



**A Collaborative, Landscape-Level Approach to  
Reduce Wildfire Hazard Across Hawai'i**

**2018-19 Vegetation Management**

**Rapid Mapping Assessment  
and**

**Collaborative Action Planning**

**Kaua'i Report**

**This report is dedicated to all those whose decisions about the built and natural environment in Hawai'i affect our vulnerability and/or resilience to wildfire, including:**

**Emergency responders** and **volunteers** who respond to wildfire;

**Policymakers** aligning funding and legislation to strategically and effectively reduce wildfire hazards and keep our communities safe;

**Planners, developers, and designers** who include strategic wildfire mitigating designs in communities, infrastructure corridors, and buffers between human ignitions and precious wildland ecosystems;

**Maintenance workers** and **community members** who do all of the great hazard mitigation and vegetation management;

**Ranchers** managing animals and maintaining fencing and water to protect our communities and ecosystems from wildfire;

**Tourism industry** informing visitors about wildfire and invasive species in Hawai'i and the importance of helping protect this valuable place they come to visit;

**Land stewards** removing invasive species, restoring the forest, working the land, and transitioning the landscape to a lower fire risk;

**Agency representatives** responsibly managing heritage resources;

**And everyone who is working to protect our communities and landscapes from wildfire and invasive species.**

## Project Lead

**Hawai'i Wildfire Management Organization**  
(Team: Elizabeth Pickett, Lele Kimball, Melissa Kunz, Orlando Smith, Pablo Beimler, Tamara Hynd) with collaborative support from:

- State Division of Forestry and Wildlife (Mike Walker)
- University of Hawai'i CTHAR Cooperative Extension (Dr. Clay Traurnicht)

## Funding

- Hawai'i State Grant-in-Aid Program, 2016
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## HWMO Photo Credits:

Elizabeth Pickett  
Lele Kimball  
Melissa Kunz  
Orlando Smith  
Pablo Beimler  
Tamara Hynd

Cover Photo: Brushfire behind community near Waimea Canyon and post-fire erosion onto mauka reefs. Photo Credit: HWMO



Collaborative Action Planning Workshop at Lihue. Photo Credit: HWMO

# A Collaborative, Landscape-Level Approach to Reduce Wildfire Hazard Across Hawai‘i

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In case of  
fire jargon

### Glossary of Terms

#### Fuel/ Hazardous Vegetation

Flammable vegetation.

#### Fuel Load

How much flammable vegetation is there, how dense, how tall, how much will burn if ignited?

#### Vegetative Fuels Management Activities

Any vegetation management activity that reduces wildfire hazard (whether that is its sole purpose or a positive byproduct of the activity).

# PROJECT SUMMARY

## Vegetation Management and Wildfire in Hawaii

In Hawaii, wildfire has devastating impacts on our communities and native ecosystems. With land use and climate changes, wildfire is a significant and growing hazard in many places across Hawaii.

Research in wildfire science shows that vegetation is a key ingredient in the recipe for recurring wildfire. **Vegetation management is essential for wildfire hazard mitigation strategies that reduce wildfire hazard; create safer conditions for firefighters; and serve as key climate adaptation strategies** for our communities, economies and environment.

Fire follows fuel and the impacts do not abide by property boundaries. Therefore, **reducing wildfire hazard is a landscape-level issue that we need to collaboratively tackle together to create safer and more wildfire resilient communities.**

## Project Background

In 2015, the Hawai'i Wildfire Management Organization (HWMO) Technical Advisory Committee, comprised of more than 35 fire and natural resource experts from across the state, initiated this project to:

- Better understand all of the important **wildfire hazard reduction already happening** by diverse land managers;
- Identify and **prioritize actions** that address the island-wide wildfire issue to **optimize expenditures** and efforts, and **maximize protection** at the landscape-scale;
- **Kick-start collaboration**, share information, and **integrate fire-thinking into current activities** to address the cross-boundary wildfire risk.

**This Kaua'i Report is one of six island reports developed to share input from professionals and community that participated in the statewide 2018-19 Rapid Mapping Assessment of Vegetation Management and Collaborative Action Planning Workshops. Additionally, a Statewide Summary Report was created to summarize findings across the state.**

## Rapid Mapping Assessment of Vegetation Management

During 2018-2019, HWMO contacted all large landowners with >1% of the island area and agencies managing vegetation. A majority participated in the mapping project.

Across Hawai'i, **128 groups** contributed to the Rapid Mapping Assessment of Vegetation Management including:

- Agencies such as highways maintenance, parks, military, utilities;
- Businesses in farming, ranching, forestry, and tourism;
- Non-profits, watershed partnerships, and community groups.

### Kaua'i Rapid Mapping Assessment Summary Findings:

- ~ **41,000 acres** and **260 miles** of **current** firebreaks, fuel reduction or fuel conversion mapped on Kaua'i.
- ~ **132,000 acres** and **90 miles** of **needed** firebreaks, fuel reduction or fuel conversion mapped on Kaua'i.

## Collaborative Action Planning Workshops

Professional and community input on priority action was collected through Collaborative Action Planning Workshops held in all four counties across Hawai'i during 2018-2019. The **182 participants** statewide represented diverse groups including agency representatives, emergency responders, land owners, community groups, technical experts, ranchers, planners, legislative representatives, businesses, and more.

### Kaua'i Collaborative Action Planning Workshop Summary:

A workshop was held on Kaua'i with a total **23** participants. Areas of concern were identified through a collaborative mapping process and prioritized actions are presented in the format of "What's the Issue" and "What Can We Do" based on participant discussion and prioritization. All concerns and suggested actions are captured in *Appendix A: Participant Input Lists*.

Themes that emerged in multiple workshops across the state are summarized in the *Hawai'i Statewide Summary* (separate report).

## Online Survey

As a follow-up, HWMO conducted a brief online survey targeted at anyone managing vegetation. Selected results from the **87 survey respondents** are presented throughout the reports.

# WILDFIRE HAZARD ACROSS KAUAI

## THE PROBLEM? – Fire follows fuel...and vegetation is fuel!

Wildfires do not recognize fences or ownership boundaries.

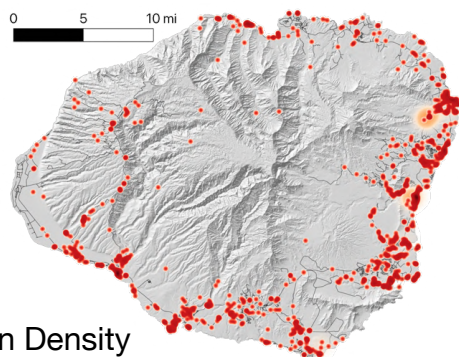
### Ignitions



### Fuel (Hazardous Vegetation)



### High Wildfire Risk



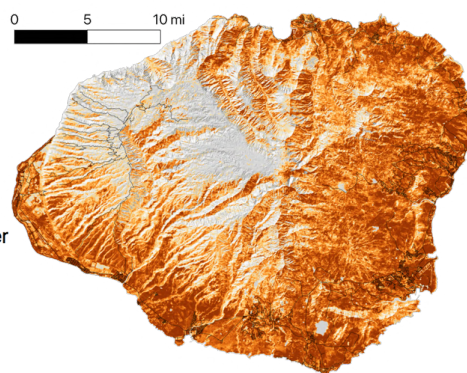
■ Ignition Density  
● Size of Fire

#### People Spark Fire

In Hawai'i, most **wildfires are caused by people**. The majority are accidental, and are started by hot exhaust, sparks from equipment, open fires, cigarettes, fireworks, and more.

These ignitions often occur along **roadsides** and **community boundaries**.

Source: HWMO 2002-2012 data

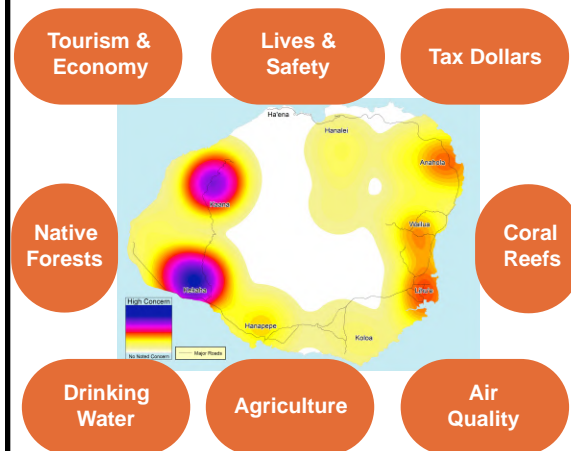


Grass Cover  
■ Low  
■ High

#### Fire Follows Fuel

Dry grass and other fine fuel is quick to ignite. Some invasive, fire-prone grasses including fountain grass and guinea grass benefit and spread with wildfire. They are the first to regrow after a burn, choking out native plant communities and **increasing fire risk**.

Source: UH Manoa 2018



#### Widespread Impacts

Professionals and community dealing with the impacts of wildfire have identified **priority areas** where wildfire **hazard and values at risk overlap**.

Source: HWMO 2019 Action Planning Workshop data

## THE SOLUTION? – Collaborative, cross-boundary vegetation management.

Reducing wildfire hazard and protecting our future requires a landscape-scale, all-hands approach to strategically coordinate limited funding and human resources. Together we can achieve multiple benefits and win-win solutions.

# THE VALUE OF BEING PROACTIVE ABOUT WILDFIRE IS ENORMOUS!

**Vegetation management and wildfire hazard mitigation strategies reduce wildfire hazard, create safer conditions for firefighters, and serve as key climate adaptation strategies for our communities, economies and environment.**

## Multiple Benefits — Value of Being Proactive:

- ❖ Healthy, functioning ecosystems
- ❖ Productive landscapes
- ❖ Safe communities and businesses

