

Final Report

Screwbean Mesquite Provenance Garden

Project # 2021-ECOCULTURE-2070B

Executive Summary

Introduction

- Screwbean mesquite (*Strombocarpa pubescens*) is an important tree for wildlife and was once a major food source for Indigenous communities. Since 2005, the species has been declining in many areas, affecting riparian habitat restoration efforts.
- Earlier work by Ecoculture confirmed the presence of fungal disease called branch canker (caused by *Neoscytalidium dimidiatum*), which was linked to widespread die-offs across the Southwest and recommended testing treatments and identifying disease-resistant trees.
- To achieve this objective, we established a 250-tree provenance garden grown from seeds collected across the range of screwbean mesquite.
- This project is a follow-up to a 525-tree provenance garden planted in 2025 and looks to expand the ability of the project to identify disease-resistant lineages.

Methods

250 Seedlings from 57 mother trees and 22 populations were planted at the DCP Mormon Mesa Subunit in January 2026. Heights and survival were recorded three months later.

Results & Conclusions

Survival rate at 3 months post-planting was 44%. Continued study of this garden has potential to yield insights into variation in genetic resistance to causes of decline.

Introduction

Project description

This project was carried out between September 2023 and April 2026 and consisted of propagation and planting on DCP property of a 250-tree screwbean mesquite provenance garden grown from seeds collected from 57 mother trees growing in 22 populations across five states.

Background and motivation for conducting the project

The Clark County Multiple Species Habitat Conservation Plan (MSHCP) and the associated Incidental Take Permit requires that the DCP acquire, restore, and manage riparian property along the Muddy and Virgin Rivers to preserve, enhance, and protect habitat for several rare and/or listed birds. To date, the DCP has acquired and manages approximately 117 acres along the Muddy and 665 acres along the Virgin River.

Screwbean mesquite (*Strombocarpa pubescens*) is an important tree species of desert riparian systems in the Southwest and is found on many DCP properties within riparian corridors. Screwbean mesquite provides wildlife habitat, supports a diversity of insect pollinators, and was a significant dietary staple for Indigenous communities of the Sonoran, Chihuahuan, and Mojave Deserts.

Since approximately 2005, screwbean mesquite trees have been experiencing die-offs, often affecting large patches, in the western portion of the species' range. Die-offs have been found to be associated with disease symptoms. The symptoms occur on the trunk and branches and include cankers, bark lesions, discoloration of xylem tissues, longitudinal wood necrosis, and extensive gumming. Recovery of threatened and endangered avian species relies upon improving riparian habitat. The screwbean mesquite die-off threatens these recovery efforts, and it is important to understand the extent and causes of the die-offs.

In 2022, U.S. Fish and Wildlife Service (USFWS) and Nevada Division of Wildlife (NDOW) partnered to contract Ecoculture LLC (Ecoculture) to discover the causes of the screwbean decline, identify areas for monitoring, and develop a monitoring protocol. Ecoculture conducted surveys throughout the region and collected samples from the symptomatic tissues of individuals exhibiting cankers, oozing sap, and branch mortality. Disease symptoms were observed on screwbean mesquites throughout numerous populations during 2022 (e.g. Virgin River, Ash Meadows NWR, Shoshone, Clark County Wetlands) and were associated with increasing die-back (tissue death) across surveyed sites.

Findings from tissue collections identified the fungus, *Neoscytalidium dimidiatum*, as the likely causative agent of disease symptoms ([Cowan et al. 2024](#)). This fungus causes the diseases branch canker and sooty canker, which have driven die-offs of native tree species in other ecosystems where they have sometimes spread from agriculture crops into wild populations.

Recommendations from those findings included identifying disease-resistant populations,

individuals and/or lineages for use in future restoration efforts. The initial provenance garden was planted in 2025 and consisted of 525 trees grown from seeds collected from mother trees across the species' range. To maximize the likelihood of identifying disease-resistant genotypes, we attempted to collect seeds from healthy individuals in diseased populations and from healthy populations which are adjacent to diseased populations. Survival at six months post-planting was estimated to be approximately 30%. To increase the likelihood that the provenance plantings allow identification of disease-resistance, we decided to plant a follow-up garden using surplus seedlings from the initial garden.

