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ENVIRONMENTAL REMEDIATION WORKING GROUP
Rep. Nicole E. Lowen, Co-Chair
Rep. Elle Cochran, Co-Chair

DATE: Friday, November 17, 2023
TIME: 1:00 p.m.
PLACE: Conference Room 309 & Videoconference

COMMENTS

Aloha Chair Lowen, Vice-Chair Cochran, and Members of the Committee

Life of the Land is Hawai`i's own energy, environmental and community action group advocating for the people and `aina for 53 years. Our mission is to preserve and protect the life of the land through sound energy and land use policies and to promote open government through research, education, advocacy and, when necessary, litigation.

The Environmental Remediation Working Group published its Draft Report on November 1, 2023. Mahalo for developing a concrete plan with specific targets and

accompanying financial costs. This analysis can lead to very meaningful legislation in the 2024 legislative session.

Life of the Land very strongly urges that a public website be set up to present the Department of Health sampling plan and results, as well as documents associated with an independent entity that conducts sampling for quality control purposes.

Our view is shaped by decades of experience dealing with governmental, commercial, and military sites with serious toxic and/or pesticide issues that affected the air, water, and land. The community must feel that the published toxic reports are reliable.

Life of the Land's Executive Director currently serves as Community Co-Chair of the Joint Base Pearl Harbor Hickam Restoration Advisory Board. He served as Community Co-Chair of the Hickam Air Force Base Restoration Advisory Board from 1996-2004, a time when the Air Force emptied and cleaned out its two massive underground fuel storage facilities in Waipio and Wahiawa, and the pipeline to Hickam.

Life of the Land was one of the groups that helped secure legislative funding 25 years ago for soil testing in Village Park, a community located by H-1 and Kunia Road. Kids were born healthy, but health issues appeared by first grade. The Department of Health wasted money with a birth study.

The soil was tested. High hits were discovered for chromium, arsenic, and dioxin. The Board of Water Supply did not have to get involved, but they came to the community and shared pre and post water treatment analysis with the community. By contrast, the Department of Health asserted that if there were high hits of chromium, they would go back and determine whether it was the safer chromium 3 or the much more toxic

chromium 6. After hits of chromium were made, the Department of Health revised its approach and asserted that they would assume it was chromium 3.

Red Hill is a current example of inertia by the Department of Health.

Mahalo,

Henry Curtis

Executive Director

**Testimony of The Nature Conservancy
Commenting on the Environmental Remediation Working Group Draft Report.**

**Environmental Remediation Working Group
Hawai'i State House of Representatives
November 17, 2023, 1:00 p.m.
Conference Room 325 and via Videoconference**

Aloha Co-Chairs Lowen and Cochran, and Members of the Working Group:

Mahalo for the Working Group's efforts to evaluate the cleanup of ground and ocean contamination, including the timeframe and techniques utilized, and to prepare recommendations for appropriate legislative action. The Nature Conservancy (TNC) respectfully submits the comments below for the working group's consideration.

Hawai'i is becoming increasingly prone to wildfire due to climate change and inadequate natural resource management. Due to climate change, we see increased droughts, hotter temperatures, more intense storms, rapid spread of invasive species, and other impacts of climate change that increase wildfire probability. As we saw on Maui, the impacts on communities and the environment from wildfire can be devastating.

The environmental impact of the fires in Maui we are seeing so far and expect in the future require a comprehensive response from State, Federal, County, and private stakeholders. The draft recommendations include many important actions for the State and stakeholders to take to protect water and air quality in affected areas. A few that TNC highlights for priority support include:

- Nearshore Coastal Water Quality Monitoring – TNC has worked with Hui O Ka Wai Ola (HOKWO) and other partners in West Maui for years, and strongly support the recommendation for funding for HOKWO included in the draft report. These monitoring efforts will be vital to understanding the ongoing impacts on our ocean and what may need to be done to remediate these impacts. Additionally, the Department of Land and Natural Resources Division of Aquatic Resources and the Department of Health funding needs for water and air quality monitoring should be a top priority to ensure that the State is doing all it can to protect the communities and environment in the fire-struck areas.
- Wetland protection and restoration – Our natural systems in Hawai'i play key roles in the resiliency of our islands. Wetlands absorb and release water; they capture the abundance during heavy rains and slowly release it during droughts. This helps recharge groundwater aquifers, which provide nearly all of Hawai'i's residential and commercial freshwater. Wetlands are also key to protecting our coral reefs from runoff, flood protection, sediment filtration, and wildlife habitat. Protecting and restoring wetlands in Hawai'i will make the

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islands more resilient in the face of climate change. The draft recognizes the important role of wetlands and TNC strongly supports these recommendations.

- Funding - Finally, the draft report includes many actions that are important to monitor and manage our natural resources in Hawai'i and to be able to fund these needs the State will likely need significantly increased funding for natural resource management, either through raising of revenue from visitors, other means, or a combination sources. The legislature should approve funding to protect, restore, and manage Hawai'i's magnificent and irreplaceable natural resources for many reasons, most pertinently to save lives by preventing and reducing wildfire risk, and to be more resilient in the face of increasing fire risk. Protection of biodiversity, climate change adaptation, water management, soil management, and conservation and other forms of mālama 'āina are all critical to preventing wildfire risk and recovering faster. Likewise, these prevention efforts require a strong workforce to achieve our shared goals. All of this requires funding, which the legislature is uniquely empowered to provide.

Mahalo for to opportunity to provide these comments. We appreciate your support of Hawai'i's natural resources, we look forward to continuing to support efforts to make Hawai'i more fire resilient, particularly through investments in our natural resources.

The Nature Conservancy of Hawai'i and Palmyra is a non-profit organization dedicated to the preservation of the lands and waters upon which all life depends. The Conservancy has helped protect more than 200,000 acres of natural lands in Hawai'i and Palmyra Atoll and has supported over 50 coastal communities to help protect and restore the nearshore reefs and fisheries of the main Hawaiian Islands. We manage 40,000 acres in 13 nature preserves in Hawai'i and Palmyra Atoll. We forge partnerships with government, private parties, and communities to protect forests and coral reefs for their ecological values and for the many benefits they provide to people.



November 17, 2023

Wildfire Prevention Working Group and
Environmental Remediation Working Group
Via Electronic Transmission

Re: The Imperative of Allocating Adequate Funding to Protect Natural Resources

Aloha members of the House Wildfire Prevention Working Group and the Environmental Remediation Working Group,

Thank you for the opportunity to contribute to the important work of the House Wildfire Prevention Working Group and the Environmental Remediation Working Group. We, the undersigned, agree that wildfire is a growing threat in Hawai'i, and that the major drivers of this growing threat include proliferation of invasive grasses, climate change, and undermanagement and underspending on wildfire prevention. As organizations focused on mālama 'āina (caring for the land that feeds us), we see wildfire prevention as an interconnected component of conservation: sound conservation will generally reduce wildfire risk, and sound wildfire prevention includes conservation.

The remainder of our comment focuses on our strong recommendation that the final report include one key element currently missing from the working groups' draft reports: **that the state significantly increase funding for wildfire prevention-focused conservation and other natural resource management, either through raising of revenue from visitors, some other means, or a combination of the two.** As a part of this recommendation, we briefly describe the connection between wildfire prevention and major aspects of conservation, such as biodiversity protection and climate adaptation, whose importance to sound wildfire prevention is not always understood.

The Need to Fund Wildfire Prevention and Related Conservation

Significant additional funding for natural resource management is and will be central to Hawai'i's ability to implement the sound recommendations in the working groups' reports. As the Wildfire Prevention Working Group's draft report explains, Hawai'i's wildfire risk is growing, and new programs, policies, state positions, and partnerships are needed to respond to this threat. Yet, as the draft report also finds, Hawai'i spends significantly less on wildfire prevention than other states. While not explicitly mentioned in the draft report, our organizations and others have found that in general, Hawai'i underspends on conservation overall. While not always understood as part of wildfire prevention, when we under-invest in watershed restoration, invasive species management, climate change adaptation, soil management, water management, biodiversity protection, and conservation in general, we increase wildfire risks in the short and long term.

As the tragic firestorms have shown, natural disaster and wildfire risk are intertwined. For this reason, conservation that reduces our state’s vulnerability to natural disasters is a critical part of wildfire prevention. Because any natural disaster could lead to unintended fire ignition, when we protect natural resources that reduce our vulnerability to hurricanes, storms, tsunamis, tidal waves, volcanic eruptions, and other natural disasters, we are also reducing the risk of costly wildfires and other disasters.