### Reactive Cost of Fire Response:

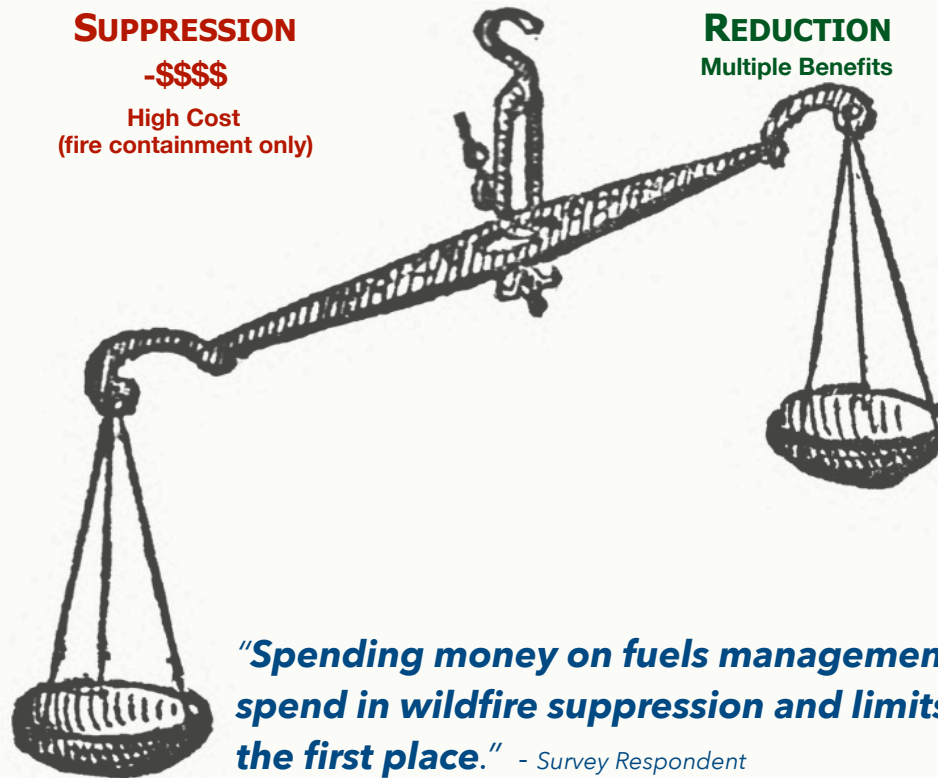
- \$ Money spent on emergency response, personnel, firetrucks, helicopters, fuel, equipment, etc.
- \$ Damage to infrastructure — costs to repairs/rebuilding
- \$ Destruction of irreplaceable native ecosystems and subsequent increased wildfire hazard
- \$ Damage to coastal resources of community, and tourism and economic value
- \$ Health costs associated with smoke and other impacts
- \$ Need for National Guard or FEMA response

### REACTIVE FIRE SUPPRESSION

-\$\$\$\$

High Cost  
(fire containment only)

### PROACTIVE HAZARD REDUCTION Multiple Benefits



***“Spending money on fuels management reduces the amount we spend in wildfire suppression and limits the potential for fire in the first place.”*** - Survey Respondent

(Question: Why is vegetation management important from your perspective?)

### Proactive Benefit of Prevention:

- ✓ Comparatively **lower \$ spent for active management of landscape** than fighting fires and recovering after wildfires have burned lands, homes, and infrastructure.
- ✓ Proactive activities that are more **cost-effective** than waiting until a firefighting response is required and urgent include:
  - Preventing ignitions through public education
  - Reducing wildfire spread potential through **vegetation management**
  - Developing quick and easy **access for firefighting and evacuations**

# WHY FOCUS ON VEGETATION MANAGEMENT?

**Managing vegetation is the key to reducing wildfire hazard at all scales! Due to the year-round growing season in Hawai‘i, maintenance is often necessary multiple times per year.**

## Fire Can Only Burn Where There Is Fuel to Burn

**What makes vegetation hazardous?** As plants dry out during dry or drought periods they become flammable, and are thus called **hazardous vegetation or hazardous fuel**. Hazardous vegetation can be dried grass, leaf litter, shrubs, or trees with dead branches. These types of vegetation ignite easily and “add fuel to the fire.”

### Recipe for Fire

Long-term, big picture perspective ↓

- **Flame (Does fire start?):**  
Key Factors: **Fuel**, oxygen and ignition
- **Wildfire (Where does wildfire burn?):**  
Key Factors: **Fuel/hazardous vegetation**, weather, and topography
- **Fire Regime (How does wildfire reoccur?):**  
Key Factors:
  - **Vegetation: Is it hazardous?**
  - **Climate:** Are there fire weather conditions?
  - **Ignitions:** What is the social and land-use context? (i.e. people’s behavior and natural ignitions)

Adapted from the three “fire triangles”

**Vegetation as fuel is a key ingredient for wildfire.**

## Wildfire Hazard Mitigation Strategies

### How to Reduce the Spread and Impacts of Wildfire:

- **Firebreaks:** Strategic integration of fire infrastructure including **firebreaks around our communities and important resources** during planning and development stages can provide access for firefighters; break the continuity of fuel to passively slow the spread of wildfire across the landscape; and serve as emergency egress when wildfire is coming from a different direction.
- **Fuel Reduction:** Immediate action to **reduce fuel and breaking the connectivity of fuel to our valued resources** (e.g. ladder fuel reduction, managed grazing).
- **Fuel Conversion:** Long-term **conversion of our landscapes to be less burnable** (e.g. Firewise community practices, active agriculture and native restoration efforts).



Collaborative Action Planning Workshop on February 21, 2019 and in Līhu'e, on Kaua'i.  
Photo Credit: HWMO

# Kaua'i Areas of Concern and Prioritized Actions:

## 2019 COLLABORATIVE ACTION PLANNING ON VEGETATION MANAGEMENT

### Qualitative Project Findings



Professionals and community came together to identify areas of concern and discuss and prioritize actions to reduce wildfire hazard. Input was gathered through an Action Planning Workshop held on Kaua'i with **23** participants representing diverse groups including:

- Land owners
- Agencies
- Emergency responders
- Community groups
- Community members
- Technical experts
- Ranchers
- Businesses
- Planners
- Legislative representatives
- And more...

The following *Kaua'i Priorities* are summaries of actions prioritized by workshop participants.

Achievability of priorities was not evaluated and any specific planning effort should include additional place-based input and best practices.

All concerns, proposed actions, and number of votes can be found in *Appendix A: Participant Input Lists*.

See Appendix C for more resources on best practices.





# Kaua'i Summary

## 2019 Collaborative Action Planning Workshop Highlighted Concerns and Priority Actions

### What Are the Issues?

- **Unmanaged, Fallow Land Creates Wildfire Hazard**

- **There Are Recurring Wildfires in High Risk Areas**

### What Can Be Done? (Top Recommendations)

- **Support Active Land Management**

- **Take a Comprehensive Approach and Prioritize Fuel Management Near Critical Road Infrastructure and Around Communities: 'Hotspot Areas'**



## Collective Areas of Concern Collaborative Mapping Process

1. First, Collaborative Action Planning Workshop participants identified and drew areas that contain "Values at Risk" on a map of Kaua'i.
2. Next participants identified areas where there are *hazardous fire conditions* due to **fuel load, fire weather, and a history of ignitions**.
3. Once all of these areas were drawn on the map, each participant was asked to use stickers to identify their priorities for **where to start first for hazard reduction activities**.

This process generated the heat map to the right.

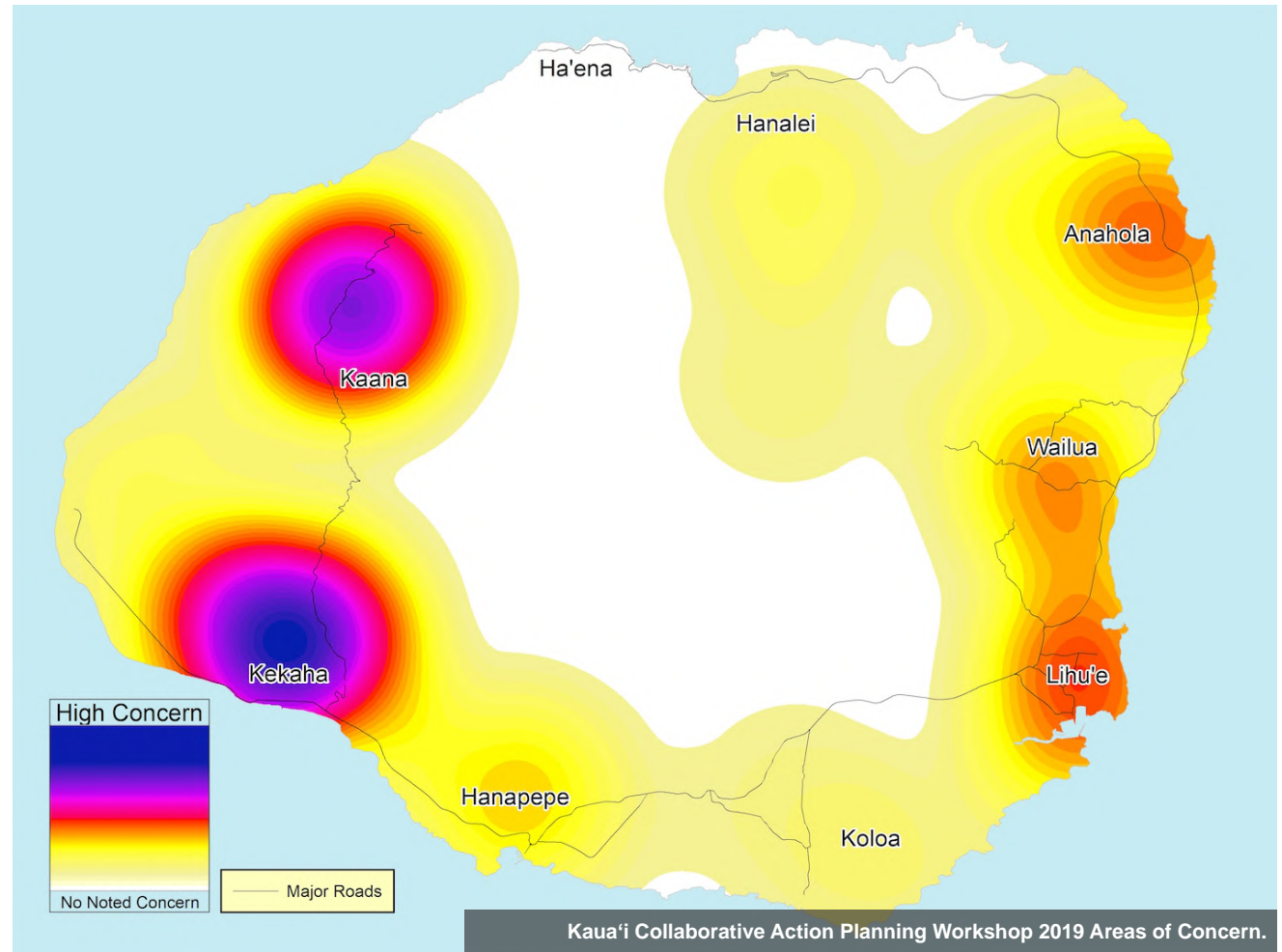
## Collaborative Prioritization Process

1. Participants discussed their concerns related to priority areas and brainstormed possible solutions/ actions.
2. After discussing next step actions and solutions, participants voted on their **priority actions**.

The following *Kaua'i Priorities* are summaries of priority actions voted on by workshop participants.

Achievability of priorities was not evaluated and any specific planning effort should include additional place-based input and best practices.

All concerns, proposed actions, and number of votes can be found in *Appendix A: Participant Input Lists*.



**Values at Risk** is fire jargon for the things that matter to us, **resources or areas that we want to protect from wildfire**. These include:

- **Community areas** e.g. homes, hospitals, schools, parks
- **Municipal infrastructure** e.g. roads, power, water

- **Natural resource areas** e.g. watersheds, makai reefs, water resources, species and ecosystems
- **Cultural resources** e.g. places of cultural heritage, substance gathering areas, significant ecosystems, water resources, soil resources, makai reefs
- **Livelihood areas** e.g. tourism, businesses, agricultural lands (grazing lands/ forestry, farming)



## What's the Issue?

### Unmanaged, Fallow Land Creates Wildfire Hazard

Abandoned agricultural land due to shifting industry economics is a common thread across the Hawaiian Islands that has led to increased wildfire hazard.

