SOILTHRIVE™
ENVIRONMENTAL SOLUTIONS MAUI LLC

MAUI NUI
MARINE RESOURCE COUNCIL

REEF FRIENDLY LANDSCAPING
PILOT REPORT

PREPARED FOR: MAUI NUI MARINE RESOURCE COUNCIL

Prepared by
Environmental
Solutions Maui, LLC

info@esmaui.com
www.esmaui.com

Project Goals

The purpose of our pilot program is to facilitate the transition of hotels and developments along beaches from conventional chemical landscaping methods to safe, nontoxic, and reef-friendly biological amendments. By introducing beneficial microbes that support plant health and natural resistance to pests and diseases, our program aims to demonstrate a cost-effective and sustainable landscaping solution that aligns with environmental conservation efforts. Through this initiative, we seek to promote the adoption of environmentally responsible practices within the hospitality and development industry, fostering healthier ecosystems and contributing to the preservation of coastal environments for future generations.

The Product

SoilThrive™ Liquid Biological Amendment product is made on Maui by aerating our Engineered Biological Compost and monitoring microbial content, then adding specific foods to feed the desired beneficial microorganisms. Once food is added, the microorganisms become active, proliferate in number, and start producing enzymes.

The enzymes act as a glue, this allows us to spray our product as a foliar feed, as well as a preventative pest and disease solution. Biocomplete Compost Tea is a climate smart replacement product for herbicides, fungicides, and foliar feed fertilizers. SoilThrive™ liquid biological amendment is made from materials sourced locally, or grown on-site, which makes our product have the least carbon footprint possible. This means we can go directly from production to distribution, with no inputs needing to be shipped for our ongoing production. This creates a localized solution for a global problem, while at the same time, diverting green waste streams within our own operation.

MAUI NUI
MARINE RESOURCE COUNCIL

SOILTHRIVE™
ENVIRONMENTAL SOLUTIONS MAUI LLC

Benefits of Adding Soil Microorganisms

Adding beneficial microbes to soil significantly enhances plant health by:

1. **Improving Nutrient Uptake**: Microbes break down organic matter, making nutrients more accessible to plants.
2. **Boosting Root Health:** Symbiotic relationships with fungi improve root absorption of water and nutrients.
3. **Disease Resistance:** Certain microbes suppress plant pathogens, reducing or eliminating disease prevalence.
4. **Enhanced Soil Structure:** The activity of microbes in the soil boosts aeration and water-holding capacity, which in turn promotes the development of more extensive and longer root systems. As a result, plants become more efficient in water usage, reducing their overall water needs.
5. **Natural Pest Deterrence:** Some microbes naturally repel pests. This is nature's way of plant insect control without any need for chemical insecticides. When switching from conventional chemical insecticides to only non-toxic biological amendments, the plant and soil will regenerate fairly quickly and insects will die off and, once again, the plant will gain back its natural ability to repel pests.
6. **Stress Tolerance:** Plants in microbe-rich soils better withstand environmental stresses including fires and droughts.
7. **Stimulating Plant Growth:** Microbes can directly or indirectly promote healthier, more vigorous plant growth.
8. **Sustainable Health:** Microbe-enhanced soils support long-term plant health, eliminating any need or dependence on chemical inputs.

In essence, beneficial microbes create a more favorable soil environment, leading to healthier, more resilient plants, the way Nature intended.

Key Performance Indicators

1. Soil Microorganisms - Measure and Compare starting and ending.

When beneficial microbes are sprayed on plants or injected into the soil, we anticipate observing a rise in the beneficial microbial population in the final soil samples compared to the initial soil samples.

Soil samples will measure fungi, bacteria, actinobacteria, fungi to bacteria (F:B) ratio, protozoa, flagellate, amoebae, nematodes, as well as the detrimental microorganisms, disease-causing fungi, anaerobic protozoa, and root-feeding nematodes.

We will take note of any increase in the (F:B) ratio compared to the preferred ratio for the target species.

*It is important to recognize that this method may not provide a comprehensive picture of the soil biology because the sample size is extremely small; 1" soil sample over a 1/4 acre pilot area.