Wildfire prevention requires a workforce to consistently manage and reduce wildfire risk. This, in turn, requires ongoing efforts to attract youth and young adults to choose careers in wildfire prevention, including wildfire prevention-related conservation. Hawai’i currently has two complementary programs that provide opportunities for young adults to begin their careers in conservation and other sustainability-focused professions: the Youth Conservation Corps and the Green Job Youth Corps. Funding is needed, however, to continue these programs, and to build capacity to augment them to fund a generation of kama’āina who can fill the wildfire prevention and related green jobs needed to reduce the wildfire risks described in the Wildfire Prevention Working Group’s draft report. The young adults participating in these programs should be able to transition into good paying wildfire prevention-focused jobs once they complete their terms,. Investing in both of these areas – good jobs and good workforce development pathways – can create a virtuous cycle that will enable continued generations to prevent and reduce future wildfire tragedies.

In conclusion, the legislature should approve funding to protect, restore, and manage Hawai’i’s magnificent and irreplaceable natural resources for many reasons, most pertinently to save lives by preventing and reducing wildfire risk. Watershed restoration, invasive species management, climate change adaptation, water management, soil management, protection of biodiversity and other forms of mālama ‘āina are all critical to preventing wildfire risk. Likewise, these prevention efforts require a strong and prepared workforce to achieve our shared goals. All of this requires funding, which the legislature is uniquely empowered to provide.

We look forward to working with you to ensure that our natural resources are at the forefront of wildfire prevention strategy and that the state budget reflects these priorities. Please let us know how we can best help you advance these efforts and secure the funding necessary to preserve and restore Hawaii’s natural resources for future generations.

Thank you for the opportunity to testify,

TRUST FOR PUBLIC LAND

THE NATURE CONSERVANCY

KUPU

RESOURCES LEGACY FUND

Testimony: Hawaii Pacific Advisory Group, to Hawaii House Working Group on Environmental Remediation - November 17 2023 Honolulu Hawaii

To: Chairs Lowen and Cochrane, and Members of Hawaii House Working Group on Environmental Remediation

Hawaii Pacific Advisory Group, organized under NHO Hawaii Pacific Foundation, welcomes the opportunity to comment on the Working Group Draft Report dated Nov 1 2023.

Hawaii Pacific Advisory Group is a voluntary network of people who care about Hawaii and connect the dots, filling gaps. We focus on fire intelligence, disaster logistics, personnel safety, regenerative reconstruction, and community inclusiveness. We invite anyone from the working group to observe or participate directly in our ongoing Maui work, via Zoom check-in 3x/week.

Our Advisory Group acknowledges the Working Group findings. Work that HPAG partners have already started can contribute greatly to the larger challenge of Environmental Remediation, which we must look at as permanent changes to the way we do business, educate our citizens, and care for the future of our land. It is those motivations that caused us to start the processes I will describe a decade ago.

Reports are attached to my submitted testimony as these subjects are complex. I will summarize here and encourage extended interaction with the Working Group and collaboration on legislation.

1. Regenerative Agriculture and Ahupuaa ridge-to-reef thinking must frame how we re-construct our care of the land. I have started such a program on Lanai and offer it to my home island of Maui. The attached program is underway on Lanai and producing ulu. There is a strong connection between how we manage water in the soil and vegetation and fire risk.
2. Conversion of waste products otherwise destined for landfill into carbon-negative construction materials, clean water, hydrogen fuel, and bio char soil amendment/filter media is underway at a facility in Minnesota. A copy of the waste conversion plant is being planned for Hilo under the name Yummet. Waste conversion is by a molecular processing method derived from long-duration space programs where conversion of waste is essential. The Yummet process owner has volunteered to demonstrate conversion of Lahaina waste if we can ship a reasonable amount to the continental yard. A White Paper with specifics is attached.
3. Our Advisory Group has proposed to several Working Groups that a deep Fire and Hazard Intelligence Network be formed as the Information layer that underlies Unified Command, based on Aha Moku planning and response structure. Such a network adopts and depends on technology in Drones, Sensors, and Sensor Analytics to provide comprehensive picture of threats to drive informed emergency response. Such a network of drones and sensors is perfectly suited to perform Environmental monitoring as well. In fact the environmental monitoring is an essential element, observing vegetative fuel content and combustability among other factors.

The Hawaii Pacific Advisory Group stands ready to help Working Group with legislation.

Submitted on behalf of the Hawaii Pacific Advisory Group, mahalo a me ka pono.

George Purdy George.purdy@HPFSPS.org 808.559.0175

November 17, 2023

Rep. Nicole E. Lowen, Co-Chair
Rep. Elle Cochran, Co-Chair
Attn: Environmental Remediation Working Group
415 South Beretania Street
Room 309
Honolulu, HI 96813
ENRWG@capitol.hawaii.gov

Re: November 17, 2023 Public Testimony for House Representatives Environmental Remediation Working Group Draft Report

Testimony is strong support of the working groups recommendation to restore the historical Moku‘ula and Mokuhina wetland landscape and suggests a biocultural restoration approach.

Aloha Rep. Nicole Lowen, Rep. Elle Cochran, and members of the the Environmental Remediation Working Group

My name is Destiny Apilado. I am a Kanaka Ma‘oli ‘āina advocate from Mililani, O‘ahu. I am also an environmental management master’s student at University of Hawai‘i–Mānoa and I testify in support of the recommendation to restore the historical landscape of Moku‘ula and Mokuhina wetlands. Further, I recommend that this restoration undertakes a biocultural process.

First and foremost, I commend the Environmental Remediation Working Group for their ongoing efforts to secure funding for monitoring soil, water, and air quality to safeguard our community from environmental contamination. Equally crucial, however, is preserving and strengthening the deep-rooted connections between the people of Lahaina and ‘āina during the environmental remediation process. To achieve this, I propose a biocultural restoration approach that harmoniously restores both the ecosystem and the cultural relationships with this sacred place.

Moku‘ula, once the majestic residence of Hawaiian royalty and the heart of the Hawaiian Kingdom's capital, holds profound historical and cultural importance. This cherished site offers a tangible link to our ancestral heritage, unveiling insights into the traditional Hawaiian way of life, governance, and their intrinsic connection to the land and sea. By embarking on the restoration of Moku‘ula and Mokuhina, we have the extraordinary opportunity to honor and perpetuate these invaluable traditions and stories, ensuring that they are shared and cherished by present and future generations.

The restoration of Mokuhina wetlands may necessitate a financial investment, but its returns will encompass far more than monetary gains. By actively involving the community in the restoration process, we not only breathe life back into this historical site but also foster resilience throughout the entire ecosystem. Native plant species, waterbirds, and aquatic wildlife will find a thriving habitat in the restored site, potentially serving as bioindicators, reducing the need for frequent laboratory tests in the future. As the community engages with the restoration, it will bring about social and cultural abundance, a legacy that will ensure the long-term environmental well-being of this cherished place. Building resilience through this restoration is precisely what Hawai‘i needs to face the imminent challenges and effects of climate change.

The tragic events of August 8th serve as a stark reminder of the consequences of environmental negligence. The plans for future environmental remediation must recognize that the failure to protect the piko of Lahaina made the community vulnerable to catastrophe.

Article XI, Section 9 of the Hawai‘i Constitution unequivocally declares: “Each person has the right to a clean and healthful environment.” Through the wisdom of our kūpuna, we know that a healthy environment requires a symbiotic relationship between ‘āina and its people. In alignment with the Hawaii State Constitution, I implore the Environmental Remediation Working Group to plan an inclusive and culturally appropriate restoration of the historical Moku‘ula, engaging the community to ensure the environmental integrity of this sacred site for generations to come.

I wholeheartedly urge the Environmental Remediation Working Group to invest further in the restoration plan and consider the biocultural approach. This endeavor symbolizes our unwavering commitment to preserving Lahaina's unique history and natural beauty, forging a lasting legacy for generations yet to come. Mahalo for providing me with the opportunity to testify and advocate for this important cause.

Mahalo,



Destiny Apilado

dmapilad@hawaii.edu

**TESTIMONY
TO THE HAWAII STATE HOUSE WILDFIRE WORKING GROUP
NOVEMBER 17, 2023**

FROM: DAVID DELEON
HAIKU, MAUI

Thank you for this opportunity to provide my thoughts on the actions that must be considered after the devastating Lahaina Wildfire. I am David DeLeon, a resident of Haiku, Maui.

I am writing to express my concern that a key element to provide safety to the residents of Lahaina seems to have been missed in your otherwise exhaustive study of the subject: alternative evacuation routes out of Lahaina.

One of the lessons of this disaster is that we must learn from it. Apparently, despite having nearly losing Lahaina in 2018, we failed to take the time do the work your group is attempting now. If that had happened, perhaps there would have been a better outcome.