## What Can We Do?

### Support Active Land Management

With the sharp decline of the agricultural industry in Hawai'i, thousands of acres of lands have gone fallow, including on Kaua'i.

**Converting lands from unmanaged to active management** will be key to reducing the wildfire threat at a large scale and in the long-term. Ultimately, incentives, resources and technical assistance are needed to support private landowners to incorporate fire-thinking in the decision-making process.

Lands in agricultural production or being restored with targeted invasive species removal for instance, can create landscapes that are less flammable since fuels are actively managed and converted to less fire-prone species.

Active management is the key because it doesn't take long for a wildfire hazard to regrow.



Invasive grasses and shrubs provide just the right fuel for fire. Photo Credit: HWMO

### Discussions and priorities from the Collaborative Action Planning Workshop included:

- **Return fallow agriculture to active use** such as vegetable agriculture and food production.
- Support community programs and private landowners with **funding and technical assistance**.
- **Increase awareness for farmers to reduce wildfire hazards** with Kaua'i Farmers United training and radio programs such as KKCR's "In the Garden, On the Farm".



## What's the Issue?

### There Are Recurring Wildfires in High Risk Areas



A wildfire just outside of Lihu'e Airport and a reminder to visitors that wildfires can occur (and quite frequently) on "The Garden Island." Credit: Seri Niimi-Burch

## What Can We Do?

### Take a Comprehensive Approach and Prioritize Fuel Management Near Critical Road Infrastructure and Around Communities: 'Hotspot Areas'

The wildfire issues on Kaua'i, especially in 'hotspot areas' such as the West and South sides of Kaua'i and the Kapa'a/Anahola area, require "all-hands and all lands."

**Residents and visitors need to play an active role** by reducing ignition potential from vehicle/machinery, fireworks, open fires, etc.

Response capabilities to wildfires in remote areas can be improved through carefully managed, **cross-boundary fuels management** (i.e., strategic grazing), **increased training opportunities** for fire personnel and landowners / volunteer crews, and **strategic placement of water resources** that can create safer and more effective first response.

County and state highways require better **funding and capacity to manage the year-round fuel growth** that tends to be greater on Kaua'i, "The Garden Island."

Participants of the Collaborative Action Planning Workshop identified several important components to a comprehensive approach in areas with recurring wildfire problems, including:

- Reduce roadside fuel hazards.
- Keep water resources maintained and include wildfire use in policies and plans for new water resources.
- Increase community awareness and keep watch / on a lookout in areas with suspected arson.
- Improve communication with public and drivers during wildfires.
- Use strategic grazing where appropriate to address unmanaged vegetation with management plan that limits impacts (such as overgrazing and damage to important ecosystems and native plants).
- Increase local response capacity with volunteer team trained as initial responders.

# What's Already Happening on Kaua'i?

## 2018-19 RAPID MAPPING ASSESSMENT OF VEGETATION MANAGEMENT Quantitative Project Findings

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Fuel Reduction	17
Fuel Conversion	21



### **Rapid Mapping Assessment**

During 2018-2019, HWMO contacted all large landowners with >1% of the island area and agencies managing vegetation. A majority participated in the mapping project. Map contributors included agencies, community groups and businesses across the state.

#### **What was mapped?**

**Current Areas:** Land managers in Hawai'i were asked to identify and map areas where they manage vegetation in a way that reduces wildfire hazard either as the primary purpose or as a byproduct of other activities.

Some contributors identified specific areas where vegetation management was taking place while others identified broad areas within which some management was occurring.

In addition to mapping areas of vegetation management, land stewards identified reasons for managing vegetation, which methods were used, and how frequently they managed areas.

**Proposed Areas:** Mapping contributors were asked to identify priority areas in need of additional management of vegetation.

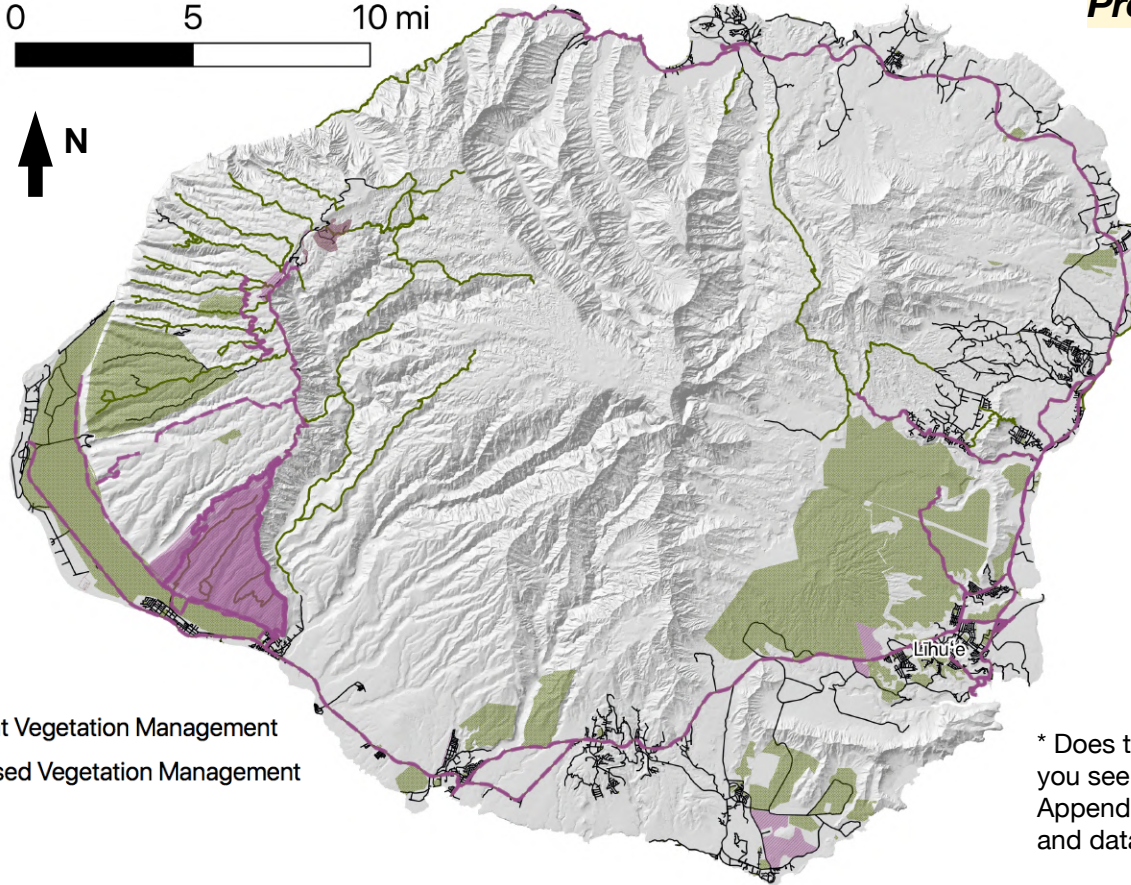
See *Appendix B* for all data collection methods.



# Rapid Mapping Assessment: Kaua'i 2018-19 Snapshot

## Current Vegetation Management and Proposed Vegetation Management Across Kaua'i

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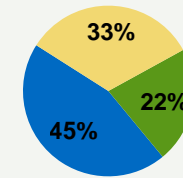


- Current Vegetation Management
- Proposed Vegetation Management
- Roads

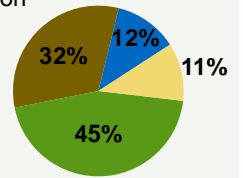
### Current Vegetation Management

#### Wildfire Hazard Mitigation Strategies

- Firebreaks
- Fuels Reduction/ Fuel Breaks
- Fuels Conversion
- Mixed



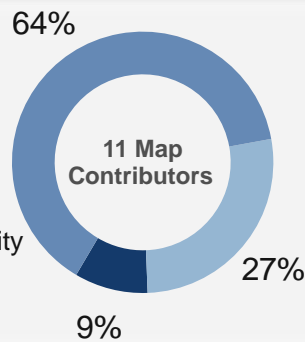
**~ 260 Miles**



**~41,000 Acres**

\* Does this map not jive with what you see on the ground? See Appendix B for mapping methods and data collection details.

### Mapping Contributors



Mahalo to:

1. Agribusiness Development Corporation
2. Department of Hawaiian Homelands
3. State Department of Transportation Kaua'i District
4. DLNR Division of Forestry and Wildlife
5. Gay & Robinson
6. Grove Farm
7. Hawai'i Army National Guard
8. Kaua'i County Department of Parks and Recreation
9. J&R Equipment, Inc.
10. Kaua'i Fire Department
11. Kekaha Agriculture Association

### Proposed Additional Vegetation Management

**~ 180 Miles**

**~7,600 Acres**

# Wildfire Hazard Mitigation Strategies: Firebreaks

## Firebreaks: Infrastructure for Access and Defense!

A firebreak does not stop wildfire advancing on its own but provides access and a defensible line for firefighters.

### The Takeaway:

Roads = firebreaks.

Firebreaks can double as emergency egress when wildfire is coming from a different direction.

The greatest protection occurs when firebreaks are enhanced with reduced flammability or quantity of fuel on either side and adequate access to water.

