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

2018-19 Vegetation Management
Rapid Mapping Assessment and Collaborative Action Planning
Kauaʻi 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.**

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**Project Lead**

**Hawai‘i Wildfire Management Organization**  
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- State Division of Forestry and Wildlife (Mike Walker)
- University of Hawai‘i CTHAR Cooperative Extension (Dr. Clay Traurnicht)

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Cover Photo: Brushfire behind community near Waimea Canyon and post-fire erosion onto mauka reefs. Photo Credit: HWMO
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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).
**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.
THE PROBLEM? — Fire follows fuel...and vegetation is fuel!
Wildfires do not recognize fences or ownership boundaries.

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

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

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

"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?)
Managing vegetation is the key to reducing wildfire hazard at all scales! Due to the year-round growing season in Hawaiʻi, 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.”

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

- **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”

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).

Vegetation as fuel is a key ingredient for wildfire.
Kauaʻi 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 Kauaʻi 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 Kauaʻi 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’
Where To Start First for Addressing Wildfire Hazard?
As Determined by Kaua‘i Participants at Workshop Held February 21, 2019 in Līhu‘e

**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.

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”.

Invasive grasses and shrubs provide just the right fuel for fire. Photo Credit: HWMO
What’s the Issue?

There Are Recurring Wildfires in High Risk Areas

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

Rapid Mapping Assessment: Kaua‘i 2018-19 Snapshot

Wildfire Hazard Mitigation Strategies:

- Firebreaks
- Fuel Reduction
- Fuel Conversion

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

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.

Current Vegetation Management

Proposed Additional Vegetation Management

~ 180 Miles
~ 7,600 Acres

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
10. Kaua‘i Fire Department
11. Kekaha Agriculture Association

11 Map Contributors

- 64% Agency
- 27% For-Profit Business
- 9% Non-Profit/Community

~260 Miles
~41,000 Acres

2018-19 Rapid Mapping Assessment
Kaua‘i Report
**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.
Wildfire Hazard Mitigation Strategies: **FIREBREAKS**

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

- **~ 40 Miles** of needed firebreaks
- **~ 6,000 Acres** in need of firebreaks
- **~ 120 Miles** of enhanced firebreaks

**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**.

**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**

2018-19 Rapid Mapping Assessment

Kaua’i Report
Wildfire Hazard Mitigation Strategies: **FIREBREAKS**
Kauaʻi Snapshot 2018-19: Miles Existing of Firebreaks

**Maintenance Frequency of Existing Firebreaks**

- **Unknown Maintenance**: 1%
- **Irregularly or Unmaintained**: 30%
- **Maintained Every Few Years**: 69%
- **Maintained Multiple Times Per Year**: 0%

Self-reported maintenance frequency by mapping contributors.

**Reasons Why Firebreaks Are Established and Maintained on Kauaʻi**

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

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

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 Kauaʻi Land Stewards Creating and Maintaining Firebreaks?**

- **Heavy Machinery**
- **Herbicide**
- **Manual Labor**
- **Mowing**

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

The most common methods used for miles of firebreaks on Kauaʻi 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.

Roughly 90 miles of firebreaks were mapped by Kauaʻi land stewards.

Nearly a third of these firebreaks are maintained only once every few years.
Some mapping participants identified general areas where there are firebreaks, roughly 5,500 acres on Kaua‘i.

Self-reported maintenance frequency by mapping contributors.

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

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

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.

Wildfire Hazard Mitigation Strategies: **FIREBREAKS**

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

**Maintenance Frequency of Enhanced Firebreaks**

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

  Self-reported maintenance frequency by mapping contributors.

**Reasons Why Enhanced 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

  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.

**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.

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

- **Method**
  - Heavy Machinery
  - Herbicide
  - Manual Labor
  - Mowing
  - Mulching

  - **Contiguous Lines Managed**

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

  Multiple methods are used in combination to maintain enhanced firebreaks.

**120 Miles**

**Mapped**

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

There are multiple reasons for managing these enhanced fuel breaks.
**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.**
Wildfire Hazard Mitigation Strategies: **FUELS REDUCTION**
Snapshot 2018-19: Current & Proposed Fuels Reduction on Kaua‘i

**Existing Fuel Reduction**
- ~60 Miles of fuel breaks
- ~120 Miles of firebreaks enhanced with fuels reduction
- ~21,000 Acres with fuel reduction

**Maintenance Frequency**
- Green: Multiple times per year
- Yellow: Once every few years
- Red: Irregularly or Unmaintained
- Orange: Unknown Maintenance

**Proposed Fuel Reduction**
- ~140 Miles of needed fuels reduction
- ~5,500 Acres in need of fuels reduction

Fuels reduction activities reduce the amount of burnable vegetation to slow the spread of wildfire and break continuity of fuel across the landscape.
Wildfire Hazard Mitigation Strategies: **FUELS REDUCTION**
Kaua‘i Snapshot 2018-19: Acres of Active Fuels Reduction

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**
  - All areas are maintained multiple times per year.
  - Self-reported maintenance frequency by mapping contributors.

### Reasons for Acres of Fuels Reduction 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

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?

- **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.

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

- **Herbicide**
- **Manual Labor**
- **Mowing**
- **Mulching**
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**

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**

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.

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.
Fuel Conversion

**Fuels Conversion:** Make It Less Burnable!

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

**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.**

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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

**Proposed Fuel Conversion**
- **~ 1,200 Acres**

**Maintenance Frequency**
- Multiple times per year
- Once every few years
- Irregularly or Unmaintained
- Unknown Maintenance
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 exclosures, grazing typically encourages grassland ecosystems which, during dry spells, become flashy fuels that are more fire-prone and spread wildfires quickly.
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.

Maintained Multiple Times Per Year
100%

Self-reported maintenance frequency by mapping contributors.

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

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

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?

Part of Area Managed

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

These areas are actively managed primarily to protect livelihoods.
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 List

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 ‘Ohi‘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. Līhu‘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.
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

5) Native Plants Hawai‘i

6) University of Hawai‘i College of Tropical and Human Resources (CTAHR) Weed Management Links
   http://www.ctahr.hawaii.edu/invweed/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

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