

**Interim Report**  
**New Mexico Department of Game and Fish, Share with Wildlife Program**

**Year 1**

**June 26, 2025**

**Project Title:**

*Foraging habitat restoration and eDNA surveys for nectar bats on the Double E WMA*

*Bat Conservation International*

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**Project Need:**

The Mexican long-nosed bat (*Leptonycteris nivalis*; federally endangered, IUCN 'Endangered'), Lesser long-nosed bat (*Leptonycteris yerbabuenae*), and Mexican long-tongued bat (*Choeronycteris mexicana*) are identified as Species of Greatest Conservation Need (SGCN) in the New Mexico Department of Game and Fish (NMDGF) State Wildlife Action Plan (NMDGF, 2016). Each year, these bats follow a "nectar corridor" of blooming columnar cacti and agaves as they migrate from central Mexico to the southwestern United States (Cockrum, 1991). All three species co-occur in southwestern New Mexico, where they seasonally share common roosts and agave food sources (Bogan and Cryan, 2006). Increasingly, *L. yerbabuenae* is being observed in the Gila Region feeding on residential hummingbird feeders, with observations ranging from White Signal in 2010, to frequent observations in Silver City and Piños Altos, the Gila Cliff Valley, and as far north as Glenwood (Ramsey and Whiteman, 2011; Geluso and Geluso, 2021; Laws et al, 2023). Poor body condition is reported in *L. yerbabuenae* captured late in the season that appear to be relying solely on hummingbird feeders for food (M. Davies, personal communication). Recently, a biological consultant documented a new *L. yerbabuenae* roost near Redrock (M. Davies and M. Ramsey, personal communication). These extralimital observations could suggest that a range expansion by nectar bats is anthropogenically induced. However, in 2021, after Jennifer D'Annibale, NMDGF Habitat Biologist for the Southwestern Region of New Mexico, posted a patch of *Agave palmeri* on the Double E Wildlife Management Area (WMA) on iNaturalist, she and R. Burke conducted monitoring for nectar bats at the site and recorded high *Leptonycteris* activity during peak flowering from late July to September (R. Burke, unpublished data). These recordings are likely the only detections of nectar bats in their natural foraging grounds in an area otherwise dominated by anthropogenic resource use, emphasizing the importance of the area for providing high-quality food sources for these bats prior to their fall migration. With climate change, the Gila region is predicted to become more important for both nectar bats and agaves (Piccioli Cappelli et al., 2021; Gomez-Ruiz and Lacher, 2019). However, the Gila region is at risk of dramatic environmental change, as exemplified by several catastrophic wildfires over the past two decades. *Agave palmeri* can withstand

low-intensity fire, but less is known about the impacts of high intensity fire (Slauson, 2002). At the Double E WMA, the isolated nature of the agaves and the dense woody vegetation in which they occur may increase the agaves' susceptibility to high-intensity fire, with dense woody vegetation a likely result of past heavy grazing (NMDGF, 2017). In 2023, the high-severity Turkey Fire perimeter was within 1.5 miles of the Double E WMA (USFS, 2024). Under current management, the uplands of the Double E WMA are undergoing a transition back to more reference plant communities as it recovers from a legacy of heavy livestock use (NMDGF, 2017). Given that *A. palmeri* is susceptible to long-term impacts from livestock (Widmer, 2002), there is now an opportunity to establish a robust and resilient metapopulation. Enhancing *A. palmeri* habitat at the Double E WMA will benefit nectar bats in the face of increasing habitat degradation elsewhere and aligns with Double E Ranch Management Plan priorities, and will enable NMDGF to further improve habitat for SGCN. This work will build upon increasing knowledge of nectar bats in the region, the potential disproportionate importance of the Double E WMA for these bats, and the need to mitigate potential fire risks. We will address Habitat Topic 1 (Nectar-feeding bat habitat improvement on the Double E WMA) with the Tasks outlined below.

### **Project Activities:**

**Task 1:** Collect seed in the existing patch of agaves (*Agave palmeri*) on the Double E WMA following the "Seeds of Success" sampling protocol to ensure that sustainable amounts of seed with appropriate genetic diversity are collected (BLM, 2024). Access the site on foot and clip 1-2 umbels from individual plants with telescoping loppers or shake stalks over a tarp to harvest the seeds. Send collected seeds to nursery partners to grow approximately 600 agave plants. Place remaining seeds in cold storage for future restoration work.