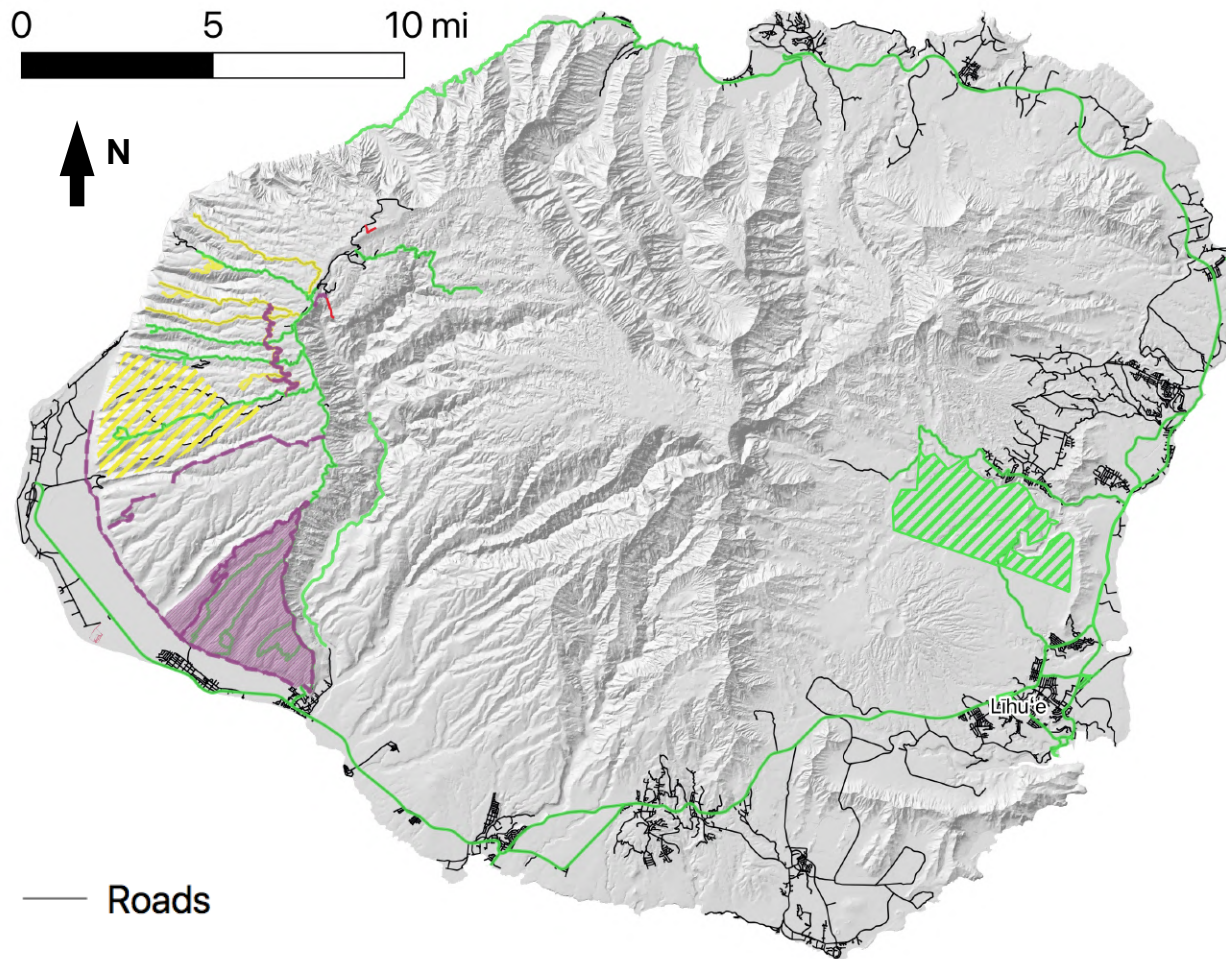
Runoff and erosion impacts for both established firebreaks and those created during an emergency response should be considered and mitigated.



Roads that provided access for firefighters during a 2017 Anahola fire. Photo Credit: Kaua'i Fire Department

# Wildfire Hazard Mitigation Strategies: FIREBREAKS

Snapshot 2018-19: Current & Proposed Firebreaks on Kaua'i



**Firebreaks** are typically scraped down to **bare soil or other non-combustable material**.

In addition to **access**, they can passively **slow the spread of wildfire by breaking continuity of fuel** across the landscape.

## Proposed Firebreaks

~ **40 Miles** of needed firebreaks

~ **6,000 Acres** in need of firebreaks

— Proposed Firebreak

## Existing Firebreaks

~ **90 Miles** of firebreaks

~ **5,500 Acres** with firebreaks

~ **120 Miles** of **enhanced** firebreaks

### Maintenance Frequency

Multiple times per year

Once every few years

Irregularly or Unmaintained

Unknown Maintenance

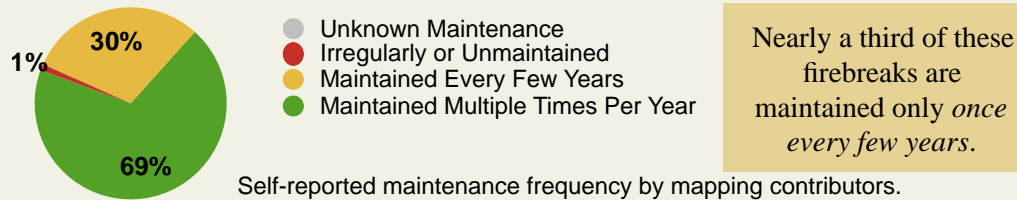


# Wildfire Hazard Mitigation Strategies: FIREBREAKS

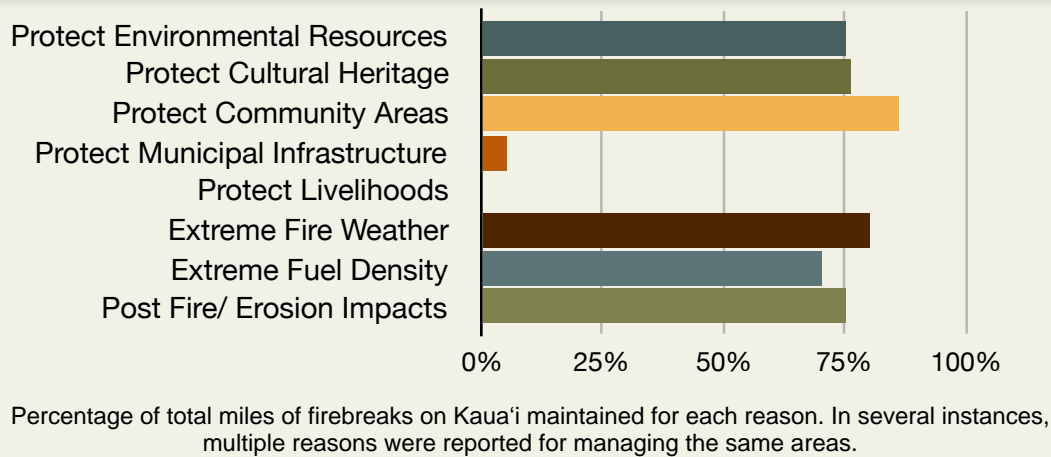
Kaua'i Snapshot 2018-19: Miles Existing of Firebreaks



## Maintenance Frequency of Existing Firebreaks

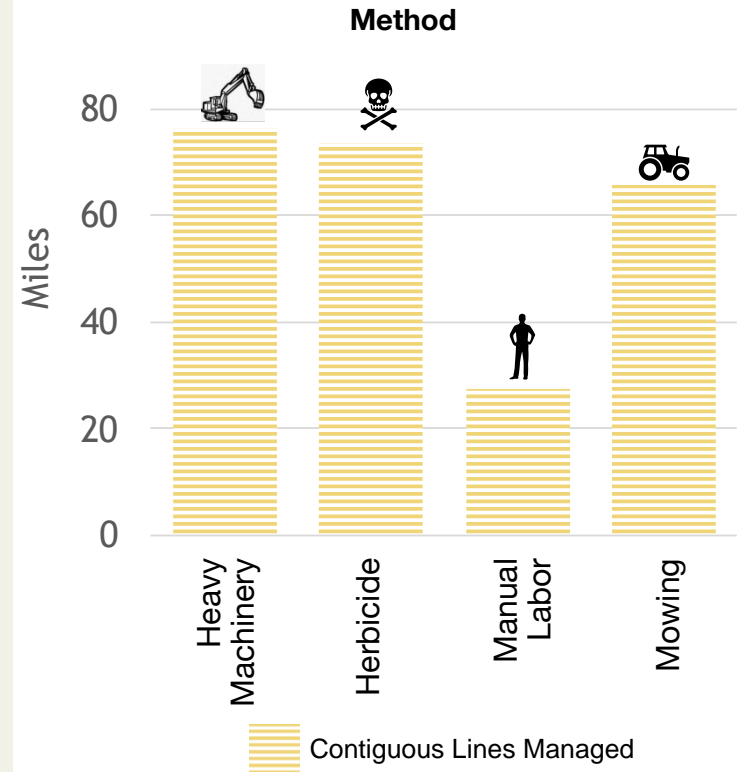


## Reasons Why Firebreaks Are Established and Maintained on Kaua'i



These firebreaks are maintained for numerous reasons including to protect *environmental resources, cultural heritage, and community areas* due to conditions of *extreme fire weather, extreme fuel density, and significant potential of detrimental post-fire impacts*.

## How Are Kaua'i Land Stewards Creating and Maintaining Firebreaks?



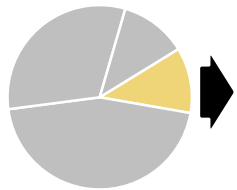
In some instances multiple methods are used to manage the same area.

The most common methods used for miles of firebreaks on Kaua'i are *heavy machinery, herbicide, and mowing*.

While mowing may not create a "firebreak" defined as "reduced to bare soil," access roads that are grassy and mowed do provide important firefighting infrastructure and may reduce erosion impacts or other externalities of completely bare firebreaks.

# Wildfire Hazard Mitigation Strategies: FIREBREAKS

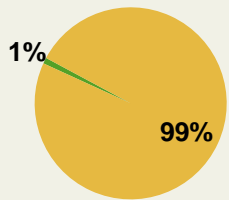
## Kaua'i Snapshot 2018-19: Acres With Existing Firebreaks



**5,500  
Acres**  
Mapped

Some mapping participants identified general areas where there are firebreaks, roughly 5,500 acres on Kaua'i.

### Maintenance Frequency of Existing Firebreaks



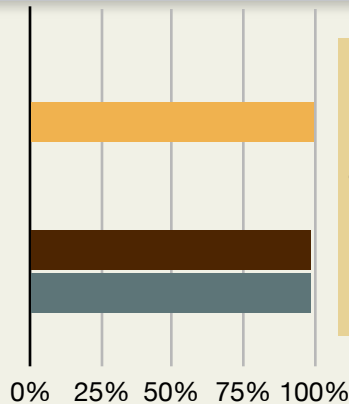
- Unknown Maintenance
- Irregularly or Unmaintained
- Maintained Every Few Years
- Maintained Multiple Times Per Year

Most of these areas are only *maintained once every few years*.

Self-reported maintenance frequency by mapping contributors.

### Reasons Why Firebreaks Are Established and Maintained on Kaua'i

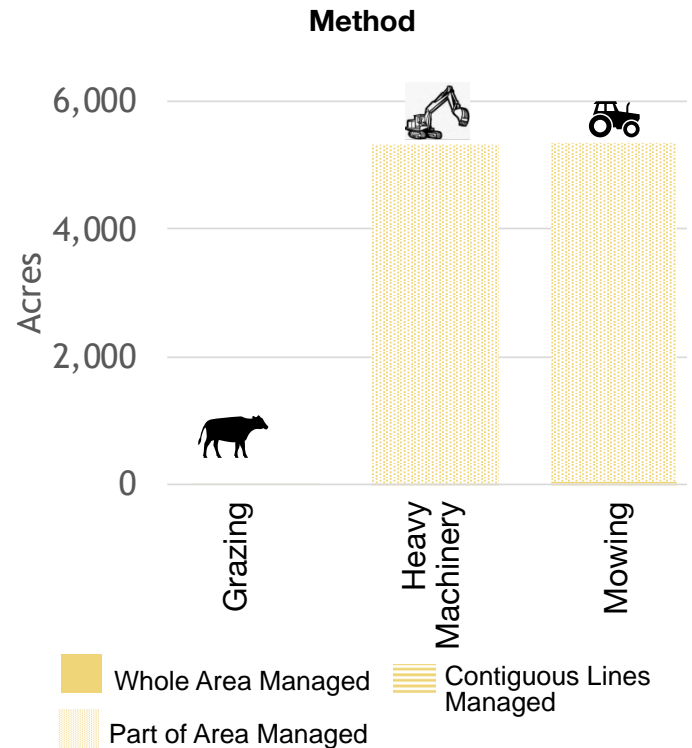
- Protect Environmental Resources
- Protect Cultural Heritage
- Protect Community Areas
- Protect Municipal Infrastructure
- Protect Livelihoods
- Extreme Fire Weather
- Extreme Fuel Density
- Post Fire/ Erosion Impacts



Reasons for these firebreaks are to *protect community areas* due to *extreme fire weather* and *extreme fuel density*.

