



Habitat Models for Culturally Significant Plants in Bandelier National Monument

Project Overview

A project completed in 2024 evaluated habitat suitability of 10 relatively common plants in Bandelier National Monument (Muldavine and Gonzalez 2024). The plants were chosen based on their cultural significance, as identified in Stoffle et al. (2007). The project recognizes habitat suitability models (HSMs) as a reliable tool for identifying conservation concerns and management actions, and for providing guidance for cultural harvesting. The data used for the models represents a 30-year timeline including the 2011 Las Conchas fire.

The project evaluated the following plants: Douglas fir, limber pine, banana yucca, chokecherry, common hop-tree, Gambel's oak, alderleaf mountain mahogany, Indian ricegrass, common yarrow, and amaranth (Figure 1, Table 1). Project authors provided HSM maps with interpretive briefings, including descriptions of cultural uses, for each plant species.

Issues Facing Cultural Plants

High severity fires, collection, shifting weather trends, and flooding are some of the issues that face native plant species in Bandelier.

1) High severity fires

- While many plants in Bandelier are fire-adapted, woody species are particularly adversely affected by fires made more severe by higher temperatures, drought conditions, and other shifting weather patterns.
- Flooding in canyons and riparian habitats is amplified by fires, which result in disturbance to one of the most sensitive and valuable habitats for flora and fauna in Bandelier.

2) Collection and human impact

- The possibility of plants being poached or overharvested by authorized users, especially in more accessible locations, should be considered, and sustainable harvesting should be practiced.

3) Shifting weather trends

- Longer drought periods may reduce already limited habitat available for native plant species.
- Infrequent but more severe flash flooding may reduce habitat in size and suitability for native plants.



Figure 1. Banana yucca is one of the culturally significant plants assessed in the 2024 project. (Norman G. Flaigg, Lady Bird Johnson Wildflower Center)

Table 1. Reported % of suitable habitat in Bandelier National Monument by species. Asterisks (*) indicate special management considerations detailed below. Source: Muldavine and Gonzalez (2024).

Culturally Significant Plants	% Suitable Habitat within Bandelier
Douglas fir*	8.4
limber pine*	9.4
mountain mahogany	18.2
Gambel's oak	30.9
common hop-tree*	7.4
chokecherry*	7.1
banana yucca	17.1
amaranth	13.9
common yarrow	16.6
Indian ricegrass	14.7

Special Considerations

Douglas fir and limber pine are woody species that are relatively slow to establish post-fire. Lack of stratification in plant generations also enhances conditions for population impacts from high severity fires. Common hop-trees and chokecherries depend on riparian habitat in canyons, which is at risk due to fire, flooding, and competition with non-native plants. Chokecherry populations have reportedly declined due to past overgrazing and other stressors in Capulin Canyon; the canyon's namesake plant is less abundant than it once was.

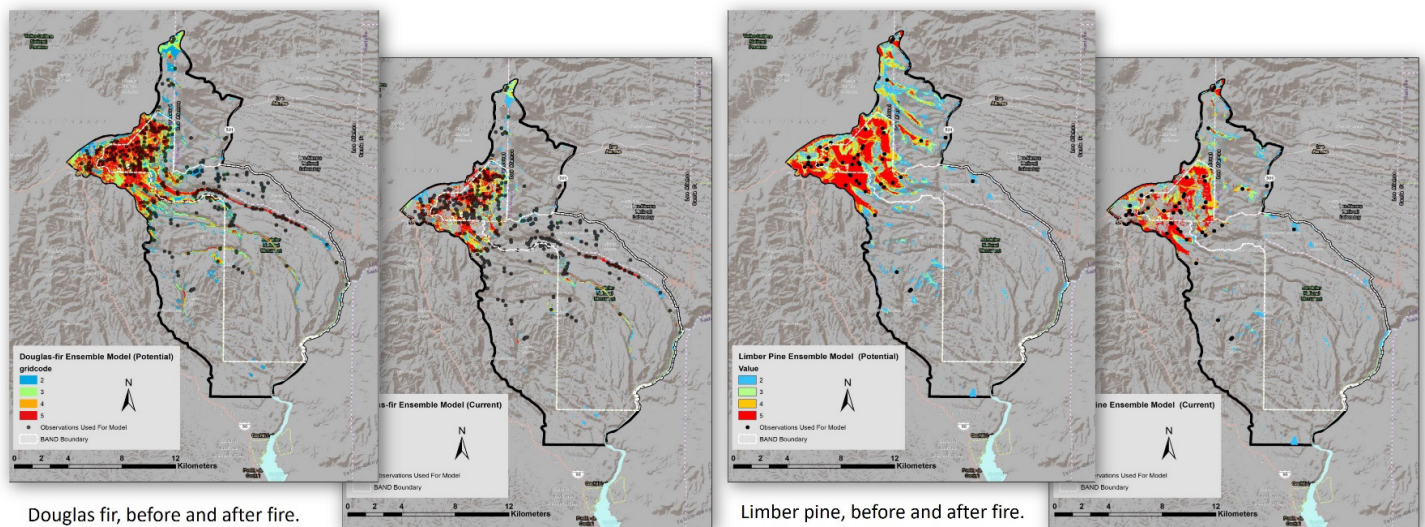


Figure 2. Habitat suitability models for Douglas fir and limber pine before and after the Las Conchas Fire in 2011. Red indicates habitat with the highest level of suitability, and blue indicates habitat with the lowest level of suitability. Source: Muldavin and Gonzalez (2024: Figures 21-22, 24-25).

Conclusions

1. **Greatest concern:** **Douglas fir** and **limber pine** trees require a long-term and integrated treatment plan which addresses high-severity fire, flooding, and shifting weather trends. Douglas fir trees have significant cultural value as a native species, though their suitable habitat has been shrinking over time (Figure 2). Restoration planting and monitoring for efficacy may be recommended for this species within areas considered high-quality habitat.
2. **Moderate concern:** **Common hop-tree** and **chokecherry** grow in areas along streams, which is the most restricted and disturbed habitat in Bandelier due to presence of fire, flooding, and historic grazing.
3. **Least concern:** **Gambel's oak** is abundant and not limited by riparian areas or growth cycle, and is well-adapted to fire.



Gambel's oak. (James L. Reveal, Lady Bird Johnson Wildflower Center)

Park Contacts

Resource Brief prepared by Miles Campos, Biological Technician,
miles_campos@nps.gov

Edited by Jamie Civitello, Integrated Resources Manager,
jamie_civitello@nps.gov

For more information:

Sarah Milligan, Natural Resources Program Manager,
sarah_milligan@nps.gov

Ana Casillas-Brownson, Botanist, ana_casillas@nps.gov

Data Availability

Unpublished report and data available on IRMA:
<https://irma.nps.gov/DataStore/Reference/Profile/2306881>

References Cited

- Muldavin, E., and C. Gonzalez. 2024. Species habitat suitability models and condition assessment for culturally significant plants. Natural Heritage New Mexico Report 427. Museum of Southwestern Biology, University of New Mexico, Albuquerque.
- Stoffle, R.W., N. O'Meara, R. Toupal, M. Buttram, and J. Dumbauld. 2007. A study of natural resource use among Culturally Affiliated Pueblo Communities. Report on file, Bandelier National Monument.