A key lesson about Lahaina's geography is that you can count on the Winds of Kauaula to cause hazards for Lahaina. This has always been a known geographical fact, celebrated in ancient stories and continuing into written history. They are sort of like the Santa Ana winds of South California. What changed on Maui in recent times is the loss of the sugar cane cover crop. Green cane that has not been prepared for harvest will not become a flash fire. It burns slowly. The wild grass that replaced the cane, when dried and coupled with high winds, will burn in a flash.

That means that human habitation around that portion of West Maui requires special measures for safety. One of those measures is the establishment of effective evacuation routes.

In the recent wildfire that need became abundantly clear. The existing road system failed to meet the sudden demand. As residents tried to escape the racing fire threat, some tried to use the Lahaina's dirt cane haul roads, only to find them locked. In some desperate cases police officers broke chains or rammed gates to make these escape routes available. One has to wonder what happened to those families who tried these routes before the officers arrived.

Consideration also has to be given to the trauma that the West Maui has suffered. If you have been around someone who has just experienced a trauma, you will note that they are now on guard, protecting themselves and their families against further harm. Many sat in traffic jams as the fire raced towards them. Some had to escape to the ocean for relative safety. The resulting emotional scars will be with them for life.

Knowing that the government has pro-actively created a system of evacuation routes – in addition to the regular highway system – may help ease their anxiousness when the winds again roar.

Because Lahaina was a plantation town not long ago, it still has a network of abandoned cane haul roads that can provide the base for an evacuation road network. While much of the work of re-building Lahaina Town's infrastructure – water, sewer, electricity, etc. – may take a decade to complete – the work of establishing an evacuation route system can start immediately with the government (county or state) taking possession of the existing cane haul routes; removing the gates and chains that impeded escape in August; and declaring them as evacuation routes.

That would be a pro-active step towards safety, towards mitigating the fear that something similar can happen again. It would be a step towards showing that we have learned from this disaster.

Maui already has one such existing route. While primarily built as a recreational route, the Northshore Greenway around the makai side of Kahului Airport was also designed as alternative route in the case the Hana Highway is suddenly out of service. The route's one bridge was designed and built to be able to handle a fire truck. Luckily, we have never had to use the greenway as an emergency bypass, but it is there if needed.

I have heard of similar discussions about giving the Waianae Community access to the Lualualei Road over the Waianae Mountains through Kolekole Pass into Schofield in the case that Farrington Highway is lost. Alternatives make sense.

The work to build out the Lahaina evacuation routes – planning, appropriating and construction of a one-lane route -- can follow a pace. But at least with the opening of the existing dirt cane haul roads as escape routes, the community will have an immediate alternative.

Mahalo for your consideration.

David DeLeon

dpdeleon@hawaiiantel.net

808-281-3269

Aloha mai kakou,

My name is Jackie Keefe and I am writing today to speak on the draft of the working group for environmental remediation.

First, the absorbent booming is not sufficient for any part of this response. We need more than just monitoring, and we need it two months ago. While I understand that this is not possible, I hope that helps stress to you the urgency of this matter... Lahaina needs bioremediated socks. While the current "booming" is helpful for trapping sediment, the issues that will come with the flood rains from our drought call for much more. The sediment that will be flowing this rainy season will be almost entirely made up of toxic waste and ash.

We already know that countless chemicals leached into the ground during and in the time since the fires. When the torrential rains come, as they do during a drought, Lahaina will need pyramids of bioremediated socks or "absorbent booming" that weave for miles through the streets of town. The reason that the pyramids are necessary is so that the water won't flow as quickly or be as likely to flow over the top. These socks should be filled with woodchips treated with mycelium and biochar, which will act as a filter for the toxins traveling in the water. Bioremediation is one of the only ways to break down the chemical bonds that make up toxic metals.

Drains must be monitored and protected as well, and the good news is that this part will be easier because they stay damp, making it easier to maintain the mycelium. It is a living organism which requires a moist environment to thrive.

Second, it is known that some of the copper pipes that carry our water melted 18" underground. Long-term water monitoring will of course be necessary, but so will funding to replace the entirety of multiple pieces of integral infrastructure in Lahaina town. If we're going to do that, we need to upgrade the entire infrastructure to an efficient, modern system... We need to look at modern technologies, and our state's laws make that difficult. We need to consider requiring that the replacement of Lahaina's infrastructure include things like dual water systems, AVOIDING septic systems in our conversion away from cesspools (as wastewater treatment facilities are also outdated technology), and underground lines and emergency systems. Please begin looking for the funding that this will require.

Next, I'd like to revisit the language used in your draft report regarding the landfill location. To my knowledge, this will be a permanent site because of the cost of shipping elsewhere. There is already discussion of "monitoring for 70 years" because of the concern that people have about how porous cinder is, since this is what the plastic-wrapped toxic waste will be stored in for degradation. I'd implore you to look into this, because most of us on Maui are not interested in this happening on island, especially so close to the water table and the shoreline.

I also appreciate the nod to Moku'ula in your draft, though I noted the missing language. The community is specifically calling for the return of Moku'ula and the surrounding abundant wetland. **This project will be a big lift.** Not only do we need to work the actual ground in that area, but also to reforest the mountainside. There is a lot of Kamehameha Schools land that would be a good location, but *there is far more state and other private land*. There are several large landowners who are trying to develop more of the specific kind of housing that we do NOT need – and they're sitting on agricultural land. They also control more than 75% of west Maui's water supply and sell it back to the people. This is unacceptable! It is time that the State reevaluates their kuleana, understanding that their obligation is to the people of Maui over the profits of private landowners. Restructuring the way that the state manages water is an inescapable part of bringing back Moku'ula and Lahaina's wetlands, and you must fight for us.

Lastly, I wanted to flag my comment about reforestation. I have attached the plan that George Purdy, a farmer, veteran, drone pilot, and firefighter shared with me from his project on Lana'i. His plan has inspired some of us here on Maui, and we are planning to use him as a consultant for our Lahaina reforestation project. His methodology is all about reestablishing the water capillary system, using limited water, and reversing desertification through the pairing of technology with Native Hawaiian farming practices. There are many groups who will be working to regreen Lahaina in the aftermath of this disaster, and I hope that you are planning to set aside funding for that necessary venture. It would be a show of true aloha and kako'o to ensure that some of the hundreds of millions of dollars raised by Maui's tourism industry are set aside to allow us the chance to truly shift towards responsible, regenerative tourism that benefits all.

I thank you for reading my message and hope that you connect with the attached resources with examples of modern technologies that we need to consider.

Mahalo,

Jackie Keefe

Lāna‘i Agroforestry Resource Park

The Lāna‘i Agroforestry Resource Park llc comes from the collaboration of partners' George Purdy, Negus Manna, and David Embery's combined and diverse experience. Additionally with their willingness to advance this project with excitement and joy for the betterment of Lāna‘i. It is believed by them that humans with a plan, and that have access to land in any condition will have the ability to grow a new beginning for their communities.



Photo of Lāna‘i's 2020 High School Graduation Ceremonial Celebration which was held in proximity to the proposed agricultural lands for Lāna‘i Agroforestry Resource Park.

What is this document?

The purpose of this document is to elaborate in detail, the Lāna‘i Agroforestry Resource Park llc & the Dry Land/Water Harvesting model and implementation phases of this dry land enterprise. The business plan is a living document and as such is continuously revised and updated as we learn and grow with regenerative agriculture operations here at the Lāna‘i Agroforestry Resource Park. We have prepared this guide and designed it to assist interested parties with supporting information on an optimized agroforestry design that can contribute to our community's development as we seek access to land on Lāna‘i.

Executive Summary:

The Lānaʻi Agroforestry Resource Park process will include both traditional and modern land-use approaches in which select trees are managed together with opportunities for additional crop production systems to be created in the setting. Agroforestry is practised in different regions of Hawaiʻi and Polynesia, where it produces food and value added products. This helps by contributing to communities nutritional security, sustained livelihoods, and in developing productive and resilient cropping and grassland environments. Agroforestry systems may also enhance ecosystems by storing carbon, preventing deforestation, increasing biodiversity, protecting water resources and reducing erosion. In addition, when applied strategically, agroforestry enables agricultural lands to withstand events, such as drought, and climate change effects.

The work schedule we are proposing will take three years to bring the landscape to full agroforestry use. The goal is 1-inch of biomass per year, 30 to 40 ton CO2 capture per acre. After this the landscape can be self-sustaining and no water will be needed from Lānaʻi water infrastructure. To start we will only need 200,000 gallons of water for the first three years if no water catchment with a tank or ground pond is built. A water truck will be used to fill water boxes for the trees and plants with 5-gallons three times per year.

