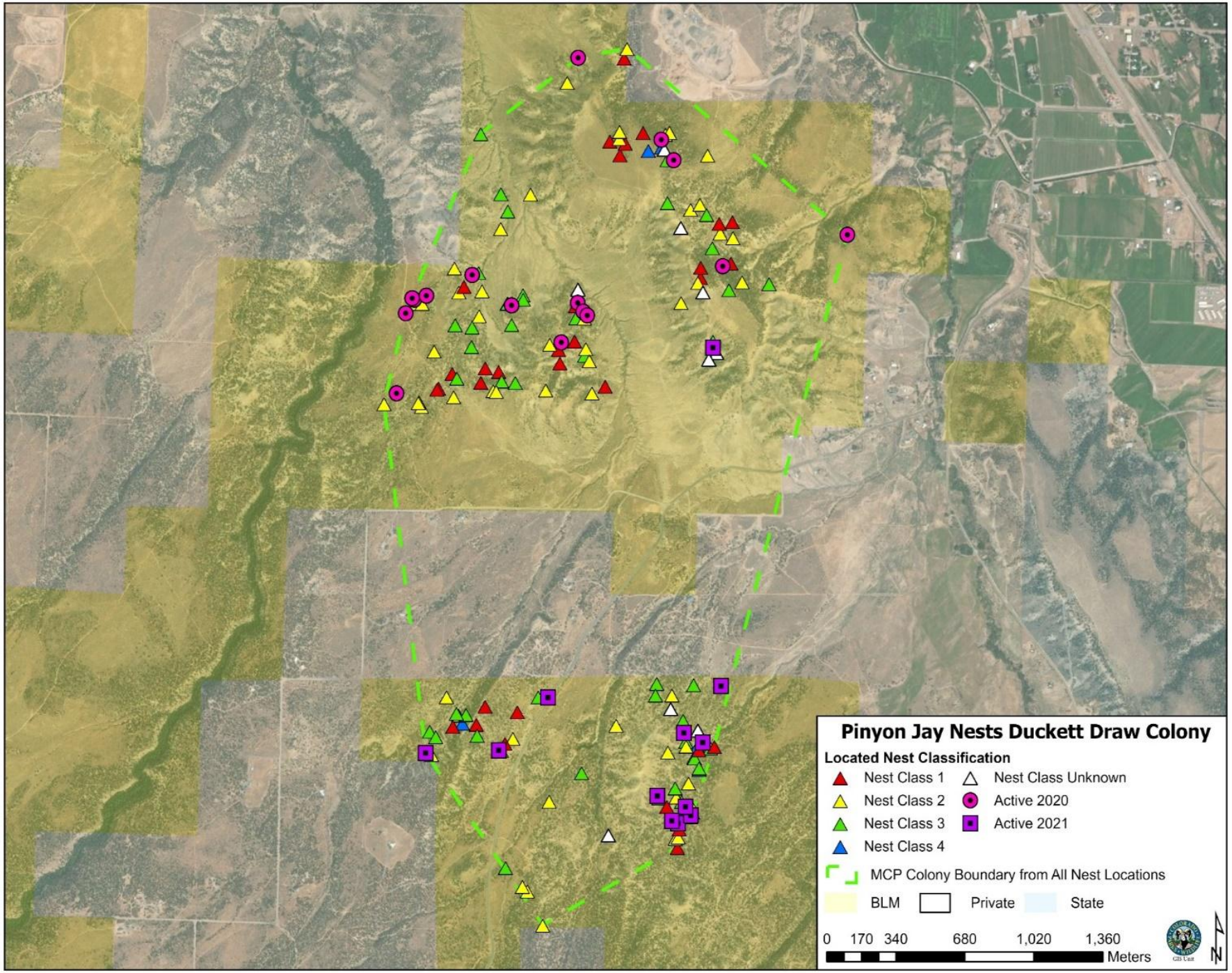
Early-Season Surveys

- Arrive 30 minutes before sunrise to setup observation point above colony (e.g., ridgeline) or point near the colony where birds can be observed, but little disturbance occurs.
- Watch and document breeding behaviors and vocalizations
- Document breeding behaviors/nest building from a safe distance.
- Do not walk in the colony looking for nests. Early season can cause jays to abandon nests.

Mid- to Late-Season Surveys

- Once breeding behavior activity declines and birds are predominantly incubating, observations of feeding bouts will be done from a safe distance to assess number of pairs and nest locations.
- Nest searches can occur when PIJAs are not in the colony area.
- **NEVER** actively move a female off of a nest or visit a nest if potential predators are noted in the area.