**Task 2:** Coordinate with the Agency to identify at least 3 reasonably-accessible agave translocation sites using existing habitat models, vegetation maps, soil surveys, and other ecological data and on-the-ground evaluations conducted throughout the winter. Coordinate with the Agency's archaeologist to ensure completion of all necessary Section 106 compliance paperwork and any on-the-ground archaeological surveys.

**Task 3:** Conduct a site assessment to determine the number of agave pups that can be sustainably removed from the existing agave patch without negatively impacting recruitment. During the 2025 monsoon season, collect up to 150 pups from the existing agave patch. Dig the pups out of the bases of mother plants with spades or soil knives and remove them without soil, following protocols developed with partner native plant nurseries. Bring the pups to a protected and shaded location to scarify for 1-2 weeks and then plant up to 50 pups at each of the 3 identified transplanting sites identified in Task 2 above. Mulch pups with onsite rock materials and partially shade them with burlap to improve plant survivorship.

**Task 4:** Conduct environmental DNA (eDNA) surveys of the existing agave patch to test for the presence of 3 nectar bat species (Mexican long-nosed bat [*Leptonycteris nivalis*],

Lesser long-nosed bat [*L. yerbabuenae*], and Mexican long-tongued bat [*Choeronycteris mexicana*]). Visit the agave patch shortly after sunrise up to 4 times during the peak flowering season in 2025 and collect up to 160 samples for eDNA analysis by swabbing open flowers with a sterile swab. Send samples to the Bat Ecology & Genetics Lab at Northern Arizona University for genetic analysis. Access all survey locations for agave eDNA sampling and field activities described in Tasks 1 through 3 above by using vehicles on established roads or, where established roads are not available, on foot. If camping is necessary, the Contractor will minimize disturbance to sites by camping where allowed by the Agency and primarily on already-disturbed ground (e.g., trails) and at least 25 feet away from any flowering agaves. Limit ground surface disturbance associated with collecting and transplanting agave pups, as described in Task 3 above, to a maximum of 464 square centimeters per pup and a maximum of 7 square meters across the WMA.

## **Summary of Progress**

### Task 1: Collect seed in the existing patch of agaves (*Agave palmeri*) on the Double E Wildlife Management Area (WMA)

BCI staff Rachel Burke (Agave Restoration Coordinator) and Brianna Mann (Restoration Specialist) collected *A. palmeri* seeds from the existing agave patch on the Double E WMA with NMDGF Southwestern Region Habitat Biologist, Jennifer D'Annibale. We collected 2-3 umbels (rebranching group of flower clusters) from 25 individual plants, following the "Seeds of Success" protocol (BLM, 2024). We clipped individual umbels that had developed fruits using a telescoping lopper and collected them in buckets. We hiked out the buckets of umbels and allowed them to fully dry to ensure full seed development. We then transported the collection to our nursery partner Borderlands Restoration Network (BRN) and cleaned the seed for propagation and storage.

The agaves had high seed set, indicating high-quality pollination (most likely by bats), and have had excellent germination rates with our partners at BRN. Over 600 seedlings were propagated in January 2025 for the Double E WMA, with additional seedlings propagated for use in restoration work on public lands in the greater Gila region. All seedlings derived from seed collected on the Double E WMA will be used in non-commercial agave restoration work as part of BCI's Agave Restoration Initiative. Seedlings will be ready for transplanting on the Double E WMA in 2027. Any seeds there were not put into immediate propagation have been placed in cold storage at BRN's Seed Lab.

### Task 2: Coordinate with the Agency to identify at least 3 reasonably-accessible agave translocation sites using existing habitat models, vegetation maps, soil surveys, and other ecological data and on-the-ground evaluations conducted throughout the winter. Coordinate with the Agency's archaeologist to ensure completion of all necessary section 106 compliance paperwork and any on-the-ground archaeological surveys.

To date, Rachel Burke has conducted 2 site visits to the Double E WMA in coordination

with Jennifer D'Annibale. On March 11, 2025, Burke and D'Annibale scouted multiple potential access routes to portions of the Double E WMA which contain suitable agave habitat. On March 12<sup>th</sup>, Burke and D'Annibale hiked into the north end of the Double E WMA on an old unmaintained road on USFS lands off of Turkey Creek Road near the southwestern edge of the Gila Wilderness. Incidentally, we documented multiple *Agave palmeri* patches on USFS lands, further emphasizing the likely importance of this region to nectar-feeding bats, as well as on the Double E WMA proper. On the north end of the Double E WMA, we delineated 3 planting clusters within appropriate ecological sites. Each cluster already contains a small number of *A. palmeri*. These northern planting areas comprise 15 acres in total. We determined that access on foot requires an 11-mile round trip hike, but that access on an unmaintained USFS road is possible with a UTV. However, access with a 4x4 truck is possible with permission from a private landowner through private and State Trust land to the west of the proposed planting area. We intend to obtain access through the private access route to enable more efficient planting and archaeological clearance. We are in the process of coordinating this.