You will find that the plan is laid out with solutions to dryland farming in very simple details that are achievable and measurable in actions that can be taken. There is no failure if not given the opportunity to break ground and implement this action plan. It comes from many resources we have researched and the final piece is the people who live here on Lānaʻi that love this land. The love of giving hope to what is possible is priceless. This team and the community members that are willing to work for such a plan to succeed makes this plan worth taking a chance on because the science and data will guide the way!

Concept overview:

Our Lānaʻi community is looking for leaders with vision to create an alliance to build a fair and diverse economy that is less dependent on imported goods. All while finding a way to restore our island at the same time in a way that is pono (harmonious). Lānaʻi Agroforestry Resource Park Management understands cooperation with ownership's vision for Lānaʻi is vital and would like to display to the community and youth of Lānaʻi that they have a future at home here. The Lānaʻi Agroforestry Park will serve as a model for Lānaʻi about Dryland/Water Harvesting and Regenerative Agriculture. This will showcase the different principles and techniques that could reduce costs, improve nutritional security, and have an increase in the land's biomass. We aspire to educate people that vocational job training in regenerative agriculture is not just environmentally viable but also economically profitable.

Insert: Impact Statement and financial overview.

By moving forwards with these sustainable agricultural practices, we estimate that this land can easily support numerous employees, while generating multiple benefits for our local economy.

Management Team Members:

George K. Purdy-Partner and Co-Owner

Functions overseeing: Chief Technology Officer (CTO)

Previous industry:-Owner, Drone Service Hawaii llc and Co-Owner and Project manager for Drone Design Hawaii.

(808) 559-0175 ; worldcat30@gmail.com

Negus M. Manna-Partner and Co-Owner

Functions overseeing: Chief Operating Officer (COO)

Education/ Certifications:-Interdisciplinary Sustainability Studies graduate from University of Hawaii.

(808) 367-6319 ; negus.m.manna@gmail.com

David Embrey-Partner and Co-Owner

Functions overseeing: Chief Executive Officer (CEO)

Related experience:-Owner and Operator of Kumu Ola Farms llc on Lānaʻi.

(808) 640-7129 ; lanaiaquaponics@gmail.com

Current AG Land condition:



Photos of the black plastic from the pineapple plantation days and of the invasive fire weed.
[Hawaii Invasive Species Council | Fireweed - Hawaii.gov](#) ; <https://dlnr.hawaii.gov/hisc/info/fireweed>

Current conditions have been barriers in bringing back agricultural ventures and in creating food security for the community residents. In the case of the introduction of microplastics in the soil on Lāna‘i, pineapples were grown on nearly every inch of cultivable land and unfortunately left black plastic embedded as a result threatening wildlife and spreading toxins. According to the Hawaii Invasive Species Council on fireweed it was first discovered on the Big Island in the 1900's and is now too widespread for control there. This invasive pest can also be found on Maui and Lāna‘i. Fireweed's preferred habitat is to invade pastures, disturbed grassland areas, and roadsides. It is very toxic to livestock when ingested, causing illness, and even death in severe cases.



To confront and halt these barriers we intend to grow topsoil and over time leave it underground by implementing the following phases; Earth works, water harvesting, and cover cropping.

These phases are the initial building blocks for carbon farming. Thus offering an opportunity in offsetting climate change instead of contributing to it. These tools improve the rate at which CO₂ is removed from the atmosphere and converted into plant material and organic matter for regeneration of Lāna‘i's landscape.

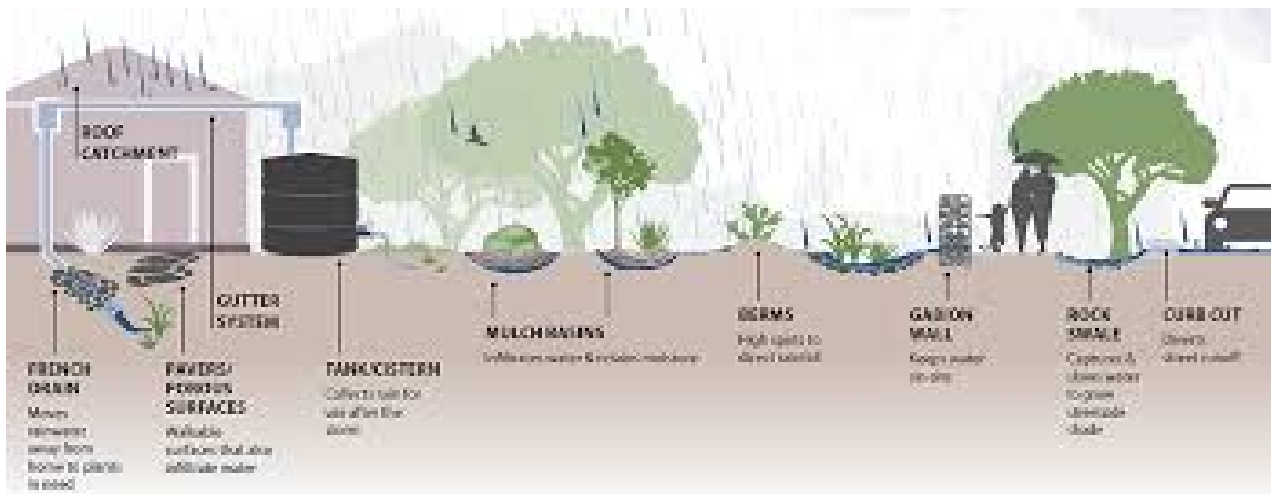
Earth works:



This phase is identifying the contour lines on the landscape and creating swales or dragging a yeomans plow on this line. This

will allow the water to slow down and percolate in the soil over time and be stored for later use. This method can often be seen utilized in permaculture designed agroforests throughout Hawai'i and Polynesia.

Water Harvesting:



Using the landscape and placing structures within the topography to slow and spread water over the terrain is how we will harvest water in this phase. Any extra rain water is to be collected and stored. We will launch a community project inviting home owners to join in on our **Rain gutter to farm land project**. We will install gutters, piping and a 500gal tank to capture the water - then we will come by and collect and store it at our farm from each home. We can expect 20 homes will give us adequate water supply to start the first year.

Cover Crops:



Photos of cover crop cocktail and common tractor method of maintaining biomass.

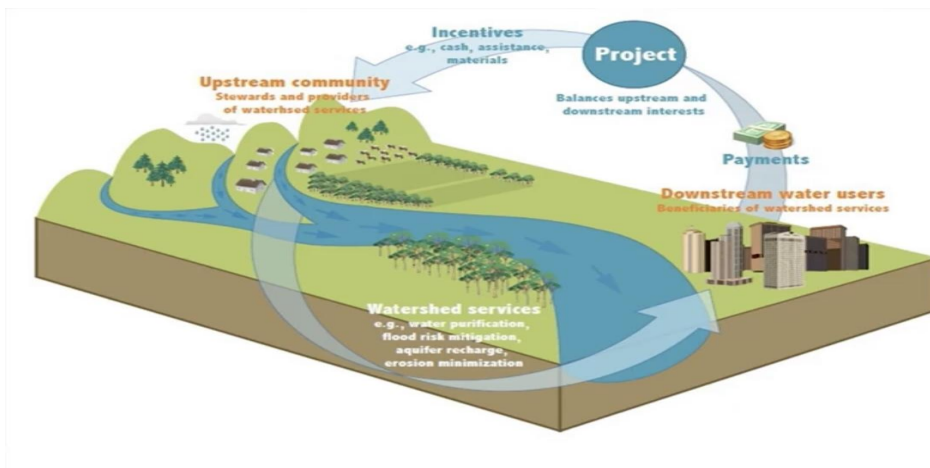
A diverse cocktail of cover crop seeds are planted in this phase to build biomass and trap CO₂ in the ground, this starts creating a sponge to hold water for later use. Commonly used in Hawaii include sesame and marigold. Other legumes commonly used in Hawaii include lablab, pigeon pea, and cowpea. Other grass cover crops commonly-used on Hawaii include sorghum-sudan grass, black oats, pearl millet, and rye. The second picture is how we manage the cover crop. It is a roller crimper and no till drill for planting seeds to regrow. This is how we will achieve creating biomass and healthier soil.

Healthy Soil Soaks up Water:

To help the community better understand the environmental benefits of the soil acting as a sponge, a demonstration can be made by poking holes in a cup and filling it with water, then “raining” onto two very different visual landscapes. Consider what happens when a cup rains water down onto bread (as a proxy for healthy soil), versus a cup that drains onto flour (which functions like degraded soil). The bread (soil sponge) will effectively absorb and hold the water without falling apart, whereas the flour will erode as the water beads up and spills off of it (degraded soil). Regeneration of Lanai landscape enables agricultural lands to withstand events, such as drought, and climate change effects.



