

A landscape photograph showing a wide mountain range in the background under a blue sky with light clouds. The foreground is dominated by a dense, green and yellowish scrubland or grassy area. A large, semi-transparent blue rectangular box is overlaid on the lower half of the image, containing white and yellow text.

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

2018-19 Vegetation Management

**Rapid Mapping Assessment
and**

**Collaborative Action Planning
Hawai‘i Island 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)

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HWMO Photo Credits:

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Cover Photo: View of Kohala Mountain from Waikoloa Road during a wetter time of the year (when fuels are growing quickly). Photo Credit: HWMO



Collaborative Action Planning Workshop at Kailapa. 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 Hawai'i Island 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.

Hawai'i Island Rapid Mapping Assessment Summary Findings:

- ~ **755,000 acres** and **2,900 miles** of **current** firebreaks, fuel reduction or fuel conversion mapped on Hawai'i Island.
- ~ **310,000 acres** and **120 miles** of **needed** firebreaks, fuel reduction or fuel conversion mapped on Hawai'i Island.

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.

Hawai'i Island Collaborative Action Planning Workshop Summary:

Two workshops were held on Hawai'i Island with a total **68** 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 HAWAI‘I ISLAND

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

Wildfires do not recognize fences or ownership boundaries.

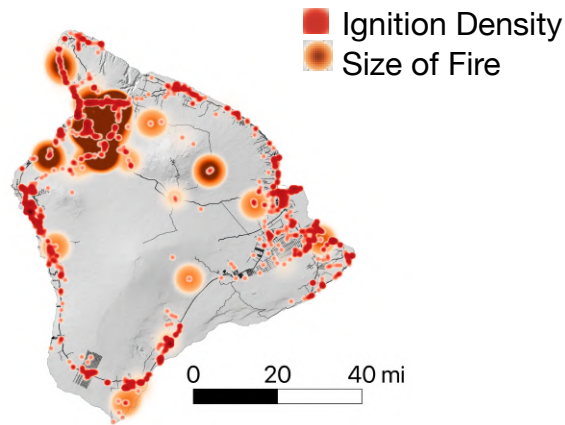
Ignitions



Fuel (Hazardous Vegetation)

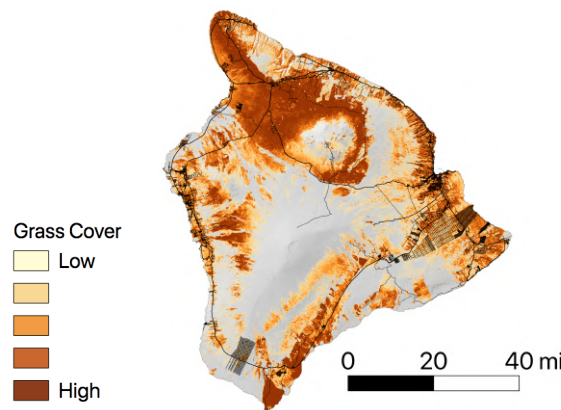


High Wildfire Risk



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:

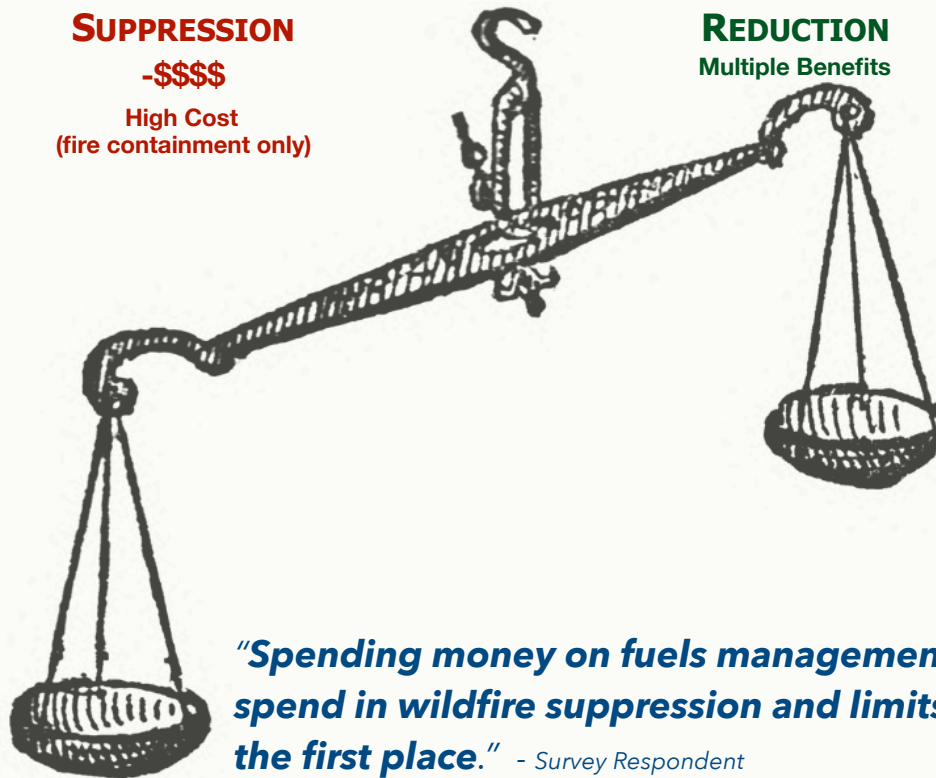
- \$ Money spent on emergency response, personnel, firetrucks, helicopters, fuel, equipment, etc.
- \$ Damage to infrastructure — costs to repairs/rebuilding
- \$ Destruction of irreplaceable native ecosystems and subsequent increased wildfire hazard
- \$ Damage to coastal resources of community, and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