On May 6<sup>th</sup>, Burke and D'Annibale conducted a site visit to suitable agave habitat on the south side of the Double E WMA. We accessed sites through state trust and BLM-administered land on the eastern edge of the Double E WMA near Hell's Half Acre. We did not encounter any existing *A. palmeri* at these sites; however, suitable vegetation and soil types exist for habitat enhancement. We delineated potential planting areas near Medina Tank and on an isolated portion on the southern edge of the Double E WMA. Access on foot involved an 8-mile round trip hike. However, with permission from the Casitas De Gila, UTV access to these sites is feasible from the west side on an existing road. We delineated 3 possible planting areas along this route, adjacent to the existing road for access feasibility. In total, these areas comprise 8 acres.

Shapefiles for these ground-validated planting areas have been provided to our staff archaeologist, who is in communication with the NMDGF archaeologist to determine the level of compliance needed. Because of access issues, site visits occurred later than intended and our BCI staff archaeologist has not been able to visit planting areas. Our archaeologist will conduct site visits in August 2025. We have shifted planting plans for the area to a pre-winter planting instead of planting during the 2025 monsoon season. We have been advised that this is also a more suitable planting time for agaves because of extreme drought conditions and unpredictable monsoon precipitation patterns. After conducting site visits, our archaeologist will relay her findings to the NMDGF archaeologist, determine level of needed compliance, and determine which potential planting areas will not have adverse archeological impacts. After these sites are confirmed, we will plant 150 agaves in December 2025.

Task 3: Conduct a site assessment to determine the number of agave pups that can be sustainably removed from the existing agave patch without negatively impacting recruitment. During the 2025 monsoon season, collect up to 150 pups from the existing agave patch. Dig the pups out of the bases of mother plants with spades or soil knives

and remove them without soil. Bring the pups to a protected and shaded location to scarify for 1-2 weeks and then plant up to 50 pups at each of the 3 identified transplanting sites identified in Task 2 above. Mulch pups with onsite rock materials and partially shade them with burlap to improve plant survivorship.

We originally intended to conduct this site assessment on July 24, 2025, but had to shift our plans due to flash flooding risks and our potential inability to cross Bear Creek due to the Trout Fire currently burning in the headwaters of the creek and predicted rainfall in the area. We will conduct this site assessment in July or August when weather conditions allow. We have been in communication with Jennifer D'Annibale about contingency plans in case there are not enough pups to sustainably harvest for transplant. If this is the case, we hope to plant a small number (150) of readily-available *Agave palmeri* seedlings from our nursery partners, derived from seeds collected in the Peloncillo Mountains. These seeds were collected by our partners at Borderlands Restoration Network on the Coronado National Forest along Geronimo Trail Road (NFSR 63) under Coronado National Forest Special Use Permit number SUP0122. These 150 transplants would introduce more genetic diversity to the Double E WMA agave population, and then would be complimented by the 600 agaves from the on-site collection that will be ready for planting in 2027. We will finalize plans as soon as we are able to conduct the site assessment to determine pup availability.

Task 4: Conduct environmental DNA (eDNA) surveys of the existing agave patch to test for the presence of 3 nectar bat species (Mexican long-nosed bat [*Leptonycteris nivalis*], Lesser long-nosed bat [*L. yerbabuena*], and Mexican long-tongued bat [*Choeronycteris mexicana*]).

We have established a study plan for conducting eDNA surveys in the existing agave patch throughout August and September 2025. We have scheduled our field crews and will begin monitoring on August 11<sup>th</sup>, 2025.

## Figures



**Figure 1.** (left to right) Brianna Mann (BCI Restoration Specialist), Rachel Burke (BCI Agave Restoration Coordinator), and Jennifer D'Annibale (NMDGF), with a developed *Agave palmeri* umbel on the Double E WMA. Photo credit: Brianna Mann, Bat Conservation International.