Percentage of total acres with firebreaks on Kaua'i maintained for each reason. In several instances, multiple reasons were reported for managing the same areas.

### How Are Kaua'i Land Stewards Creating and Maintaining Firebreaks?

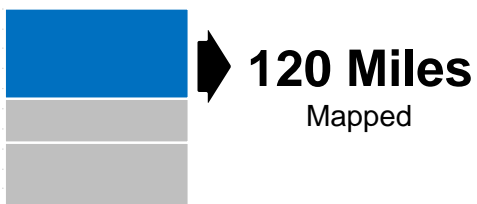


In some instances multiple methods are used to manage the same area.

In these areas, the most commonly reported methods for maintaining firebreaks are *heavy machinery* and *mowing*. While mowing may not create a "firebreak" defined as "reduced to bare soil," access roads that are grassy and mowed do provide important firefighting infrastructure and may reduce erosion impacts or other externalities of completely bare firebreaks.

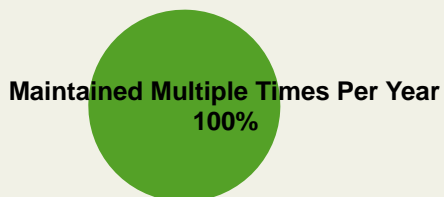
# Wildfire Hazard Mitigation Strategies: **Enhanced FIREBREAKS**

## Kaua'i Snapshot 2018-19: Miles of Enhanced Firebreaks



**Enhanced firebreaks provide the greatest protection to firefighters**, because as a wildfire approaches, it loses intensity if there is less fuel to burn. When there is also adequate access to water, even better. Lines mapped as both firebreaks and fuel reduction are considered enhanced firebreaks. Many roads are enhanced firebreaks due to the wide pavement or gravel surface and fuels reduction on either side.

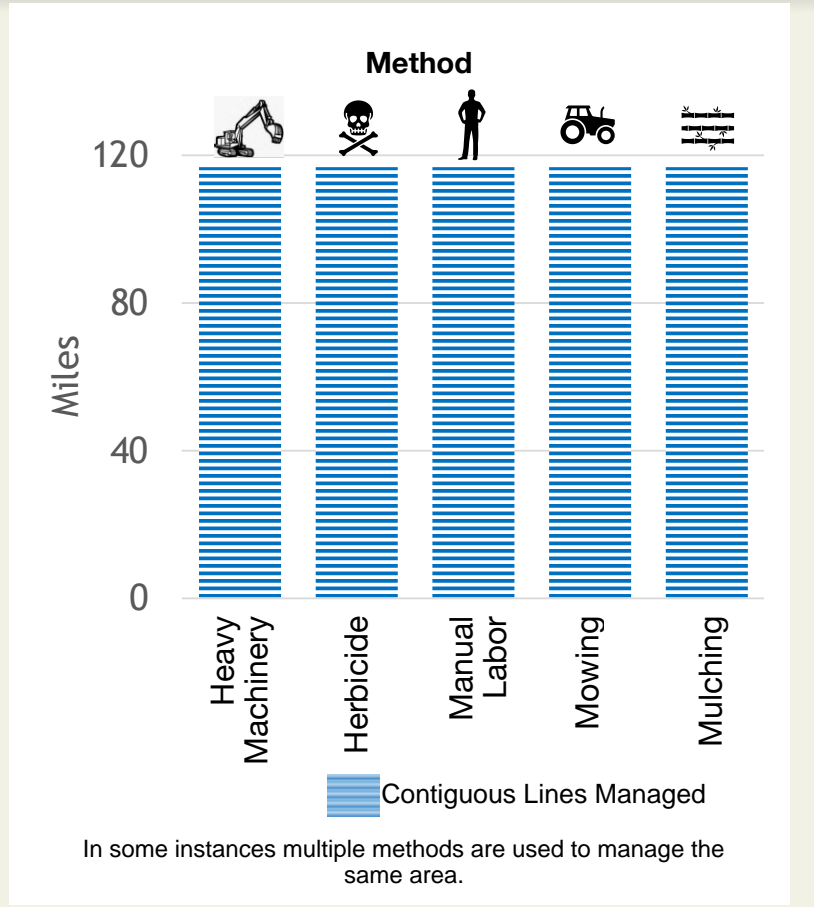
### Maintenance Frequency of **Enhanced** Firebreaks



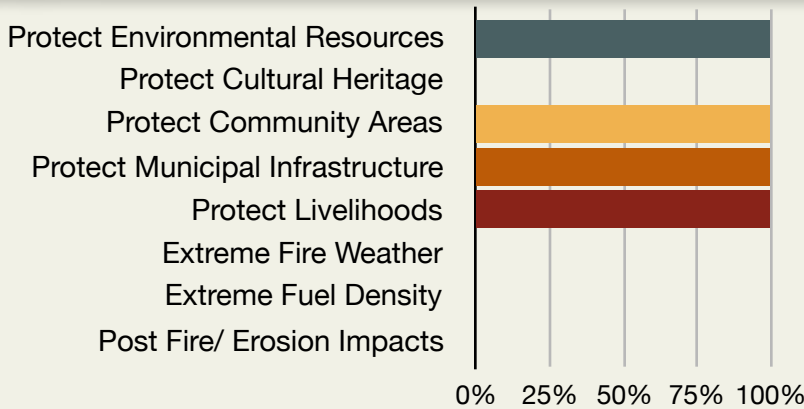
Interestingly, nearly all miles of enhanced firebreaks are *maintained multiple times per year*, likely reflecting the ongoing fuel reduction needs of vigorous vegetation growth.

Self-reported maintenance frequency by mapping contributors.

### How Are Kaua'i Land Stewards Creating and Maintaining **Enhanced** Firebreaks?



### Reasons Why **Enhanced** Firebreaks Are Established and Maintained on Kaua'i



There are multiple reasons for managing these enhanced fuel breaks.

Percentage of total miles of enhanced firebreaks on Kaua'i maintained for each reason. In several instances, multiple reasons were reported for managing the same areas.

Multiple methods are used in combination to maintain enhanced firebreaks.

# Fuels Reduction: Decrease how much is available to burn!

Fuels reduction is an immediate action that can significantly reduce wildfire hazards.

### The Takeaway:

Fuels reduction areas can require **frequent maintenance and active management.**

Linear fuel reduction, or fuel breaks, slow the spread of wildfire and are beneficial along roadsides and other areas with frequent ignitions.

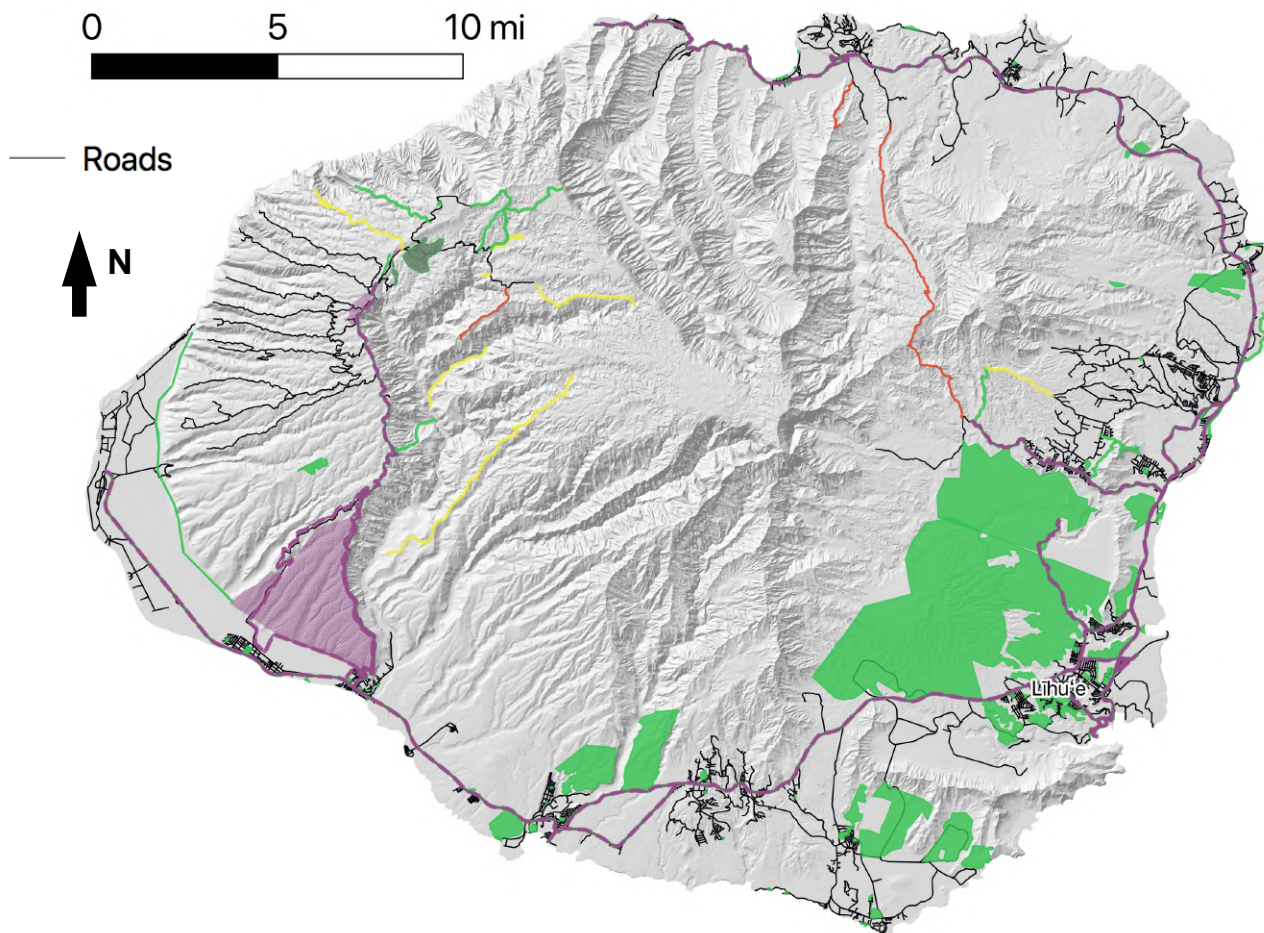
In Hawai'i, it only takes a few rainstorms for vegetation to re-grow and if unmanaged, **vegetation becomes hazardous fuel during the next dry spell or drought.**



Mowing along road edges on Kauai is a common form of fuels reduction.