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 wildfires and recovering after fires 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 in Hilo on February 22, 2019, Hawai'i Island.



Collaborative Action Planning Workshop in Kailapa on February 26, 2019, Hawai'i Island. Photo Credits: HWMO

Hawai'i Island 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 two Action Planning Workshops held on Hawai'i Island with **68** 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 *Hawai'i Island 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.

Hawai'i Island Summary

2019 Collaborative Action Planning Workshop

Highlighted Concerns and Priority Actions

What Are the Issues?

• Roads with Adjacent Fuels Create Wildfire Hazards

• Hazard Mitigation Requires Ongoing Maintenance, But There Is a Lack of Maintenance Funding

• Fire Suppression and Hazard Mitigation Can Also Have Unintended Consequences

• Biosecurity, Invasive Species, and Wildfire Are Linked

• People's Behaviors Can Become Unsafe in Extreme Fire Weather

• Wildfires Are a Recurring Issue in Some Areas

What Can Be Done? (Top Recommendations)

• Improve Roads to Be Firefighting Infrastructure: Create Wildfire Mitigating Transportation Corridors

• Encourage Funding for Vegetation Management that Reflects Ongoing Maintenance Needs

• Balance Impacts: Protect Natural and Cultural Resources During Emergency Response and Hazard Mitigation Activities

• Connect People with the Land: Encourage Active Stewardship

• Raise Awareness of Extreme Fire Weather Conditions and Encourage Fire-Safe Behavior

• Plan for Wildfire and Post-Fire Response



Wildfire Hazard Areas of Concern

As Determined by Hawai'i Island Participants at Workshops Held February 22, 2019 in Hilo and February 26, 2019 in Kailapa

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 Hawai'i Island.
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.