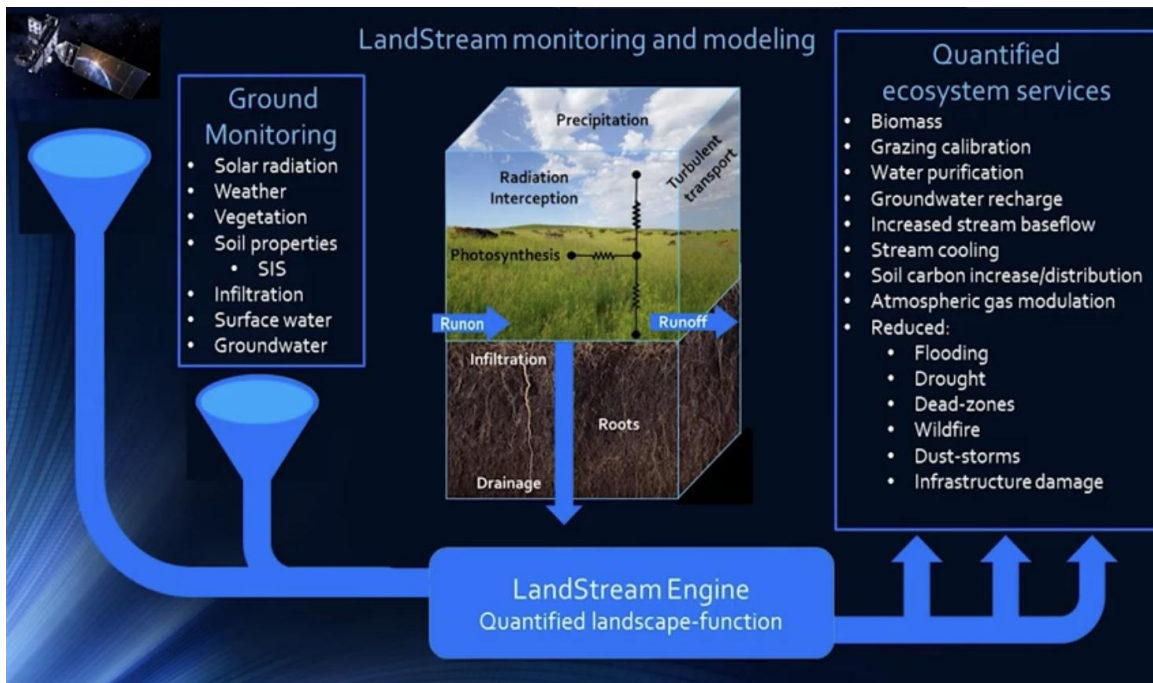
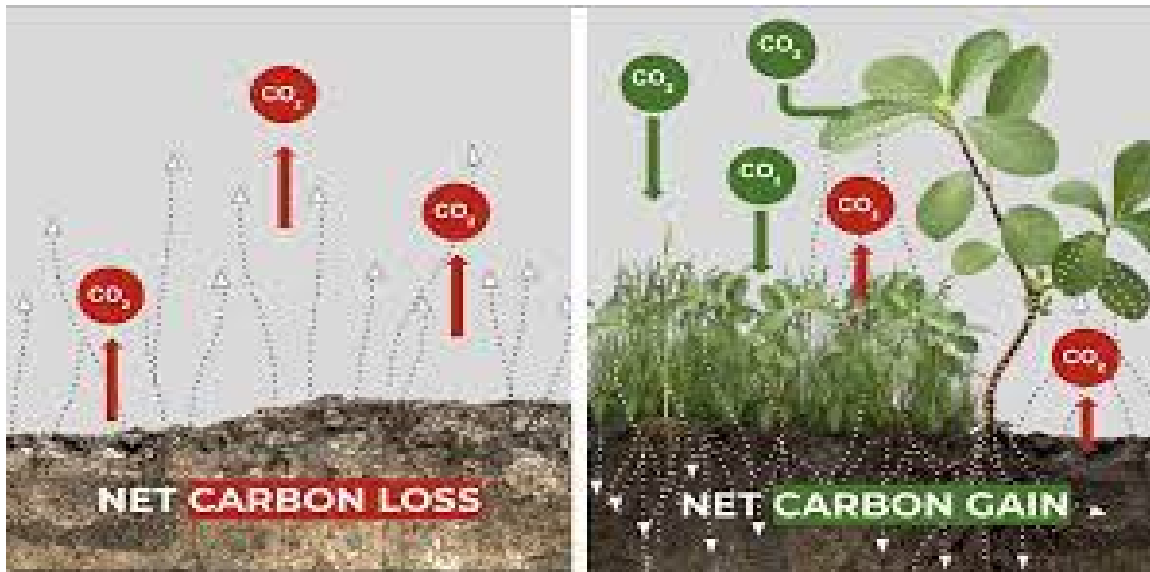
Carbon Farming: By implementing these practices mentioned, Earth works, water harvesting, and cover cropping we set up ourselves to become carbon farmers. Carbon farming seeks to reduce emissions in its production processes while increasing production and sequestering carbon in the landscape. This is a simple process accomplished by farming in a way that reduces Greenhouse Gas emissions and captures and holds carbon in vegetation and soils. It is managing land, water, and plants to meet the Triple Challenge of Landscape Restoration, Climate Change and Food Security.



Regenerative economics

- Forbes: The \$8 Billion Bargain: How Watershed Payments Save Cities, Support Farms And Combat Climate Change

Regenerative Economics



Carbon Credit payments: To collect this payment we will have to prove Carbon capture in the ground. To achieve this careful documentation by using technology as in soil sampling, moisture sensors, and infrared imaging to capture the progress over time.



MUSK FOUNDATION

Elon Musk, X Prize launch \$100 million carbon-removal competition

The Carbon Removal X Prize challenges entrants to demonstrate ways to remove large amounts of heat-trapping carbon dioxide from the air or oceans and lock it safely away for long stretches. The competition is open to anyone around the globe, and it will run through 2025.

Lānaʻi has a team in this competition lead by George Purdy Team Name: **Ike Hou Lānaʻi (Rediscover Lānaʻi)** below is our information on how to execute our physical action to solve this problem.

The most recent data from the Environmental Protection Agency's Greenhouse Gas Inventory Data Explorer reveals U.S. greenhouse gas emissions in 2018 totaled 6.7 billion metric tons in CO₂ equivalents, up 2%, or 188 million metric tons, from the previous year ([Agriculture's Greenhouse Gas Emissions and Sinks](#)). Compared to 1990, U.S. GHG emissions have increased by 4%, or 240 million metric tons.

To offset GHG emissions and reduce atmospheric CO₂, carbon can be trapped in soils through various carbon sink activities such as the growth of trees, forestry management that reduces forest fires and forest degradation, increasing below-ground plant matter and sequestering carbon in soils through cropland, wetland or grassland management. A variety of carbon-capturing practices are used on agricultural lands, including but not limited to conservation cover crops, no-till or reduced tillage, anaerobic digesters and nutrient management, e.g., [GHG and Carbon Sequestration Ranking Tool](#).

EPA data reveals that during 2018 carbon sequestration efforts resulted in an increase in CO₂ stocks, i.e., carbon removed from the atmosphere, of 764 million metric tons. CO₂ removals in 2018 represented 12% of the total GHG emissions and resulted in reducing net GHG emissions to 5.7 billion metric tons. Since 1990, the ability to reduce carbon stocks through land and forestry management practices has decreased by approximately 9%, or 80 million metric tons of CO₂ equivalent. Today's article reviews trends in carbon offsets achieved through forestry, grassland, cropland and wetland management.

<https://www.fb.org/market-intel/reviewing-u.s.-carbon-sequestration>

According to data analyzed by carbon farming expert Eric Toensmeier, farmers who convert to no-till practices and start using cover crops may achieve a net carbon gain of only one or two tons per hectare each year, however the more diverse agroforestry systems in the tropics may achieve improvements of 30 or 40 tons per hectare. For example, if a farmer with a 100-hectare farm (250 acres) was able to sequester 2 metric tons of carbon per hectare and sell the credits for \$15 each (100 hectare × 2 tons × \$15), they would net \$3,000. Depending on the practice, that income might accrue yearly, or it might be a one-shot opportunity.

<https://modernfarmer.com/2016/04/carbon-sequestration/>

Action Plan

Insert Cash Flow Projection, a timeline Year 1 shows a monthly breakdown and then a yearly summary for years 2-5.

Operational Needs:

Below can only happen when we receive funds and everything is on island prior to start. This start window will be one month before the wet season starts on Lānaʻi. It will continue through until the end of spring - at this point we will play the weather forecast and take advantage of any rainfall for the summer months. Then we roll the fields and start the process all over again for the next two years. Data will drive quick decision making through the year to gain as much advantage nature will allow.