# Wildfire Hazard Mitigation Strategies: **FUELS REDUCTION**

Snapshot 2018-19: Current & Proposed Fuels Reduction on Kaua'i



**Fuels reduction** activities **reduce the amount of burnable vegetation to slow the spread of wildfire** and break continuity of fuel across the landscape.

## Proposed Fuel Reduction

~ **140 Miles** of needed fuels reduction

~ **5,500 Acres** in need of fuels reduction

--- Proposed Fuels Reduction

▨ Proposed Fuels Reduction

## Existing Fuel Reduction

▨ ~ **60 Miles** of fuel breaks

▨ ~ **120 Miles** of firebreaks **enhanced** with fuels reduction

▨ ~ **21,000 Acres** with fuel reduction

### Maintenance Frequency

▨ Multiple times per year

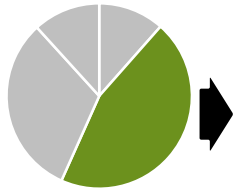
▨ Once every few years

▨ Irregularly or Unmaintained

▨ Unknown Maintenance

# Wildfire Hazard Mitigation Strategies: **FUELS REDUCTION**

Kaua'i Snapshot 2018-19: Acres of Active Fuels Reduction



**21,000**  
**Acres**  
Mapped

On Kaua'i, roughly 21,000 acres of fuels reduction were mapped, the bulk of which are likely working ranch lands.

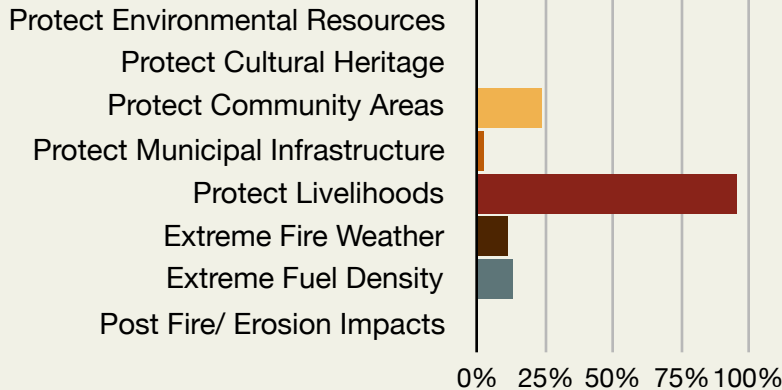
## Maintenance Frequency of Reported Fuel Reduction

**Maintained Multiple Times Per Year**  
**100%**

All areas are *maintained multiple times per year.*

Self-reported maintenance frequency by mapping contributors.

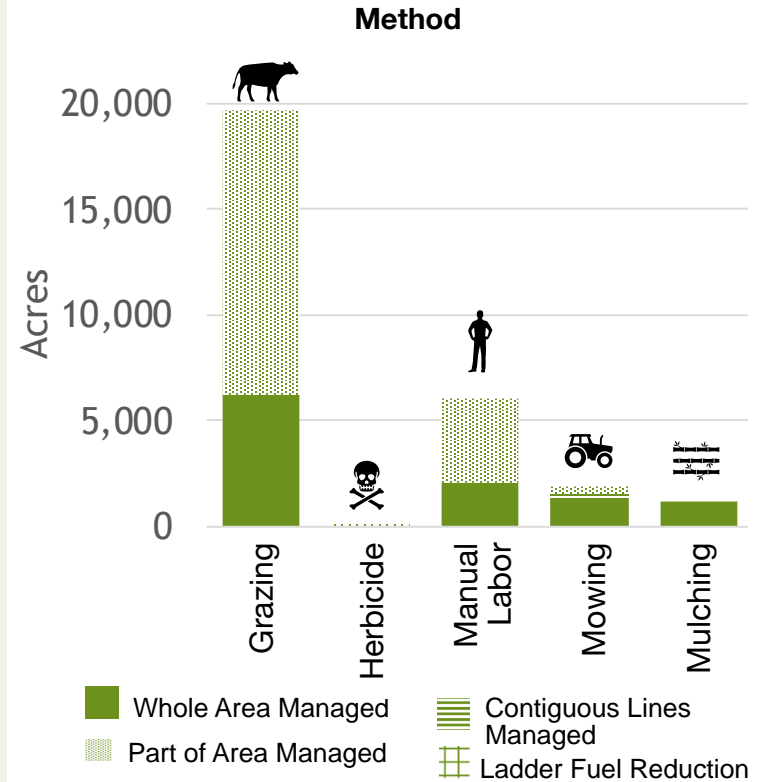
## Reasons for Acres of Fuels Reduction on Kaua'i



Most of these areas are managed to *protect the livelihoods.*

Percentage of total acres of fuel reduction on Kaua'i maintained for each reason. In several instances, multiple reasons were reported for managing the same areas.

## How Are Kaua'i Land Stewards Reducing Fuel?

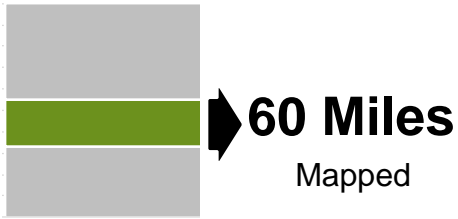


In some instances multiple methods are used to manage the same area.

*Grazing* makes up the greatest proportion of fuels reduction mapped. Most of the area reported is only partly managed but even so, a patchwork of reduced fuel can significantly slow the spread of wildfire across a landscape.

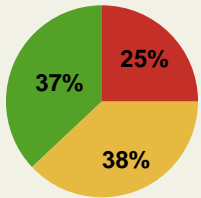
# Wildfire Hazard Mitigation Strategies: **FUELS REDUCTION**

Kaua'i Snapshot 2018-19: Miles of Active Fuels Reduction



Land stewards on Kaua'i mapped roughly 60 miles of fuel breaks, or linear fuels reduction.

## Maintenance Frequency of Reported Fuel Breaks

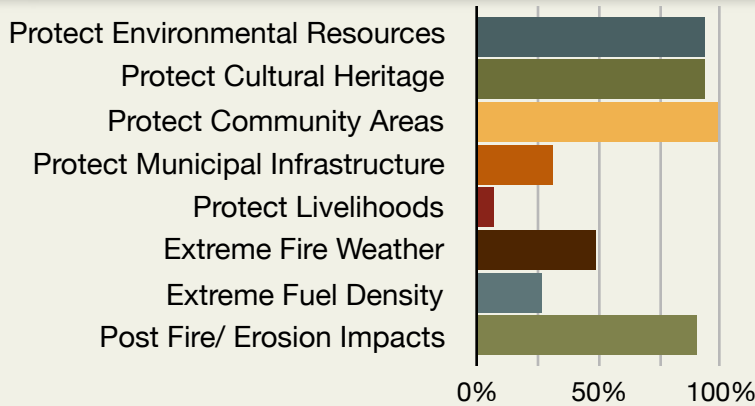


Self-reported maintenance frequency by mapping contributors.

- Unknown Maintenance
- Irregularly or Unmaintained
- Maintained Every Few Years
- Maintained Multiple Times Per Year

Only 37% of these fuel breaks are maintained multiple times per year meaning the remaining 63% are maintained much less frequently. It doesn't take long for substantial amounts of hazardous fuel to grow back, especially on Kaua'i where rainfall is generally more abundant than the other islands.

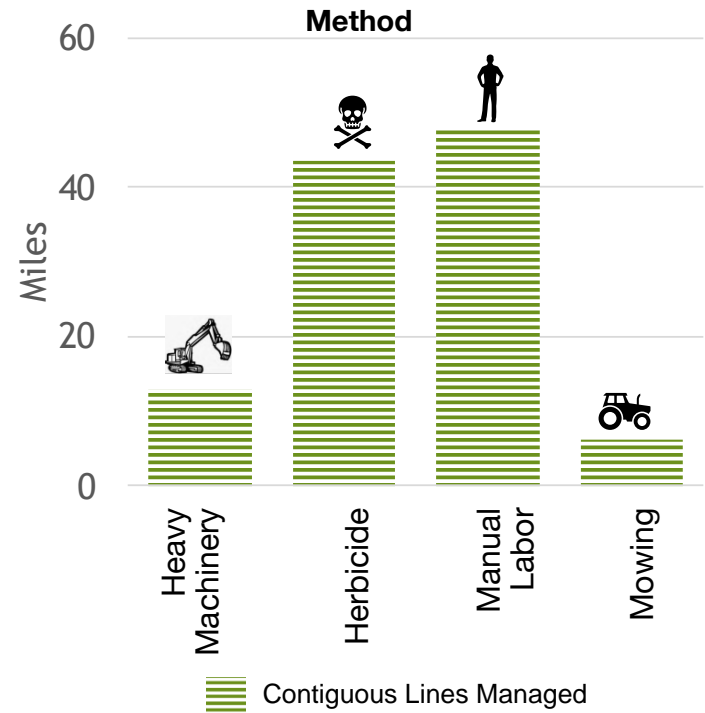
## Reasons for Fuel Breaks on Kaua'i



Percentage of total miles of fuel reduction on Kaua'i maintained for each reason. In several instances, multiple reasons were reported for managing the same areas.

There are multiple reasons reported for managing these areas including *protecting community areas, cultural heritage, environmental resources, and the potential detrimental impact of post-fire effects.*

## How Are Kaua'i Land Stewards Reducing Fuel?



In some instances multiple methods are used to manage the same area.

The most common methods reported are *manual labor* and *herbicide*.

## Fuels Conversion: Make It Less Burnable!

A long-term solution to reducing wildfire risk at the landscape scale.

### Benign Neglect

### Higher Fire Risk

(e.g. fallow agriculture, landscapes invaded by fire-promoting species; unmaintained vegetation around homes and community areas)



### Actively Managed Landscapes

### Lower Fire Risk

(e.g. active agriculture, targeted invasive species removal, maintained homes and community areas)

### The Takeaway:

Fuels conversion is a long-term approach to reducing wildfire hazard through **active land management and reducing flammability**.

Many land management activities result in converting fuel whether it be agricultural lands, development of community and recreational areas, or removal of invasive species.

**Including fire-thinking in these ongoing activities provides multiple benefits.**



A large eucalyptus fire in Koke'e created an opportunity for DLNR Division of Forestry and Wildlife to convert 1,000+ acres of burned land to a far less fire-prone koa plantation.

