



Governor Josh Green, MD.

Maui County Mayor Richard Bissen

Re: Assessment & Initial Mitigation Plan for the Exceptional Lahaina Banyan Tree

The following report addresses the Exceptional Banyan Tree in Lahaina, Maui. The State of Hawaii Governor's Office and the Mayor of Maui County requested an assessment and mitigation plan regarding the Indian Banyan tree (*Ficus benghalensis*), which was significantly impacted by the catastrophic fires on August 8-9, 2023.

Background:

The Lahaina Banyan was planted in 1873, and is 150 years old. The tree occupies nearly 2 acres of area along Front Street in Lahaina's historic district. The tree is an icon of Lahaina town, and a gathering place for residents and visitors. The tree has over 40 major aerial roots of different sizes anchored into the soil, which originate from a central parent plant. Beneath the tree's limbs are concrete walkways and pavers with benches and minimal vegetation. The Lahaina Restoration Foundation contributed to management of the tree, including improving the tree's irrigation system. Due to its historic designation, large size, and unique shape, the tree was elected to be an Exceptional Tree by the Maui County Arborist Committee, and is protected by County ordinance.

Plaque recognizing the tree in 1982 from the National Arborist Association



On August 8, 2023, Hurricane Dora to the south of Maui and a high-pressure system to the north of Hawaii caused strong winds, with gusts up to 60 mph. The winds, paired with drought conditions, facilitated several wildfires on Maui's west side. The wildfires devastated Lahaina, burning the majority of the town. At the time of this report, over 90 lives were lost, and thousands of residents are without homes, businesses and loved ones.

While this report addresses the health of the Lahaina Banyan tree and provides a mitigation plan for preserving this tree, I want to acknowledge that many lives were lost and even more were significantly affected by this fire. The tree's health is secondary to the health and well-being of the survivors.

Site Inspection & Results:

With the help of concerned citizens and local companies, I was able to conduct an inspection of the historic tree on August 12, 2023. The owner of Prometheus Construction organized the assessment, with facilitation by the Governor's Office, the Maui County Mayor's Office, the Lahaina Restoration Foundation and Goodfellow Bros. Kumu Kaponu Kamaunu, who attended the elementary school next to the tree, conducted a blessing of the site and the tree before we proceeded with the assessment. Prometheus provided an aerial lift to inspect the tree's crown, and erected a tree protection zone with fencing and signage. Goodfellow Bros. supplied the water trucks for the tree.

Blessing by Kumu Kaponu Kamaunu of Lahaina.



Establishing a tree protection zone



Aerial roots, trunks and soil

There were no significant signs of singeing, charring or cracking on most of the 40+ aerial roots or main trunk (image, right). Two aerial root trunks appeared to have small sections that had been burned by embers from the fire. I tested the cambium layer around each aerial root to identify if live tissue was present. I used a small pocket knife to cut through the thin bark layer into the cambium layer. All test sites revealed live tissue, with minimal amounts of sap that oozed out of the cut.



Test cuts into anchored aerial roots show live tissue with minimal sap oozing



The soil under the tree did not appear to be charred or burned. Goodfellow Bros. watered the soil near the anchored aerial roots. The soil absorbed water quickly with no ponding. The majority of the wooden benches (~90%) beneath the tree were not burned and still intact (pictured, right).



Canopy

I used the aerial lift to inspect the tree crown around the perimeter and the central upper branches. Leaves and fruits were still attached to the tree, though they were shriveled and brown. The small ¼ in. to 1 in. twigs holding the leaves and fruit were shriveled, desiccated and dead. The 3in. to 8 in. diameter branches attached to the twigs were tested by cutting the outer layer. Many of the branches had live tissue but minimal sap flow. The branches on the corner of Front Street and Pioneer Hotel were dry with some cracks and no signs of live cambium tissue.



Desiccated leaves and fruit with shriveled twigs



Live cambium in branches



Most heavily burned side of the tree, Front St. and Pioneer Hotel, without live tissue.



During the inspection, Goodfellow Bros. watered the tree crown to remove the soot and moisten the branches.



Discussion:

The aerial roots and trunks were the least impacted parts of the tree, and the soil appeared to be normal with minimal evidence of charring or burning. Furthermore, the wooden benches beneath the tree were mostly intact. These observations suggest that minimal fuel beneath the tree's canopy contributed to a lower intensity and less-prolonged burn close to ground level.

The section of the tree towards Front St. and Pioneer Hotel appears to have been the most heavily impacted area of the tree, as this section had the least amount of live cambium tissue in the crown. The rest of the tree did have live tissue in the crown. On a normal and healthy Indian banyan, sap will ooze out excessively when the tree's thin layer of bark is cut. While live tissue and some sap was observed when cutting into the cambium layer in this tree, the amount of sap that oozed was much less than I expected.