When we receive more funding or generate our own capital we are looking at our equipment to be all electric. This will get us close to carbon neutral and or negative. We are starting with fleet trucks, the F150 all electric. First year land rehab fuel base equipment is a must, second year and beyond electric equipment is all that will be needed. Cost per acre will be \$250 or less, 88% savings from the first year. Data analyst will be 75% of the work to collect on the carbon credit payment, as the farm matures diversity of economic benefits start to emerge and will carry it for the long haul.

Equipment:

1. 2 track skid steers with impliments \$200K
2. 2 X F150 Electric truck with a trailer 1000 gal tank \$140K
3. Farm tractor with no till drill seeder and roller crimper \$100K
4. Farm building for equipment, office and water catchment \$200K
5. Water storage tank 10,000 gal \$12,000
6. Groasis water box 10,000 units \$75K
7. Fencing 100 acres \$200K
8. UAS, weather station and ground moisture sensors. \$100K
9. Rain gutter to farm land community project 500gal, 20 homes \$60K
10. Miscellaneous \$113,000 (cushion for shipping cost variations due to rural location and increase cost to materials and building supplies).

Total: \$1,000,000.00- **Maui County Grant in Cash Flow**

- \$3,333.33 to rehab 1 acre of land for the first year.

Operational Tasking First Year:

1. Mow 100 acre perimeter only and start fencing. 2 weeks
2. Mow landscape 25 acres block 7 days
3. Earth works for water harvesting 10 days per 25 acre block
4. No till seed drill 1 day
5. Weather report, plant cover crop seeds 5 days from rainfall.
6. Fencing 10 days per 25 acre block
7. Plant trees with Groasis water box 100 trees per day, goal 10,000. 100 days
8. Observe work completed Make adjustments to monitor cover crop life cycle. ongoing
9. All 100 acres in six months.
10. Review data and monitor the weather. On going
11. Rain gutter to farm land community project 20 homes until goal is met.

Operational Task Second Year:

1. Water Collection top off farm tank.
 2. **Hawaiian Moon Calendar**
 3. Crimp roll cover crops and replant for the wet season.
 4. Review Data and monitor weather.
 5. Create ponds and more water storage on the landscape.
 6. Fence maintenance.
- Maintenance per acre cost \$250

Operational Task Third Year:

7. Water Collection top off farm tank.
 8. **Hawaiian Moon Calendar**
 9. Crimp roll cover crops and replant for the wet season.
 10. Review Data and monitor weather.
 11. Create ponds and more water storage on the landscape.
 12. Fence maintenance.
- Maintenance per acre cost \$250

At this point we review how to move forward, this plan has laid out the possible future of this project only mother nature may change this outcome. With our partners' fire department training in restoring a community after a disaster and experience in agriculture and the military helps us to readily execute this work plan with excitement and joy of a better Lāna'ī .

Solving the water Issue:

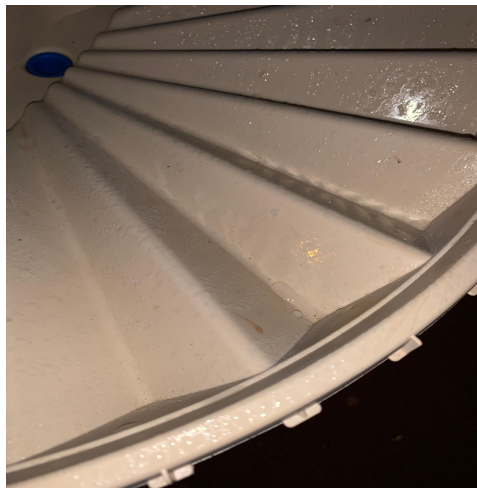
1. *Groasis Waterboxx reversing desertification*

The *Groasis Waterboxx* is an instrument that collects water by catching rainwater and collects water produced from condensation within the box. The Waterboxx then distributes the collected water over an extended period of time to the tree growing in the center of the Waterboxx.

Furthermore, it stimulates the capillary formation of the soil; prevents the evaporation of groundwater; steadies the temperature around the roots; fights competitive weeds near the planted tree; and can even prevent damage caused by rodents. Waterboxx is one of our tools to reverse desertification combined with biomass weed mats to start addressing accessible areas here on Lānaʻi. Product is from Europe and will take 4 months to get here at a cost of \$75K, traditional irrigation will cost \$200K for the 100 acres, this does not include getting a water main to the site. We don't need it because we are going for a micro climate change for sustainability.



Photos: The Groasis boxes are in use at properties on Maui and Lānaʻi by George Purdy, who is a pioneer in bringing this technology to Hawaiʻi.



Community Involvement

Project 1 Rain gutter to Farmland Project:

Community support for the farm we would use \$60K for 20 homes to help support our water needs. Below is a 500gal system, farm investment \$3,000 per home. The RainFlo 500 Gallon Complete Above Ground Rainwater Collection System is designed with premium components for optimal performance in residential or commercial applications.

After a rain event we will go to our sponsor homes, empty the tank with our water tanker, and deposit the water at our storage tank at our location. Lānaʻi is unique because of the short distance to the farm and with the future of electric trucks there will be no fuel dependency.



Project 2 Cardboard Recycling:

Lānaʻi Cardboard Box recycling for mulch and earthworm cultivation. Here is an example from my Costco order, the second picture is shredded cardboard 20lb for \$70.

Great for pet bedding, making fire starters, padding packages, adding structure to your compost, we've got as much shredded cardboard packaging as you could possibly need.

This will be another opportunity for the community to participate in this ag project and reduce landfill waste for something we can use.



Project 3 - The 10,000 Tree project fundraising: Milo and Ulu \$2,990,000.00 (Carbon Credit payment)

We are going to promote an opportunity to crowdfund capital for people to sponsor a tree planting for \$299.00. Because of our imagery collection we will be able to GPS locate where their tree is planted and be able to check in on that tree for the life of this area and can be passed on to their families in the future what their kupuna made as a contribution.

The Hawaiian name milo means to twist, curl or spin and may be a reference to the tree's growth habit, especially in windy locations at the seaside. Though it is known that milo was brought to Hawaii by early Polynesian settlers, it is also possible that it was already growing in the islands. The bark of milo was used for cordage fiber, similarly to hau, but it is inferior in quality to hau and to olona. The **tree** also yields tannin, dye, oil, medicine and gum, from various parts of the plant. The **milo wood** was skillfully crafted into poi bowls called `umeke `ai, and into plates, too.

Milo is usable within how long?

Meet Hawaiian 'Ulu, the Protein-Rich Tropical Superfruit

An ancient example of modern-day sustainable agriculture, the life of an 'ulu tree spans decades. As legend has it, the god Ku transformed himself into an 'ulu tree to feed his human family and spread the fruit trees throughout the Hawaiian Islands.

"Breadfruit embodies sustainability and food security more than any other food crop in Hawaii." Lots of value added products. E.g. Pono Pies- Maui Breadfruit Company's John Cadman. Cite ULU Co-op success in Big Island and are coordinating with their advisors.



Long term management: Once the landscape is working the **Hawaiian Moon Calendar** will guide operations on what needs to be done for example: harvesting and replanting.



Products Developed on island: Biomass, food, woodworking, water and recycled cardboard products for Lānaʻi restoration projects. For example, grass bail, also known as biomass weed mats, can be used as a base to reverse desertification, Ulu Fruit, Milo wood, shredded Cardboard and surplus water.





*If we think small we will make small changes,
but if we think big we can make big changes.*

For more information:

Lāna‘i Agroforestry Resource Park llc: # (808) 559-0175

George K. Purdy, Negus M. Manna, & David Embery.

MAUI BIOREMEDIATION GROUP

Problem & Next Steps

Flames have reduced much of Lāhainā, the first capital of the Hawaiian Kingdom, to ash. Hot enough to melt metal, the fire consumed homes, cars, and more, releasing toxic chemicals into the environment. These toxins are now threatening 'āina (land that feeds), wai (water), human communities, and marine ecosystems. Contamination has already occurred, but immediate remediation can mitigate the aftermath. We must do so before it permeates further into our water sources, ocean, and soil.

We advocate for bioremediation to avoid the negative consequences common of industrial solutions. Moving urgently, we, respective experts in the field, under the advisory of cultural practitioners and community leaders, have collaborated to present a comprehensive remediation plan featuring the following proven models as phases to address the post-fire contamination:

Practices

Plant Remediation (Phytoremediation): Plants are used to extract pollutants from soil and water. Selected species absorb contaminants like heavy metals and organics, aiding breakdown through roots. Plants act as green buffers, curbing erosion and runoff, thus restoring soil and water quality.

Compost: (Solid Microbial Amendments): Bio-complete Compost, Biochar, and Bokashi: These amendments improve soil structure and microbial health. Compost provides nutrients, Biochar captures pollutants, and Bokashi adds beneficial microorganisms. Using them aids in pollutant breakdown and fosters new plant growth.