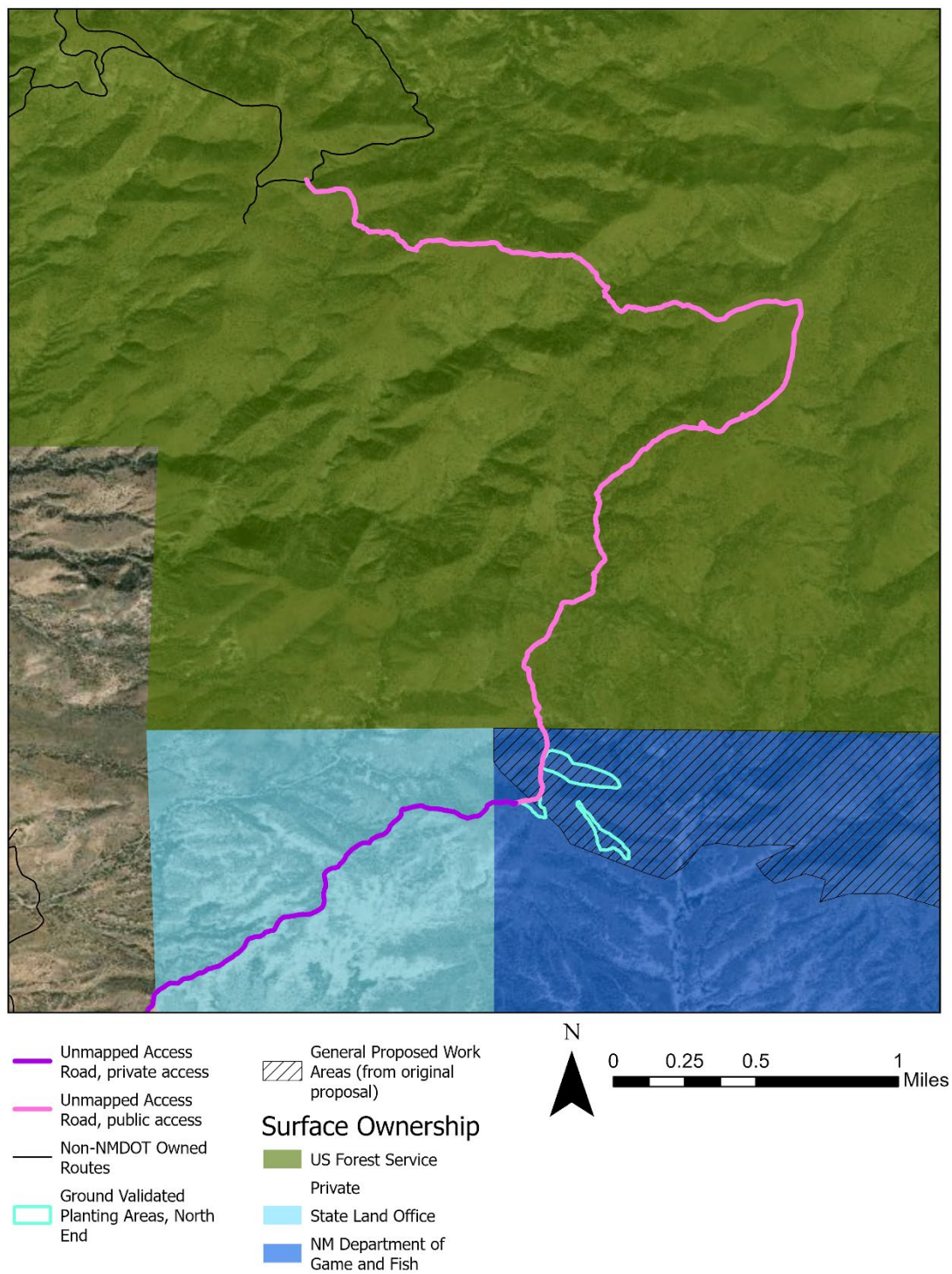


**Figure 2.** Dried *Agave palmeri* fruit collected on the Double E WMA. The black seeds in the pod are all viable seeds, while white seeds are inert. The high proportion of black seed indicates high-quality pollination. Photo credit: Rachel Burke, Bat Conservation International.