2. Pest Problems - Measure and compare before and after.

3. Plant Growth and Vitality - Compare before and after.

PROJECT PROPERTIES FROM MAKENA TO LAHAINA:

TIMEFRAME: October of 2023 through January of 2024.

NUMBER OF LOCATIONS: 12

Locations were chosen for their proximity to nearshore reefs and the level of management cooperation for eventually transitioning their landscaping methods to 100% Reef-Friendly as outlined by Maui Nui Marine Resource Council.

PILOT PROJECT LOCATIONS:

Southside
Wailea Beach Resort
Maui Banyan Resort
Ledcor Group
Legend Farm
Kai Malu Development
Kamalani Condos

Westside
Ritz Carlton
Montage
Napili Shores
Mahina Surf
Hale Royale
Kahoma Village

01 Kamalani Condos

October 2023 Lawn has many weed patches and grass color is lighter green/yellow.

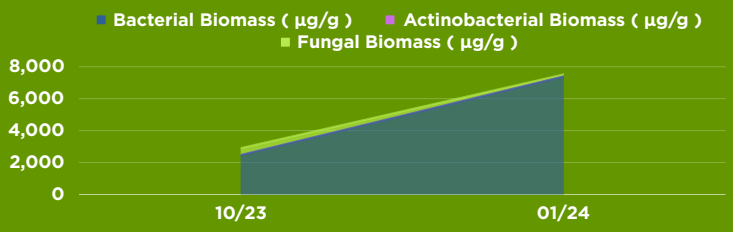
December 2023 Lawn weeds are gone and grass is lush and darker green

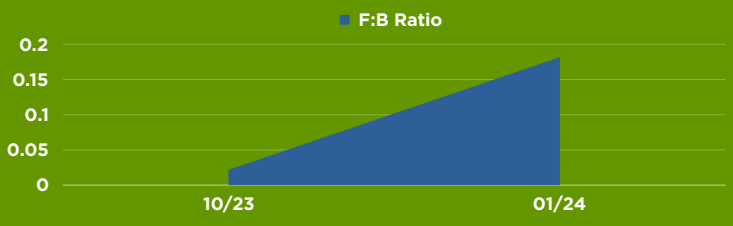
OBJECTIVES/RESULTS

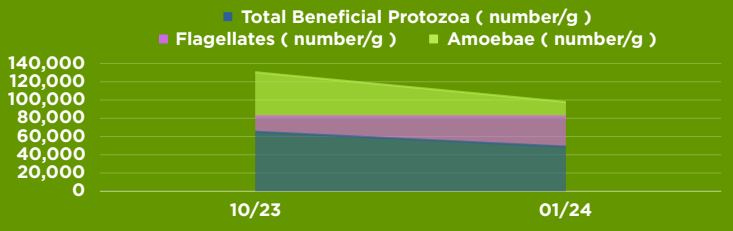
Property Manager's Objective: The aim was to assess whether SoilThrive liquid biological amendments could address the weed problem in the lawn.

Outcome: The objective was successfully achieved. The application of SoilThrive resulted in a luxuriant and weed-free lawn, illustrating its transition from a weedy state to a beautiful, weed-free lawn achieved without the use of chemicals.

Property managers are very pleased with the results, and are in discussions for transitioning from conventional to reef friendly landscaping.







FINAL OBSERVATIONS:

1. Soil Microorganisms - Measure and Compare starting and ending.

Samples show beneficial microbes present in low numbers.

Bacterial biomass and Actinobacteria increased. Protozoa and Flagellates present in low numbers but still in ok range.

No detrimental microorganisms or diseases observed in the soil samples.

Fungi:Bacteria Ratio - The ratio did not change significantly. F:B Ratio Target for Turf: 0.75

2. Pest Problems - None observed.

3. Plant Growth and Vitality - Turf is thicker and more vibrant in color.

4. Weeds died off, leaving a beautiful chemical free lawn.

02 Ledcor Group

October 2023 New development and planting bed, some plants already unhealthy

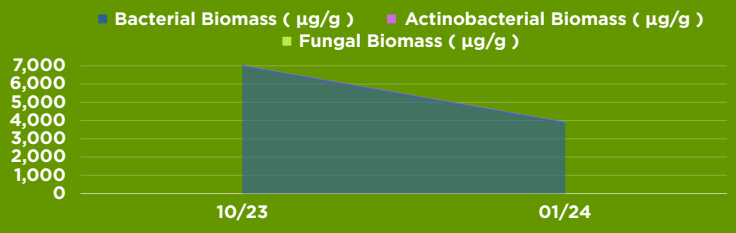
December 2023 Plants grew fast, strong and vibrant colors. Healthy.