Compost Tea (Liquid Biological Soil Amendments): Liquid treatments with beneficial microorganisms enhance soil health in fire-affected areas. They increase microbial activity, break down contaminants, and promote soil structure, water retention, and nutrient availability, aiding ecosystem recovery.

Fungal Filters (Myco-Filter Socks): Mesh tubes filled with biomass & mushroom mycelium, which can uptake and neutralize various pollutants. They serve as living filters, purifying the water as it flows through them.

Non-Profit Partnerships



TEAM

Paul Apao

Co-Owner of ALGH LLC,
Macadamia nut farmer

Vi Girbino M.S. in Tropical
Conservation Biology and
Environmental Science

Hannah Hartmann M.S. in
Tropical Conservation Biology,
Mycorestoration Specialist,
Community Advocate

Sanae Hartmann PhD Fellow in
Geography: Bioremediation at
Red Hill

Kaipo Kekona

Cultural Practitioner
President of the HFUU

Chase McLean B.A. History
Permaculture Design Certificate,
Field Mycologist for Hawaii Fungi
Project

Summer Perrin Lab researcher
for Hawaii Fungi Project, Owner
of Environmental Solutions Maui

ADVISORS

Taye Bright B.S. in Biology and
Environmental Science, Post-fire
restoration researcher for
CoRenewal

Alan Booker, Founder and
executive director, Institute of
Integrated Regenerative Design

Maya Elson Grad. Cert. in
Ecopsychology, B.A.
Environmental Studies, Post-fire
restoration researcher for
CoRenewal

Jerry Hatfield PhD Agricultural
Climatology and Statistics,
Former Director of the USDA
Laboratory for Agricultural
Research Service
2007 Nobel Peace Prize Laureate

Enoka Phillips

Cultural Practitioner
Lahaina Lineal Descendent

Olivia Spencer M.S. in
Geography

GIS Analyst and Fire Ecologist

Rebekah Uccellini Kuby

Landscape Architect, Post-Fire
Remediation/Recovery

MAUI BIOREMEDIATION GROUP

Due to the onset of rainy season, it is imperative that immediate action is taken.

Where

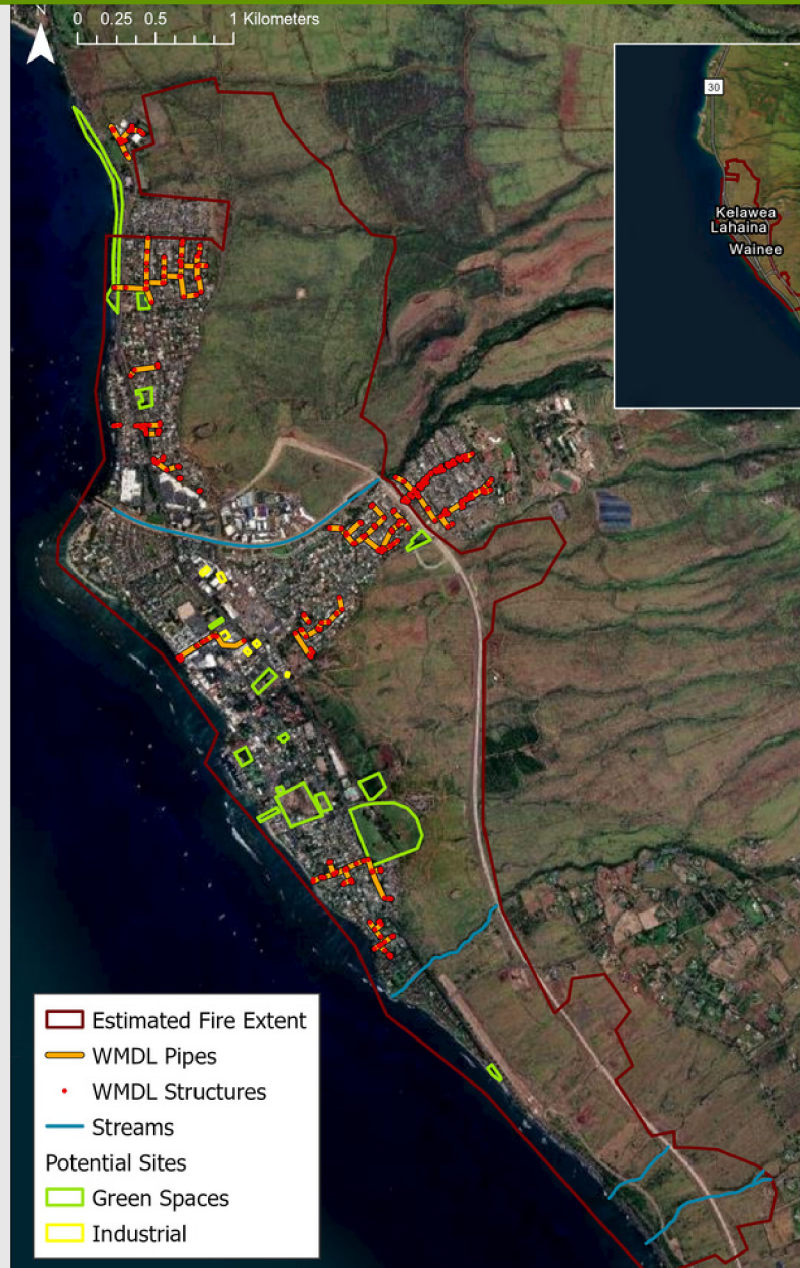
Our analysis yielded results pinpointing sites in need of priority treatment within the affected areas. We identified these priority sites based on several criteria, including their cultural significance, industrial usage, and the presence of green spaces. Furthermore, our analysis took into consideration both perennial and seasonal water movements along established waterways. We cross-referenced our preliminary results with a cultural practitioner and lineal descendant of Lāhainā to ensure accuracy and that we mālama pono.

Myco-socks (fungi-infused silt socks) will be placed in areas to best intercept contaminated water and sediment. Liquid Biological Amendment will be applied to all accessible green spaces. Phytoremediation and Compost/Biochar will be applied in replanting areas pending meetings with community leaders & county representatives.

Timeline

Sampling and monitoring should begin immediately, and continue for the next 12 months. **Myco-Filter Sock** project has an estimated timeline of 5-6 weeks per heavy rain event. **Liquid Biological Amendment** will be a 12 month application process.

Phytoremediation, Compost, and Biochar are mid to final phases of the project, and are expected to begin following debris removal. This is estimated to be a 5 year project.



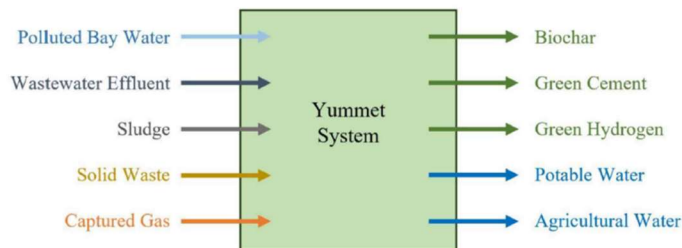
Volunteers from several organizations are on standby and ready to help implement our action plan.

For more information please call, email, or visit:
808-276-3454 | info@mauibioem.org | www.maubioem.org

Yummet Introduction

Yummet is the leader in developing state-of-the-art technology to convert waste into valuable products in an environmentally positive manner. Our process mimics nature's way of breaking down molecules and re-building them into minerals, soils, atmosphere, and water.

The Yummet process is versatile and can handle a wide range of waste feedstocks, including landfill waste, metals, plastics, glasses, green waste, industrial waste, construction waste, seawater, and wastewater. We derive the energy needed to operate our system from the waste itself through a pyrolysis-like, thermal-chemical process. Our facility in Hilo is scaled to divert approximately 840 metric tons of waste from landfills and up to 5 million gallons of wastewater effluent from the wastewater facility daily. The Yummet process generates 4 main products:



1) Carbon-negative cement. Sold as cement and used to produce carbon-negative concrete.

2) Green hydrogen. This high-purity green hydrogen has various applications, including fuel cell usage, and can be sold at prices not yet seen in the green hydrogen market.

3) Biochar. A carbon-based soil amendment that enhances crop yield, improves resistance to drought and diseases, and protects waterways and coral reefs from toxic runoff.

4) Clean water. Potable drinking water and agricultural water for the community.

Leadership and Experience

The Yummet leadership team has extensive experience leading large multi-disciplinary teams in designing, developing, and delivering complex technologies and projects of large scale. We have strong expertise to execute successfully, drawing from a pool of 300+ collaborative consultant talents globally.