Pinyon Jay Nests Transfer Road Colony
Located Nest Classification
Nest Class 1
Nest Class 2
Nest Class 3
Nest Class 4
Nest Class Unknown
Active 2020
Active 2021
MCP Colony Boundary from All Nest Locations
0 150 300 600 900 1,200
Meters
N


Pinyon Jay Nests Duckett Draw Colony
Located Nest Classification
Nest Class 1
Nest Class 2
Nest Class 3
Nest Class 4
Nest Class Unknown
Active 2020
Active 2021
MCP Colony Boundary from All Nest Locations
BLM
Private
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Meters
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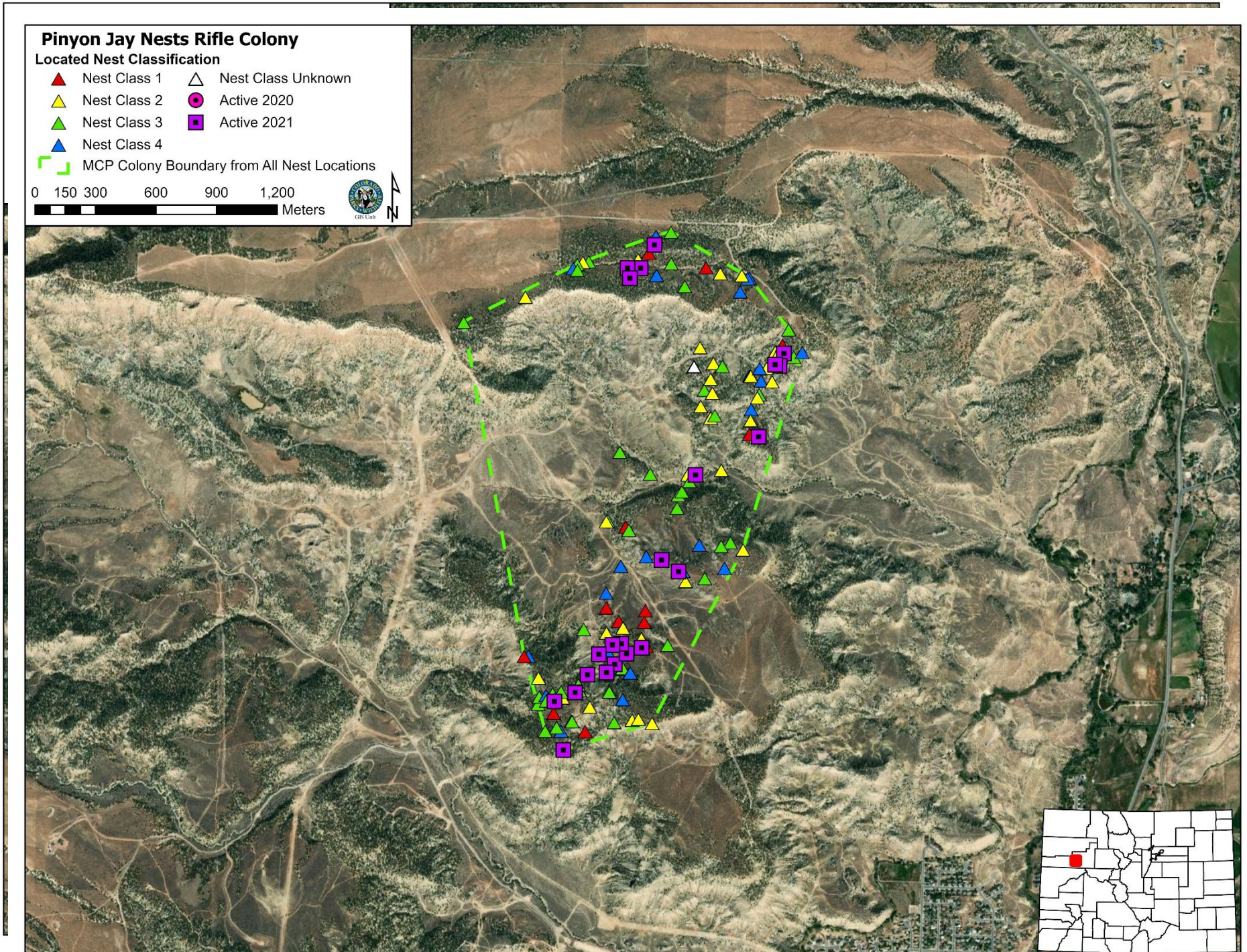

Pinyon Jay Nests Rifle Colony
Located Nest Classification
Nest Class 1
Nest Class 2
Nest Class 3
Nest Class 4
Nest Class Unknown
Active 2020
Active 2021
MCP Colony Boundary from All Nest Locations
0 150 300 600 900 1,200
Meters
N

Fledglings

- Soon after fledging, family groups leave the colony area and disperse into the surrounding habitat.

- Unless fledglings are located near a nest tree, presence will not be recorded as being in a colony area.

Classifying Nests

- **Active -** observer pairs building, female incubating, nestlings in nest.
- **Class 1** – Recently active nest - clearly defined cup, large stick volume, and little debris in nest.
- **Class 2** – An older nest - still has large stick volume and vertical structure, but nest cup full of debris.
- **Class 3** – Dilapidated nest - sticks beginning to fall out of tree, lining of nest cup is absent.
- **Class 4** – A nest that is not a true nesting attempt.