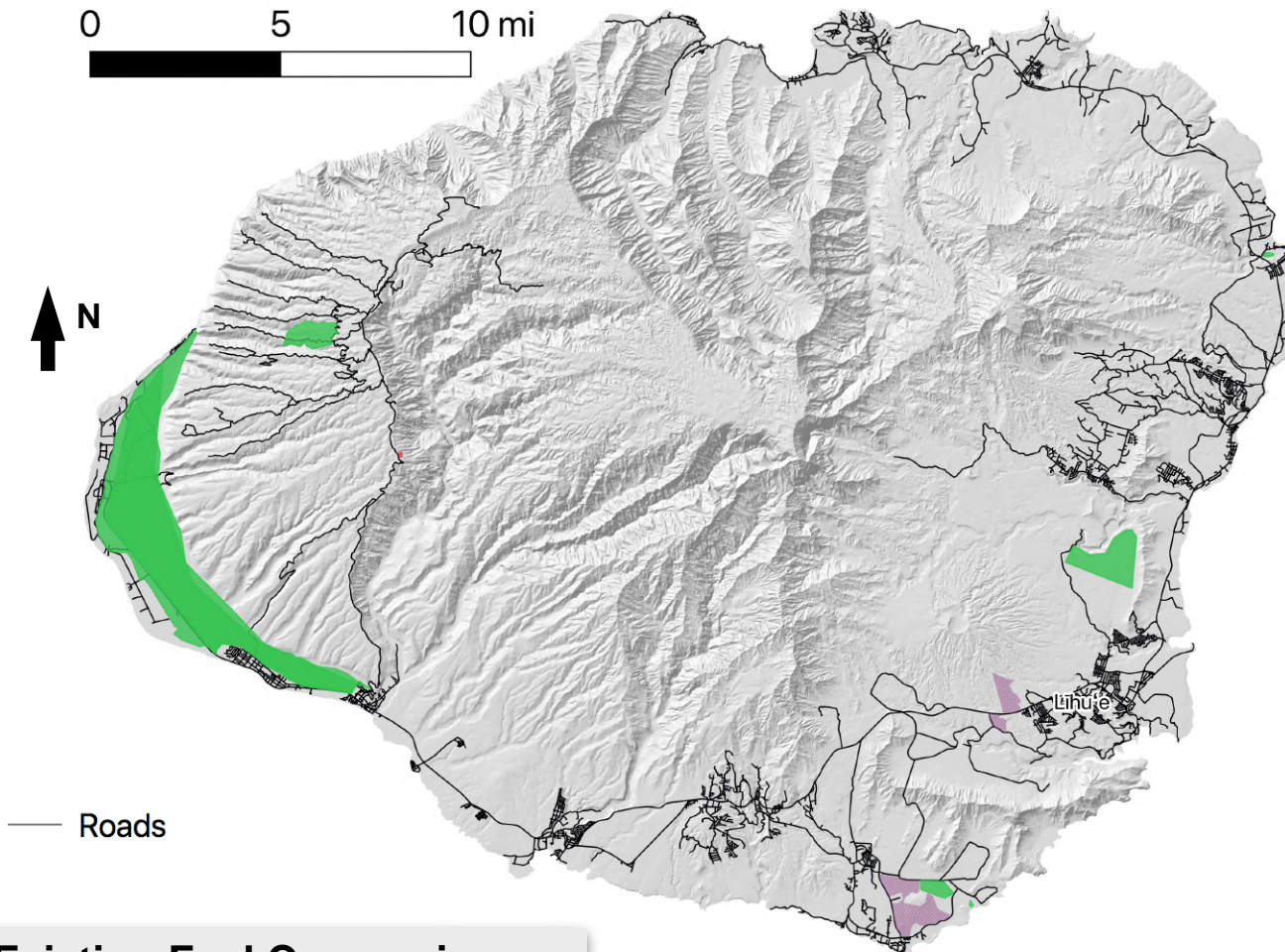


# Wildfire Hazard Mitigation Strategies: **FUELS CONVERSION**

Snapshot 2018-19: Current & Proposed Fuels Conversion on Kaua'i

**Fuels conversion** essentially means **transitioning vegetation from a higher fire risk to a lower one**.

This includes replacing invasive, fire-promoting grasses to **less flammable species** or **increasing moisture** (such as green breaks, converting fallow agricultural lands to **actively managed** agriculture or restoring riparian areas or lo'i).



## Existing Fuel Conversion

~ **15,000 Acres**  
fuels conversion only

~ **5,500 Acres**  
multiple vegetation management strategies

### Maintenance Frequency

- Multiple times per year
- Once every few years
- Irregularly or Unmaintained
- Unknown Maintenance

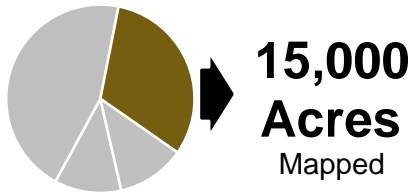
## Proposed Fuel Conversion

~ **1,200 Acres**

Proposed Fuels Conversion

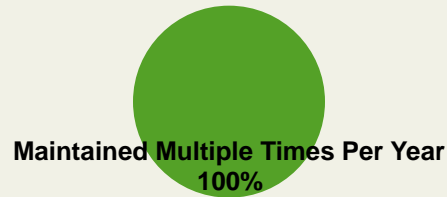
# Wildfire Hazard Mitigation Strategies: FUEL CONVERSION

Kaua'i Snapshot 2018-19: Acres of Active Fuel Conversion



Mapping participants identified roughly 15,000 acres of fuel conversion on Kaua'i.

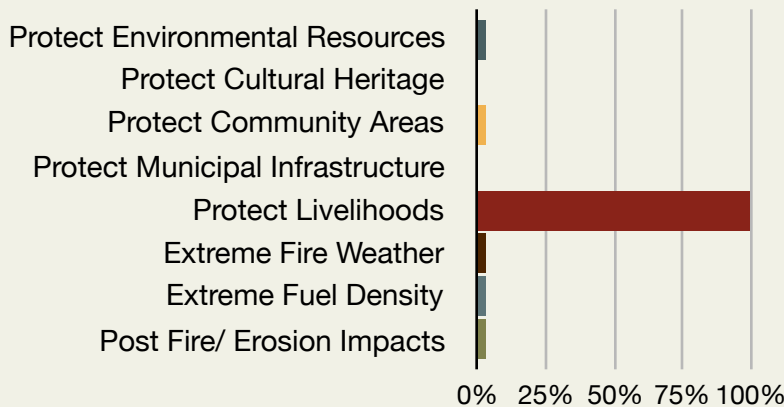
## Maintenance Frequency of Active Fuel Conversion



All areas of fuel conversion mapped are *maintained multiple times per year*. These are actively managed landscapes.

Self-reported maintenance frequency by mapping contributors.

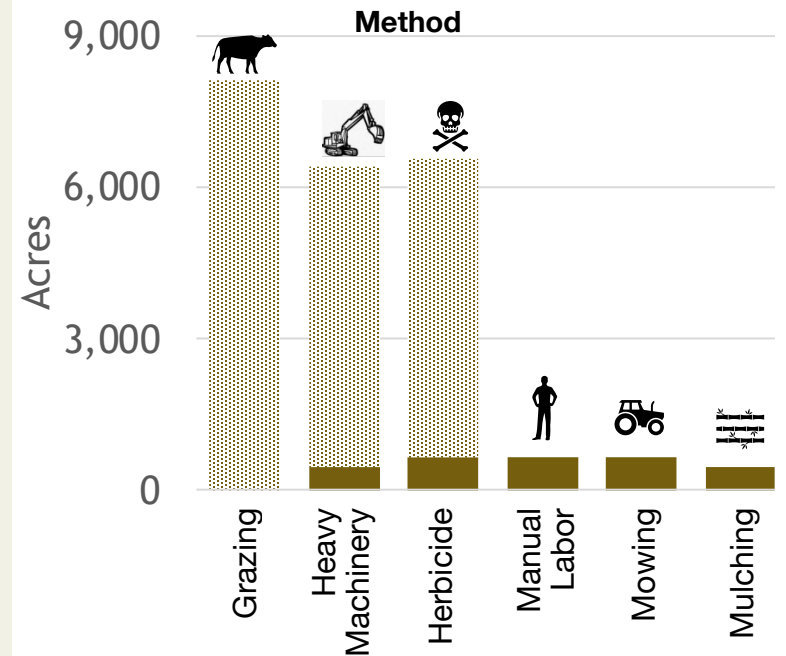
## Reasons for Acres of Fuels Conversion on Kaua'i



The reason for managing these areas is predominately to *protect livelihoods*, probably reflecting that these are working agricultural and grazing lands.

Percentage of total acres of fuel conversion on Kaua'i maintained for each reason. In several instances, multiple reasons were reported for managing the same areas.

## How Are Kaua'i Land Stewards Implementing Fuel Conversion?



**Whole Area Managed** **Part of Area Managed**

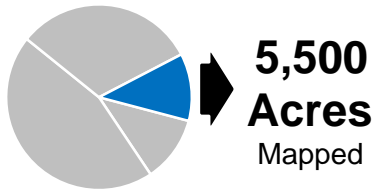
In some instances multiple methods are used to manage the same area.

The methods used for the most acres of fuel conversion include *grazing, herbicide and heavy machinery*.

It is interesting that grazing is used extensively in areas mapped as fuel conversion. While grazing could be implemented through a long-term approach to strategically reduce fuel around plantings in enclosures, grazing typically encourages grassland ecosystems which, during dry spells, become flashy fuels that are more fire-prone and spread wildfires quickly.

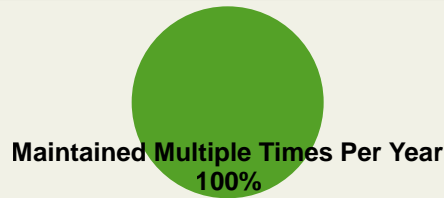
# Wildfire Hazard Mitigation Strategies: **MULTIPLE STRATEGIES**

Kaua'i Snapshot 2018-19: Acres With Multiple Hazard Mitigation Strategies



Land stewards on Kaua'i mapped roughly 5,500 acres where they are implementing multiple vegetation management strategies.

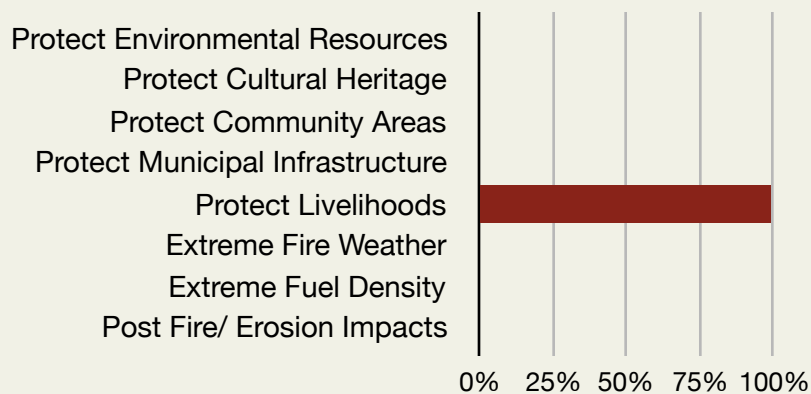
## Maintenance Frequency of Areas With Multiple Strategies



Land stewards in these areas are actively maintaining vegetation throughout the year.

Self-reported maintenance frequency by mapping contributors.