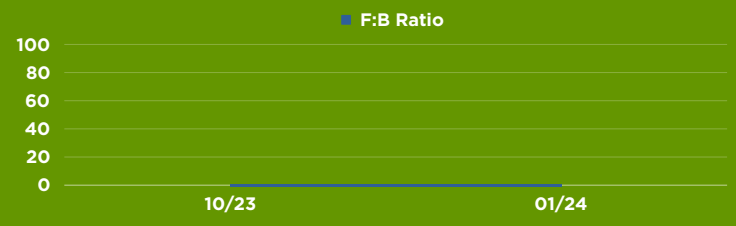
OBJECTIVES/RESULTS

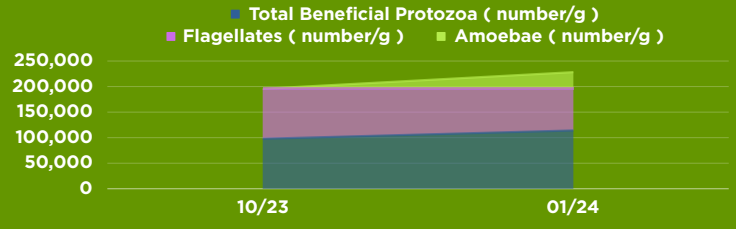
Objectives for Property Manager and Landscaper: The goal was to evaluate whether SoilThrive liquid biological amendments could match or surpass the effectiveness of traditional products in supporting and benefiting plant growth. The project was conducted in a newly planted area within a new development. The landscaper's priority was to confirm that the use of SoilThrive would not lead to any adverse effects, ensuring no plants would become unhealthy or die.

Outcome: The objectives were successfully achieved. The application of SoilThrive resulted in plants that were not only nourished but also thriving, indicating its effectiveness in plant care and maintenance.

Manager and Landscaper are very pleased with results and are in discussions for total transition from conventional to reef friendly landscaping.







FINAL OBSERVATIONS:

1. Soil Microorganisms - Measure and Compare starting and ending.

Samples show beneficial microbes present in low numbers.

Bacterial biomass is greater than recommended, most likely due to the soil that was added to this site for the planting. Actinobacteria is low but not a problem. Protozoa numbers are good and above requirement. Flagellates and amoebae numbers are good.

No detrimental microorganisms or diseases observed in the soil samples.

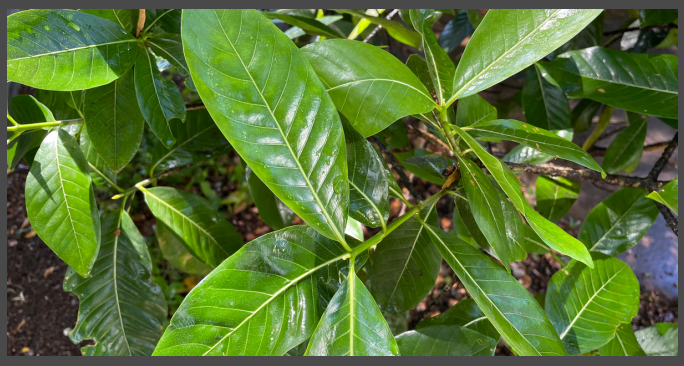
Fungi:Bacteria Ratio - Both samples did not show fungi observed. We recommend adding fungi dominate liquid biological amendments during 2024.