Class 1 Nests

Class 2 Nests

Class 3 Nest

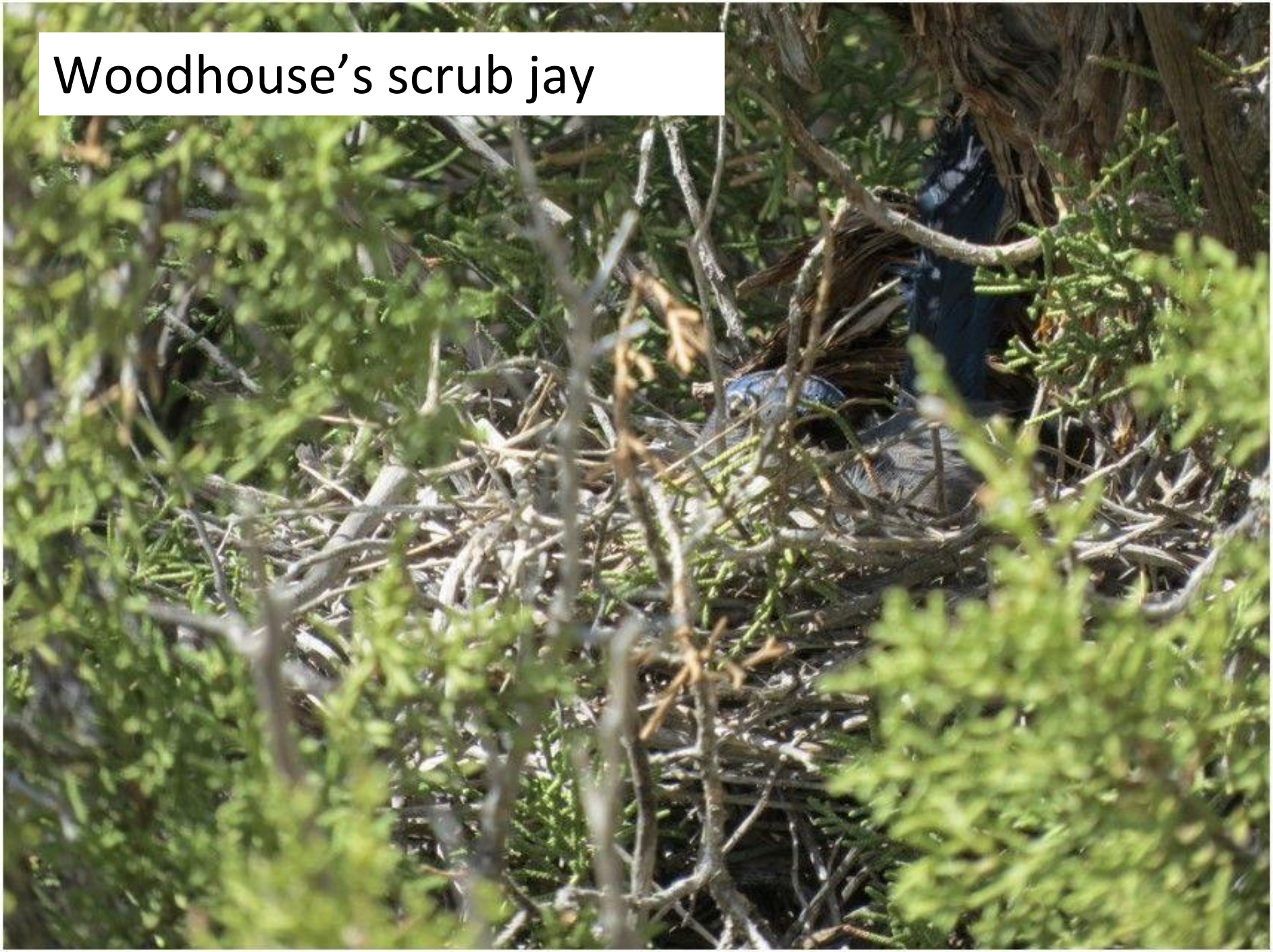
Class 4 Nest

Know your species

Woodhouse's scrub jay

Pinyon Jay


Pinyon Jay


Woodhouse’s scrub jay


Clark’s nutcracker

Data Recorded at Nests:
Tree Species, Nest height, Tree height

Example of Nest Trees – Short Young Trees

Young Healthy Trees

Mature Old Trees

Things to Consider

- Patience is key to finding colonies.
- PIJA are extremely vigilant and have sentinels – surveyors must be quiet and sneaky.
- PIJA do have patterned breeding behaviors. These behaviors occur normally within colony boundaries.

Importance of Protecting Breeding Areas

- Pinyon Jays have high site fidelity to breeding sites – use them for decades
- It is the one time of year birds are somewhat predictable in their habitat use
- Maintaining good reproductive output is crucial for species survival
- Birds will forgo breeding if food and nesting resources are limited
- We currently have a poor understanding of the species use of habitats as well as a poor understanding on how to mange PJ habitats. THIS IS THE ONE SEASONL AREA WE HAVE THE CAPACITY TO PROTECT!!!!