Goals and objectives of the project

The goal of this project was to establish a second, smaller screwbean mesquite provenance garden that would improve our ability to identify genetic traits related to *Neoscytalidium dimidiatum*-resistance and resilience to climate shifts. To achieve this goal, we grew out surplus seedlings left over from the 2025 garden for an additional year and planted them into a different DCP parcel, where soils are known to remain saturated for much of the year.

Methods

Seeds for the provenance garden were collected from across the southwest in September and October 2023. This was the ideal time for seed collection as seed-production for the species occurs in late summer. Seeds were collected from 57 mother trees found in 22 populations (one to seven mother trees per population). Metadata for all mother trees (GPS coordinates, population, presence/absence of branch canker symptoms, whether the tree was planted or wild) is included in the data file "screwbean-provenance-garden-2026-data_2021-ecoculture-2070B.xlsx", tab "Provenance Seed Source Data". The shapefile "mother_tree_locations_2021-ecoculture-2070B" contains the locations of all mother trees. Germination, propagation and grow-out were conducted by the Northern Arizona University Research Greenhouse from December 2023 to January 2026. Details of the grow-out process may be made available upon request. Seedlings were grown in 4" x 14" pots for 14 months.

A total of 250 seedlings were included in the 2026 provenance garden, representing eight to 11 replicates per mother tree (actually siblings grown from different seeds). Seedlings were planted at least 3.5 meters apart along the edges of swales found across DCP Mormon Mesa subunit from January 26-28, 2026. All seedlings were planted with a unique tag number (metal tag with engraved number on a U-stake) that can be used to ascertain the mother tree ID for each seedling (found in "screwbean-provenance-garden-2026-data_2021-ecoculture-2070B.xlsx", tab "3-month survey data"). Locations of individual trees were taken with ~0.6 meter accuracy using a Trimble DA2 model GPS antenna. The survival status and height in centimeters of each seedling was recorded approximately three months later (April 20, 2026). As some of the swales had dried out by the time of the survival survey, each planted tree was watered with at least one gallon of water on April 21, 2026.

Results/Conclusions

All 250 seedlings were successfully planted into the Mormon Mesa Subunit. The shapefile folder “screwbean-provenance-gardenmap-2026_2021-ecoculture-2070B.zip” and the spatial file “screwbean-provenance-gardenmap-2026_2021-ecoculture-2070B.kml” contain all planted tree locations, tag numbers and spatial metadata. On April 20, 2026, approximately three months after planting, 44 of seedlings % (110 of 250) showed aboveground living tissue. The remaining 56% showed no living aboveground tissue, although we did not dig these up and they may have still been alive below ground. The living seedlings averaged 45.7 cm in height with high variation (standard deviation = 59.45). Seedling survival and height data are found in data file “screwbean-provenance-garden-2026-data_2021-ecoculture-2070B.xlsx”, tab “3-month Survey Data”, along with basic metadata for each seedling (unique tag #, mother tree ID, etc.).

Compared to the 2025 provenance garden, the seedlings for this project had an additional year to grow out in the greenhouse, allowing for more root development. This may have contributed to higher survival (44% in 2026 vs. ~30% in 2025). The Mormon Mesa Subunit also shows more naturally saturated soils in spring compared to the 2025 garden site, which could also explain higher survival for the latter year.

We recommend follow-up surveys be conducted in the upcoming years to verify survival status going forward and to document variation in growth rates. Although it is impossible to predict when disease symptoms might begin to manifest in the trees of this garden, previous work suggested that disease symptoms do not become apparent until seedlings are 5-7 years old (Cowan et al. 2024). Thus, annual to bi-annual surveys beginning in the 2030s may be adequate to allow documentation of patterns of disease spread, should it occur.

Literature Cited

1. Cowan J, Hu J, Haubensak K, Grady KC. Range-wide population decline of a foundational riparian species tree is linked to an endemic fungal pathogen in the western United States. *Biol Conserv.* 2024 Aug;296:110704.