Chief Executive Officer and Founder – Brittany Zimmerman: Ms. Zimmerman is the Founder of Yummet. Ms. Zimmerman was selected earlier in her career as the Youngest NASA Principal Investigator (PI) and served as PI for three NASA Programs. She performed as the Lead Engineer, Program Manager, and Inventor in the development of multiple patents and/or technologies for the ISS, Artemis, US DoD, and the private space sector. She has received over \$85 Million dollars in proposal selection for human spaceflight systems.

Chief Financial Officer – Henry Hu: Mr. Hu has over 25 years of experience as a finance & strategy leader. Previously the CFO at IBM systems, he led teams to triple strategic initiatives revenue to \$4.2 Billion. Mr. Hu launched 2 IBM innovation centers, and supported \$34 Billion in cloud M&A. He previously served as the VP of Strategy & Transformation at 1010data.

Chief Operating Officer – Dr. Kevin MacDonald: Dr. MacDonald has over 30 years of experience in the design and manufacture of high-performance concrete and is responsible for producing over 3 million cubic yards of Cement. He was the former VP Engineering at Cemstone Products, a former Board Member of the American Concrete Institute (ACI) and was named one of the 5 most influential people in the Concrete Industry in 2009.

Chief Technology Officer – Dr. Chris Cogswell: Dr. Cogswell is a leading expert in the design of nanostructure solids for capture and conversion of CO₂ and sustainable systems. He has aided in the design and safety of some of largest petrochemical facilities globally.

Chief Policy, Equity, and Culture Officer– Melinda Hughes: Ms. Hughes has over 25 years of environmental and policy experience. Ms. Hughes was a key member of the Creation Team for Al Gore's Climate Reality Training. She was a former Senior Manager with the National Wildlife Federation and is the current Executive Director for Thurston Climate Action Team.

Chief Marketing Officer – Bryce Groark: Mr. Groark is an Emmy-Nominated Cinematographer for his Netflix film, Mission Blue. He has over 20 years of experience promoting ocean health for National Geographic, Discovery, HBO, Tesla, Red Bull, and more.

Director of Innovative Concrete - Dr. Rex Donahey: Director of Innovative Concrete for the American Concrete Institute (ACI). He was a publisher and the Editor-in-Chief for Concrete International over 18 years. Prior Director of Engineering & Development for Composite Technologies.

Hydrogen Operations Lead – Ebrahim Takolia: Founder & CEO of Green Hydrogen solutions. Mr. Takolia is an expert and executive in full gas infrastructure value chain who oversaw more than 10 hydrogen projects through project lifecycle internationally.

Founded on Hawai'i Island, Yummet Hawai'i LLC is working with Hawai'i agencies, state and local, industry collaborators in construction, energy, transportation, utilities, and agriculture. We are partnered with local non-profit organizations and are working with workforce development groups and educational systems throughout the state. Our organizational decisions are based on a platform of science-based environmental and social sustainability.

Yummet uses waste streams as the only inputs, without the need for mining or calcination. By converting waste into valuable products, Yummet mitigates CO₂, reduces the need for traditional cement and synthetic fertilizing soil amendments. Our carbon-negative cement and biochar offer environmentally friendly alternatives while addressing waste management and climate change challenges.

This process yields sustainable commodities for the community: Green Concrete, Green Hydrogen, Biochar, and Water. The cement and concrete produced at the Yummet center are the most carbon-negative concrete products tested to date. This process produces a coproduct in the form of gaseous green hydrogen. This green hydrogen has a purity of 99.998%, making it appropriate for fuel cell applications, and can be sold at near-moonshot prices because it is a byproduct of the Yummet cement production. Additionally, biochar is produced. Biochar is a carbon-based regenerative soil amendment product. Biochar regenerates stripped soils, increases crop yield, improves cultivar resistance to drought and pathogenic diseases, offers a local and sustainable alternative to synthetic fertilizers, and captures toxic runoff to protect waterways and coral reefs. Clean water, both potable and R-1 agricultural water, are major output of this system.

This interconnected process is feasible because of the unique cementitious material created by Yummet, which can then be used to produce our carbon-negative concrete. The unique cement chemistry of this material allows it to hold significantly more secondary species than traditional Portland cement-based concretes, including solidified carbons, metallic oxides, and other materials considered industrial waste. This ability to utilize materials previously considered to be waste in the cement binder material allows for these connected technologies to become economically feasible as well as have an unprecedented positive impact on the environment.

Municipal waste processing technologies have been considered for some time within the industry. These methods have been held back, however, due to two major concerns. First, traditional processes produces significant amounts of solidified carbon black. Therefore, converting municipal waste to solid carbon would simply be kicking the proverbial can down the road, by replacing one landfill for another filled with carbon black. Second, traditional systems used as an energy generation system traditionally produce some small, yet relevant, amount of greenhouse gas emissions. Traditional estimates ranging from 10-15% of the carbon in the feedstock waste being released as emissions. Although significantly better than traditional fossil fuels such as natural gas or coal, standard units would highly limit greenhouse gas emissions but not stop it completely.

This is where Yummet's state-of-the-art technologies make an extraordinary breakthrough. Unlike traditional systems, Yummet captures the 10-15% of the carbon that is traditionally expelled and transforms the carbon into a solid that has been considered a waste product in industries for a long time but is now utilized by Yummet in the production of our carbon-negative concrete product. Because these materials are waste products to all other organizations, it significantly hinders the economic benefits of other technologies and causes a negative environmental impact. Similarly, in the purification of the water that comes into our system, the concentrated waste stream are typical major waste issues and end up polluting the environment. The Yummet concrete allows for these issues to be overcome by incorporating all these wastes into our revenue generating product.

Equity and Cultural Impacts and Considerations

Hawaiian tradition and history describe the concept of circular sustainability better than almost any modern sustainable textbook could. Only taking as much as one needs from the environment, and replacing that which one takes, is a key tenant. The Yummet solution is built on a similar foundational principle, taking the engineering we already practice in space (where every atom is a rare and precious commodity not to be wasted) and applying it to issues faced on the Earth. This system is built around the idea that the relative abundance

our engineering has so far taken for granted is coming to an end, and that it is more prudent to design systems that do not take more than they really require for operation. And of what they take, more should be provided to account for this loss. It is our belief that this purpose and the unique culture of the Hawaiian people make building sustainable systems on these islands a return to previous ways of living, as much as they are a shift towards the engineering of the future.

To date, Yummet has had significant community engagement on the Island of Hawaii, where we have had boots-on-the-ground representation for over a year. Through this effort we have been lucky to learn from these communities and share our vision, as well as working together to shape the solution to become something that the local community can be proud to take part. During this time, Yummet representatives have experienced life in multiple areas of the island, immersing themselves in the community and in community issues. Some of the places we have visited and worked with community members are schools, businesses, civic and social organizations, and we have also met with elected leaders. We have strong community support for Yummet on the Island of Hawaii and specifically in South Hilo, by the communities of Keaukaha, Pana'ewa, and King's Landing which are the communities nearest to where our facility will be built.

The Hawaiian culture and traditions are an important part of the communities' identity, and efforts have been made to preserve and promote these traditions and their environment. In 1921, the Hawaiian Homes Commission Act intended to return native Hawaiians to the land while encouraging them to become self-sufficient farmers, ranchers, and homesteaders on leased parcels of reserved land. The Keaukaha Homestead was the first residential homestead developed on Hawaii Island in 1924 to place socially disadvantaged native Hawaiians onto reserve lands. In 1976, Keaukaha-Pana'ewa Homestead was the second homestead on Hawaii Island to be mapped out and made available as agricultural farming opportunities for native Hawaiians. The first awards of these agriculture lots were granted to 50 Keaukaha Homestead residents forced to relocate due to the new International Airport.

Today, this area is home to 1,140 Native Hawaiians, 285 agriculture lots, situated on 1,615 acres. While the native Hawaiians of Keaukaha and Pana'ewa understand and support development, they also want it to make sense to their community and their health. Likewise, there is a strong sense of community and commitment to preserving their unique identity and way of life.

In working with Malama ka Aina Hana ka Aina (MAHA), we will strive to help preserve culture, diversity, and the environment. For example, our facility helps clean air and water. Together we collaborate and work with the neighboring communities to take their wastes and showcase a sustainable transformation of the wastes into useful commodities. These commodities help build infrastructure, provide water, store energy and help in revitalizing soils. Our organization is built as an employee-owned organization, which gives ownership to all who are employed with the Yummet Facility. With local job offerings for neighboring communities being prioritized, it is the hope that the organization will have a large amount of hawaiian ownership through this Employee Stock Ownership Program.

Yummet is happy to work with and discuss how we can work collaboratively with native Hawaiians across the state. Please reach out for more information.



Brittany Zimmerman
FOUNDER and CEO



Yummet | Celestial and Terrestrial Sustainability

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