Six water trucks were used at the tree. The soil quickly absorbed the water, indicating the soil was dry. A soil moisture meter was not available during this inspection. Fires will dry out the soil, and soils can become hydrophobic when without water for prolonged periods of time. An irrigation system was updated in 2001, and will need repairs and replacement after this event.

Trees have many adaptations to survive fires, and many trees can recover following a fire event. The live tissue in the banyan indicates the tree has the potential to survive, though the tree will require additional and consistent care for many months, especially during the hot and dry summer and early fall. An initial tree care plan is being developed based on my experience and discussions with highly qualified Arborists from Hawaii, California, Oregon, Washington and Arizona.

Tree Care Plan:

Initially, our immediate plan includes:

- Water:
 - Test water quality (hazardous chemicals, pH, minerals) and apply cleanest water available.
 - Daily watering program of the tree crown and ground, in partnership with Goodfellow Bros. using water trucks with hoses and cannons. Up to 6 trucks of water daily.
 - Monitor soil moisture daily by using soil moisture testing equipment and recording results. Adjust water truck quantities based on results.
 - When the water system is back online and safe to use, replace water trucks by:
 - Repairing and likely replace existing irrigation system.
 - Installing a watering system in the tree's upper crown. Use PVC pipe attached to branches with zip ties to secure sprinkler heads in the upper crown. Water the branches daily on a battery-operated timer system.
 - Watering system can be temporarily connected to a fire hydrant (if functioning and the water is safe to use).

- Soil:
 - Collect soil samples for analysis, including pH, nutrients, cation exchange capacity, micronutrients, organic matter, soluble salts, hazardous chemicals
 - Use air spade to improve soil conditions by aerating the soil, reducing compaction, and improving drainage. The air spade minimizes damage to the tree's roots.
 - Spray aerated soil around aerial roots with compost tea (beneficial microorganisms). Amend as necessary with humates or biochar (based on availability and soil tests).
 - Breaking up additional sections of concrete around the main trunk may be required to get the treatments into the ground (To be determined)
 - Install a 3-in. thick layer of aged mulch over the open area under the full width of the tree's canopy and continue to keep the mulch moist. Mulch can become hydrophobic if desiccated.
- Trunk & Canopy:
 - Presently, leave the dead leaves, twigs and branches on the tree to help protect the inner branches from sun scalding and desiccating during the next two hottest months of the year.
 - If too much sun is impacting the main branches, wrap the lateral and structural branches in shade cloth
 - Monitor tree health every 2 weeks by testing trunk and aerial root tissue for changes in tissue quality and amount of sap oozing. Record the results. Use results as a gauge for adapting treatments.
 - Inspect weekly for insect damage, as boring insects are attracted to weakened and stressed trees.
 - Pruning needs will be determined based on tree recovery.
- Adaptive Plan:
 - Review results with team of qualified Arborists
 - If necessary, adjust treatment plan based on tree's reaction and appropriate procedures recommended by a consensus of qualified arborists.
 - Consult with Lahaina Restoration Foundation and Maui County Arborist Advisory Committee on management for the tree.

The tree will be the guide to changing the treatment program as it responds to the treatments. With a team approach, we will be able to provide the best crutches and care to one of the most well-known and beloved trees in the Hawaiian Islands and across the world.

If you have any questions, please contact our office at 808-734-5963.

Respectfully,



Steve Nimz
 ASCA Consulting Arborist, #WE-0314AM

Arborist Disclosure Statement:

Arborists are tree specialists who use their education, knowledge, training and experience to examine trees, recommend measures to enhance the beauty and health of trees, and attempt to reduce the risk of living near trees. Clients may choose to accept or disregard the recommendations of the arborist, or to seek additional advice.

Arborists cannot detect every condition that could possibly lead to the structural failure of a tree. Trees are living organisms that fail in ways we do not fully understand. Conditions are often hidden within trees and below ground. Any tree, whether it has visible weaknesses or not, will fail if the forces applied exceed the strength of the tree or its parts. Arborists cannot guarantee that a tree will be healthy or safe under all circumstances, or for a specified period of time. Likewise, remedial treatments, like any medicine, cannot be guaranteed.

Treatment, pruning and removal of trees may involve considerations beyond the scope of the arborist's services, such as property boundaries, property ownership, disputes between neighbors, and other issues. Arborists cannot take such considerations into account unless complete and accurate information is disclosed to the arborists. An arborist should then be expected to reasonably rely upon the completeness and accuracy of the information provided.

Trees can be managed, but they cannot be controlled. In assessing and managing trees, we should strive to strike a balance between the risk that a tree poses and the benefits that individuals and communities derive from trees. It is impossible to maintain trees free of risk; some level of risk must be accepted to experience the benefits that trees provide.