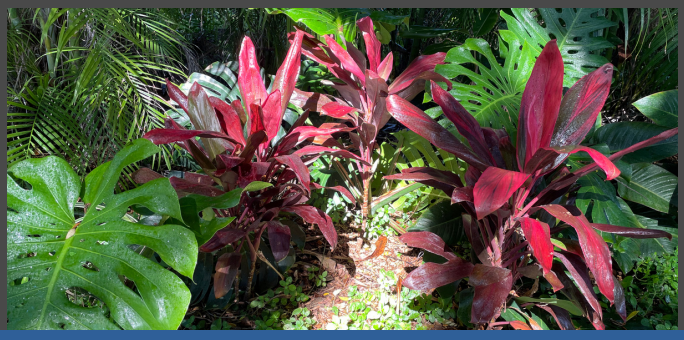
2. Pest Problems - No above ground pest problems observed.

3. Plant Growth and Vitality - Plants growing healthy with vibrant color.

03 Wailea Beach Resort

October 2023 Pests: White flies were heavy and covered most leaves.





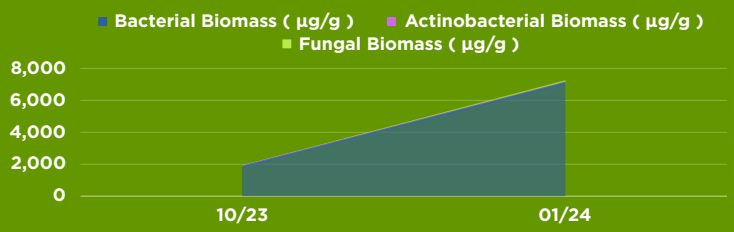
December 2023 Pests: White flies dramatically reduced, beautiful new growth. Expect total elimination of pests if treatment continues, we also recommend adding vermicompost to soil around plants.

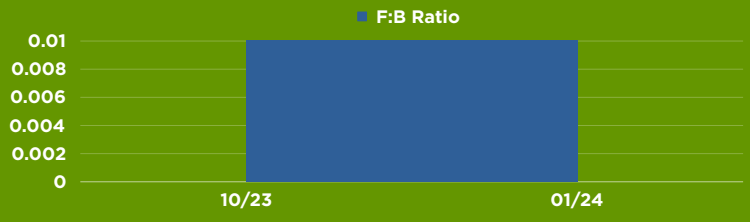
OBJECTIVES/RESULTS

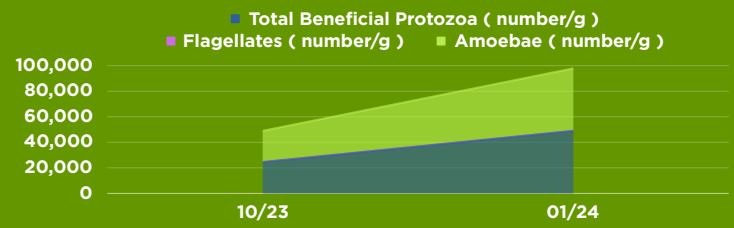
Objectives for Property Manager:
The primary aim was to determine if SoilThrive liquid biological amendments could equal or exceed the performance of conventional products in fostering and enhancing plant growth. A specific objective included observing whether the application of SoilThrive would lead to a reduction or complete eradication of whiteflies infesting the gardenias. This project was implemented along the entrance drive.

Outcome: The objectives were successfully achieved. The application of SoilThrive resulted in plants that were not only nourished but also thriving, indicating its effectiveness in plant care and maintenance.

The population of white flies on the gardenias were dramatically reduced. If we were to continue the program we are confident white flies would be eradicated. Continuing the program would also increase the beneficial microbes to the recommended levels.







FINAL OBSERVATIONS:

1. Soil Biology - Measure and Compare starting and ending.

Samples show beneficial microbes present in low numbers.

Bacterial biomass is significantly greater than recommended. Additional applications of liquid biological amendments would reduce this and balance this out. Actinobacteria is low but not a problem. Protozoa numbers are low. Flagellates are low and amoebae numbers are good.

No detrimental microorganisms or diseases observed in the soil samples.

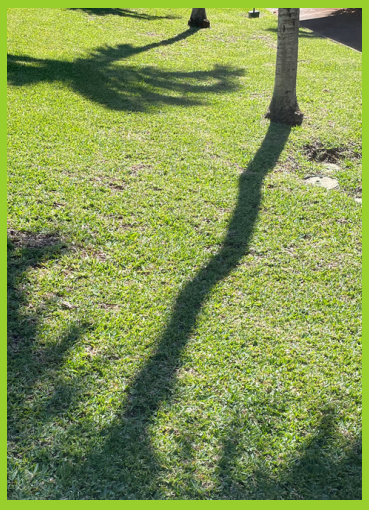
Fungi:Bacteria Ratio - Fungi increased at the end but is still below recommended level.