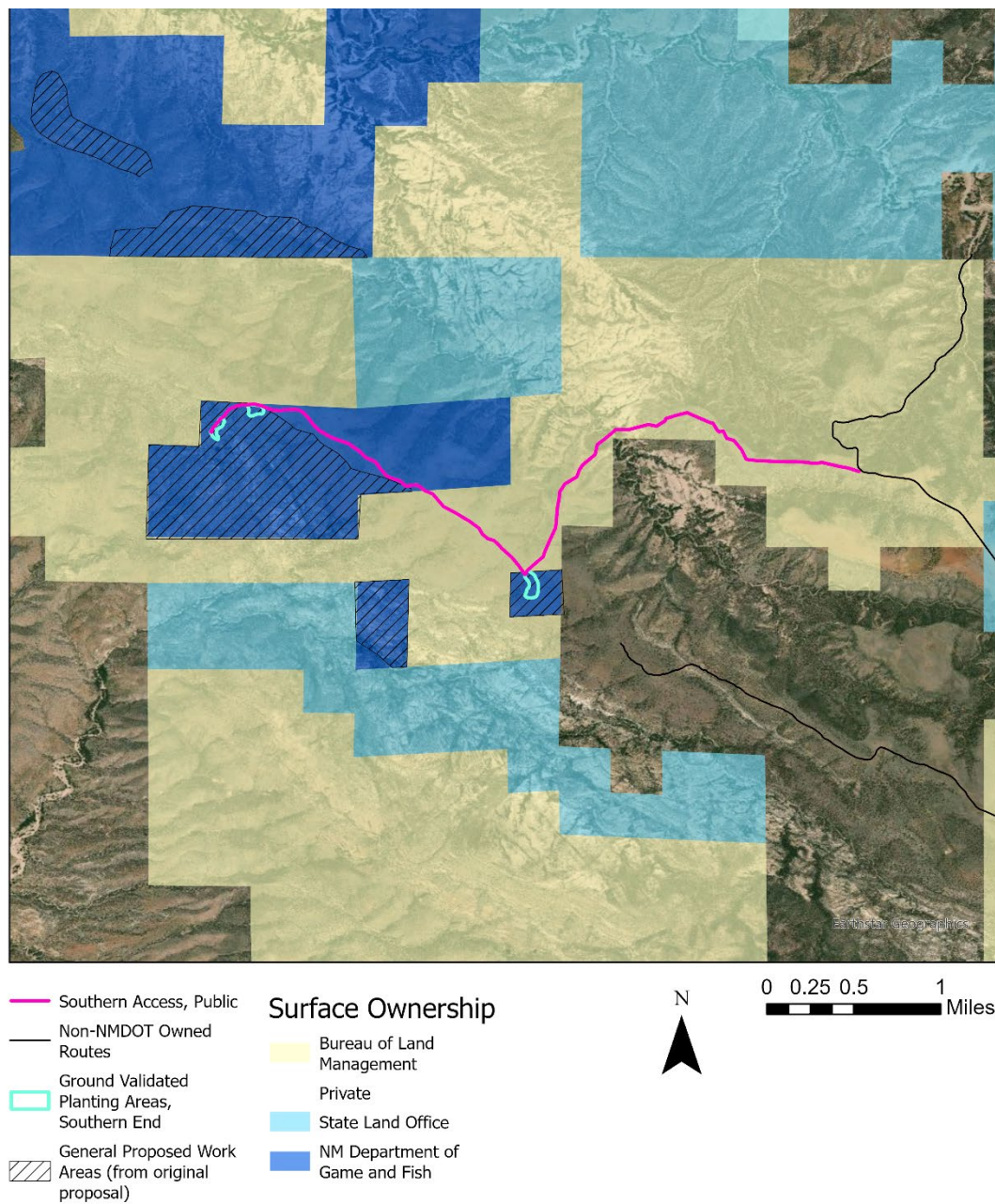


**Figure 3.** Rachel Burke (Bat Conservation International) holding *Agave palmeri* seedlings that are growing in the greenhouse at Borderlands Restoration Network (Patagonia, AZ) from seeds collected at the Double E WMA. Photo credit: Francesca Claverie, BRN.





**Figure 4.** *Agave palmeri* planting areas delineated on the northern edge of the Double E WMA.



**Figure 5.** *Agave palmeri* planting areas delineated on the southern edge of the Double E WMA.





**Figure 6.** Left: Example of a proposed *Agave palmeri* planting area on the north side of the Double E WMA along an existing road. Right: Example of a proposed planting area on the south side of the Double E WMA. Photo credits: Rachel Burke, Bat Conservation International.

### **Acknowledgements**

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