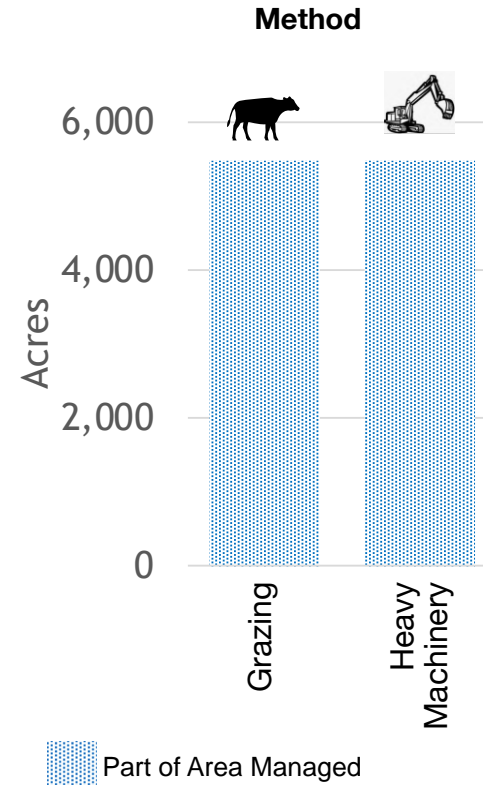
## Reasons for Acres of Multiple Vegetation Management Strategies on Kaua'i



These areas are actively managed primarily to *protect livelihoods*.

Percentage of total acres with multiple vegetation management strategies on Kaua'i maintained for each reason. In several instances, multiple reasons were reported for managing the same areas.

## How Are Kaua'i Land Stewards Implementing Multiple Vegetation Management Strategies?



In some instances multiple methods are used to manage the same area.

These areas are likely working ranch lands with firebreaks integrated throughout as the methods include *grazing* and *heavy machinery*. Although only *part of the area* is managed, a patchwork of reduced fuel and strategic firebreaks can significantly slow the spread of wildfire across a landscape.

# APPENDIX A: COLLABORATIVE ACTION PLANNING PARTICIPANT INPUT LIST



**For the following participant input list:**

1. Concerns are numbered
  - Suggested solutions brainstormed by participants are bulleted
  - **Suggestions that were voted on after discussion by participants are bold (# of Votes)**



## Kaua'i Participant Input From Workshop Held February, 21, 2019

### NORTH and EAST Area Specific Concerns

1. Need for private landowner assistance / programs
  - **Explore funding and technical assistance opportunities for private landowners and community programs (2)**
2. Anahola — Fuel loads need to be decreased
  - **Grazing via community group or rancher in limited areas (due to concern about cattle near ocean); Fuel breaks (1)**
3. Bridge by marina in Wailua; fire shuts highway, Kapa'a residents blocked; Cane Haul Road has high fuels
  - **Fuels management; Strategic fuel break (1)**
4. Decommissioned reservoirs
  - **Add water sources; New rules for water/dams should include planning for wildfire use, integrating fire into plans/policies for dams; dry pipe (1)**
5. Access: Need firefighting and fuels management access but do not want to increase ignitions; also deal with Rapid 'Ōhi'a Death
  - Manage fuels as possible and remove dead 'ōhi'a
6. Dealing with Guinea grass
  - Grazing?
7. Moloa'a Farms needs to increase awareness
  - Kaua'i Farmers United training; KKCR "In the Garden, On the Farm" program
8. Sleeping Giant - High usage and high number of ignitions
  - Outreach/education for recreational users

### WEST and SOUTH Area Specific Concerns

1. Need to manage fuels in fallow agricultural lands
  - **Manage fuels in these areas; Return to active use such as vegetable agriculture / food production (5)**
2. ADC land / Waimea Canyon Drive suspected arson issues
  - **Managing fuels; Better lookouts / people on watch; Keep water resources maintained (2)**
3. Koke'e area has high number of visitors and hazardous conditions (and only landline communications)
  - **Better roadside fuels management and communication with public/ drivers during wildfires (1)**
4. Koke'e cabins at risk with high potential for entrapment
  - **Inspect houses and help residents with fireplaces/wiring/etc.; Increase regulations; Insert wildfire prevention practices in leases (they are state-owned); Better communication DURING fire incidents; Volunteer team / trained initial responders; Education for safety purposes (evacuate early, mitigate/manage hazards ahead; learn to safely defend); Improve**

### communications for firefighting (repeaters and cell tower); Physical addresses and signage (1)

5. Abandoned homes and buildings with unmanaged fuels
  - Legislation/laws that owners and businesses must manage fuels
6. LThu'e and Poipu water no longer flowing; irrigation expensive
  - Work to support grazing
7. Markets needed for eucalyptus removal and food/vegetables/agriculture
  - Forest products industry to manage cleared timber
8. Moving cattle is costly and challenging
  - Sheep instead of cattle? (KIUC model); Beware of sheep getting loose and choose area carefully
9. State-owned land has strict regulations, which limits grazing opportunities; Over-grazing caused erosion
  - Grazing needs to come with grazing management plan that limits impacts
10. Wildland Urban Interface issues in South area (i.e., Poipu, Koloa)
  - Work with large landowners



Mahalo to all of the workshop participants who contributed their input and expertise.

# APPENDIX B: RAPID MAPPING ASSESSMENT DATA COLLECTION DETAILS

Mapping data was collected as a rapid assessment during 2018 and 2019. HWMO contacted all large landowners with >1% of each island's area and successfully had a majority participate in the mapping project. Mapping collaborators were engaged through one-on-one meetings and mapping workshops across the state. Other entities or groups were also welcome and participated. Some participants shared existing GIS files while others mapped areas using Google MyMaps (a free, collaborative, online mapping platform).

In addition to mapping areas of vegetation management, land stewards identified: the hazard mitigation strategy of the activity; reasons for managing vegetation; which methods were used; and how frequently they managed areas.

Some land owners mapped the exact areas of their activities while others, for privacy and other reasons, simply reported general areas where activities were taking place. Therefore, map areas and numbers of acres reported should be contextualized as such.

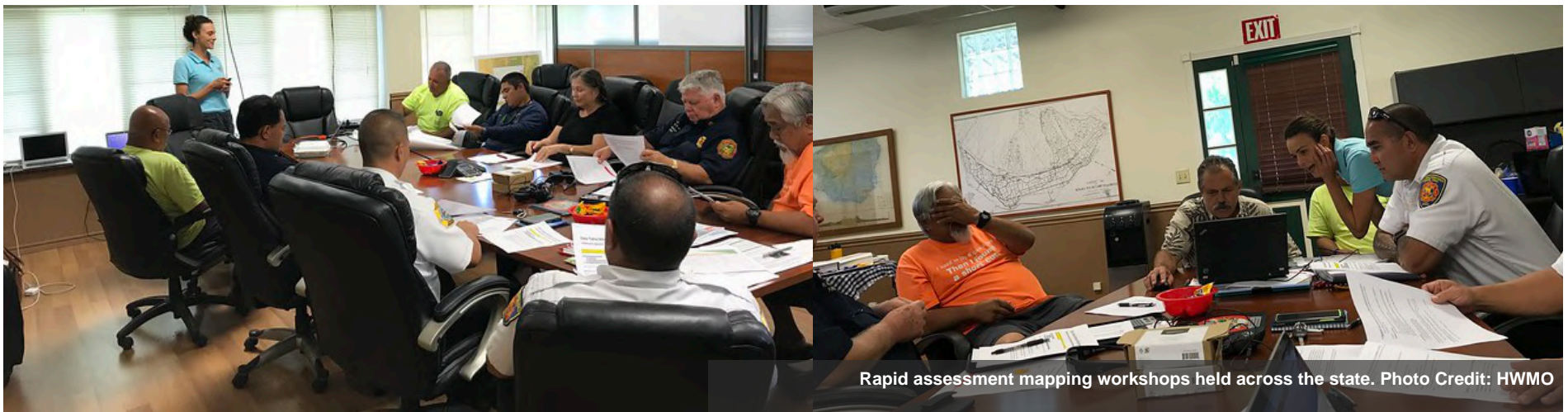
In an effort to maximize data quality, mapped areas and associated attributes were confirmed with mapping collaborators after all data was

converted in a compiled QGIS database. In some cases, areas were mapped by multiple groups, therefore efforts were made to minimize duplicate areas mapped when reporting acres using 'Dissolve' and 'Difference' geo-processing functions in QGIS 3.4

Feral animal grazing presented a particular problem for mapping because while feral animals do reduce fuel load (sometimes completely denuding the soil) they also have many undesirable impacts. During data collection, some groups reported areas with known 'significant feral animal grazing pressure'. Due to the lack of active management of the animals, these areas with no other management methods were excluded from maps and final data analysis.

Due to the nature of the data, maps are more reflective of active management of fuels and lands with "groups at the table for discussion" rather than depicting specific fuel load at any point in time.

This is the first ever state-wide dataset of vegetation management and can provide a great starting point for more specific or regional future planning efforts.



Rapid assessment mapping workshops held across the state. Photo Credit: HWMO

# APPENDIX C: RESOURCES

1) Hawai'i Wildfire Management Organization Website

<http://www.hawaiiwildfire.org>

2) Pacific Fire Exchange

<http://www.pacificfireexchange.org>

3) University of Hawai'i CTAHR Cooperative Extension NREM Wildland Fire Program

<https://www.nrem-fire.org/>

4) Ready, Set, Go! Wildland Fire Action Guide

<http://www.Hawaiiwildfire.org/fire-resource-library-blog/rsg-your-personal-wildland-fire-action-guide>.

5) Native Plants Hawai'i

<http://nativeplants.Hawaii.edu/index/>.

6) University of Hawai'i College of Tropical and Human Resources (CTAHR) Weed Management Links

<http://www.ctahr.hawaii.edu/inweed/weedlinks.html>

7) USDA Natural Resources Conservation Service: Hawaii State-Listed Noxious Weeds

<http://plants.usda.gov/java/noxious?rptType=State&statefips=15>

8) Firewise Communities Recognition Program and Online Portal

<http://firewise.org/usa-recognition-program.aspx>

9) NRCS Field Office Technical Guides

<https://efotg.sc.egov.usda.gov/#/details>

Standards and specifications related to fuels management:

- Brush Management (Code 314)
- Forage and Biomass Planting (Code 512)
- Fuel breaks (Code 383)
- Grazing Land Mechanical Treatment (Code 548)
- Herbaceous Weed Control (Code 315)
- Land Clearing (Code 460)
- Prescribed Grazing (Code 528)
- Range Planting (Code 550)
- Riparian Forest Buffer (Code 391)

10) Joint Fire Science Program Brief: Prevent or Reduce Fire with Goats

[http://www.firescience.gov/projects/briefs/99-1-3-02\\_FSBrief34.pdf](http://www.firescience.gov/projects/briefs/99-1-3-02_FSBrief34.pdf)



**HWMO**



**HAWAII WILDFIRE MANAGEMENT ORGANIZATION**