2. Pest Problems - white flies, numbers reduced dramatically at end of pilot.

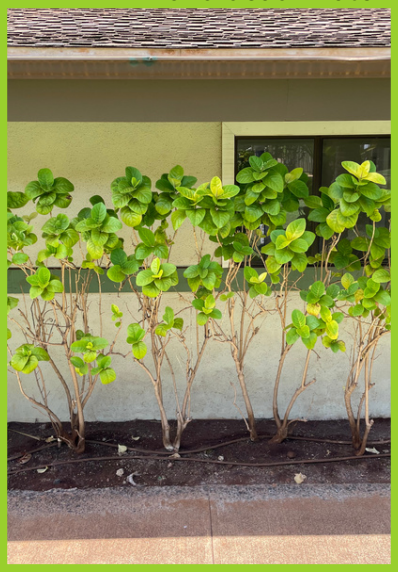
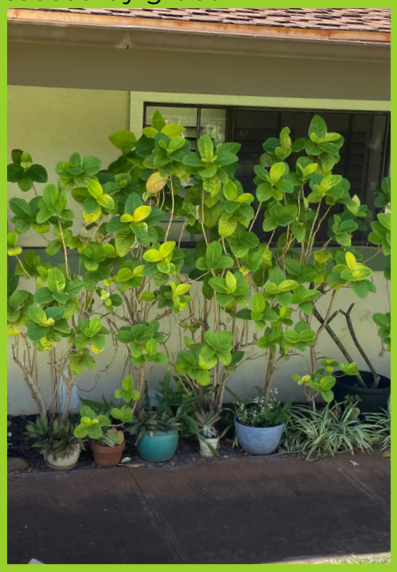
3. Plant Growth and Vitality - Plants growing healthy with vibrant color.

BEFORE AND AFTER


Hale Royale - Problem Solved: Grass patch brown and dead. Patch caused by grubs.

Mahina Surf Problem Solved: Grass patch brown and dead. Patch caused by grubs.

Hale Royale - SoilThrive gives nourishment and increase microbes for healthy plants


Legend Farm - Problem Solved: Garden was dry and low in microbes. Added ground cover that tomato plants can be grown right into.

CONCLUSION

Following the completion of this pilot study, it's clear that biological soil amendments have the ability to effectively replace synthetic fertilizers, herbicides, and insecticides in landscape management. Notably, each pilot location exhibited an improvement in plant health where plants were previously struggling, and maintained the vigor of already healthy vegetation.

The utilization of SoilThrive's biological soil amendments led to plants that were not just sustained but flourishing. This underscores its capability in nourishing and maintaining plant health.

This comprehensive approach has positively altered the soil's natural biological equilibrium, enhancing plant health and simultaneously eliminating the reliance on chemical pesticides and fertilizers. The increased presence of fungi, beneficial bacteria, and protozoa in the soil made nutrients more accessible to plants. The team adeptly managed and controlled various pests and diseases. Moreover, this approach if continued, will eventually bring about a decrease in irrigation needs, leading to a more efficient, water-conserving, and cost-effective system. An elevated fungal biomass will play a role in improving water retention and lessen the necessity for manual dethatching, resulting in considerable labor savings.

Pilot Objectives Successful: Kahoma Village has signed a contract to utilize the amendment to treat the whitefly on their hibiscus. Hale Royale, Mahina Surf, Napili Shores, Ledcor Group, Kamalani Condos and Legend Farms are all currently in discussions with moving forward with more reef friendly landscaping for 2024. The remaining 6 properties are patiently awaiting their final reports and review meetings with SoilThrive. They are all very supportive of reef friendly landscaping.

SoilThrive Hawaii LLC, is confident that this holistic approach to land management, which leverages existing soil microbiology to boost soil and plant health, is scalable and adaptable to various environments. The team is enthusiastic about continuing their work in cultivating healthier soils for flourishing landscapes, particularly in the context of Maui's unique ecosystem.