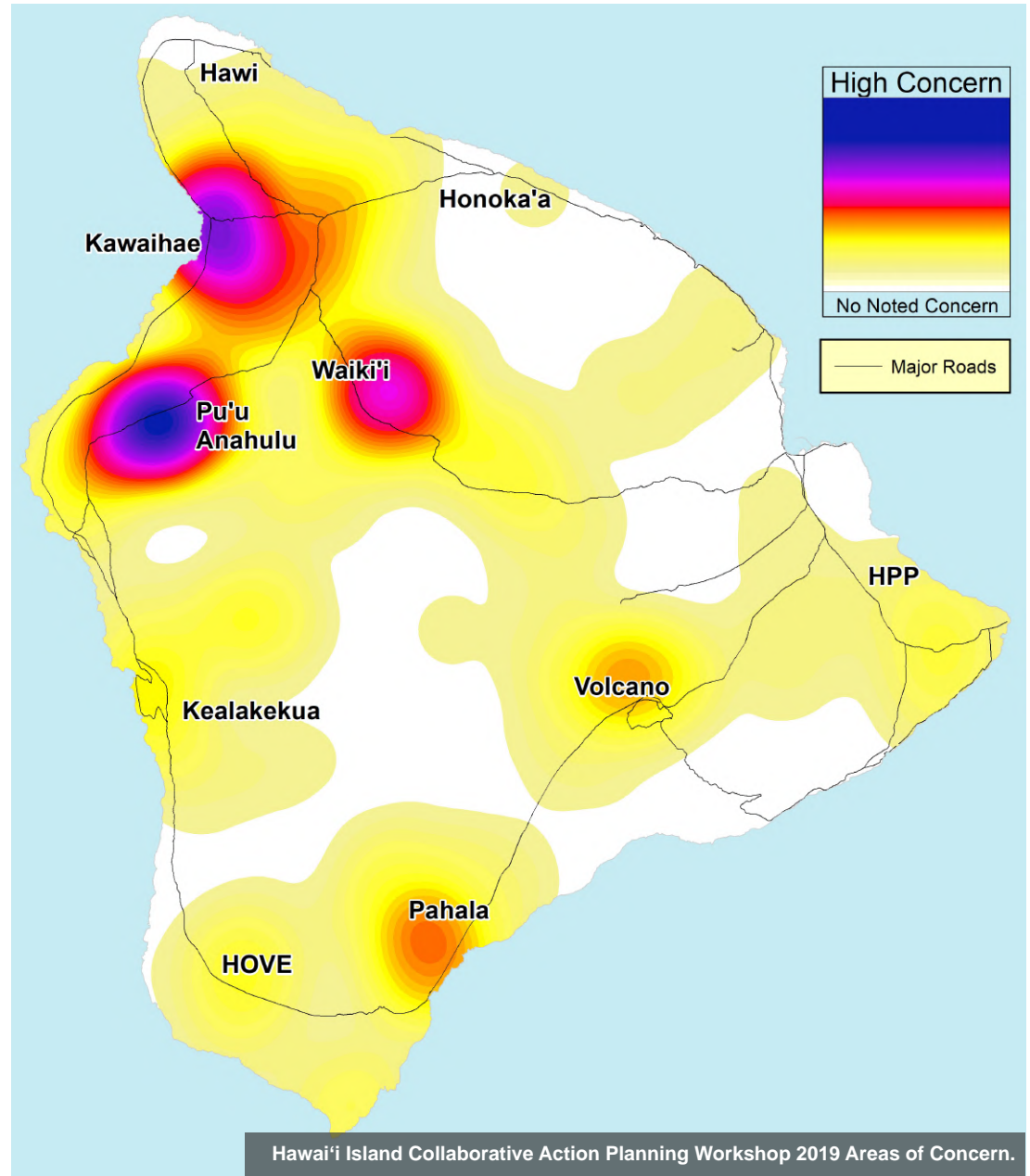
Values at Risk is fire jargon for the things that matter to us, **resources or areas that we want to protect from wildfire.** These include:

- **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)

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 *Hawaii Island Priorities* on the following pages are summaries of actions prioritized by workshop participants.



Hawai'i Island Collaborative Action Planning Workshop 2019 Areas of Concern.



What's the Issue?

Roads with Adjacent Fuels Create Wildfire Hazards

What Can We Do?

Improve Roads To Be Firefighting Infrastructure: Create Wildfire Mitigating Transportation Corridors

Roadsides tend to be where many fires ignite due to the presence of people and items that are hot or spark including machinery, hot exhaust, cigarettes, etc.

Furthermore, **roadsides tend to be a conduit of fire-promoting invasive species that spread** when seeds hitch a ride on equipment.

Roads are also great firebreaks because they are wide, paved, and un-burnable surfaces. Even more, they **provide critical access during emergencies** for first response and ingress/egress.

Therefore, **roads where adjacent fuel is managed for low fuel loads or low flammability (i.e., enhanced firebreaks) reduce the intensity and spread of wildfires that do start** and help firefighters more quickly contain a wildfire.

These **enhanced firebreaks keep firefighters safer** because less fuel means less fire intensity as the wildfire approaches. Enhanced firebreaks allow firefighters to be more effective in their initial response to fire and minimizes wildfire impacts.

This is why managing roadside vegetation (e.g. grazing or mowing) is so important.



Managing roadside fuels creates safer firefighting infrastructure and reduces the speed that roadside ignitions spread fire across the landscape. Photo Credit: HWMO

Collaborative Action Planning Workshop participants suggested prioritizing several actions to reduce roadside ignitions and improve roadway safety, including:

- **Collaborate with relevant parties** including regional partners, adjacent landowners, and road maintenance agencies **to keep fuel loads low near roads.**
- **Integrate fire-thinking into the development process to ensure good/safe roads, adequate emergency access, and water infrastructure.**
- Encourage alternative methods to manage roadside vegetation (because common herbicide practice can leave dead and ignitable fuels) including **roadside conversion of vegetation to lower ignition potential** such as:
 - Targeted fire-promoting invasive species removal;
 - Shaded green breaks adjacent to roadside with tree canopy shading out understory vegetation and increasing moisture;
 - Appropriate bio-cultural restoration between roadside and adjacent multi-use paths (e.g. enhanced firebreak).



What's the Issue?

Hazard Mitigation Requires Ongoing Maintenance, But There Is a Lack of Maintenance Funding

**Every action planning workshop group across the state highlighted the need for maintenance funding to manage hazards in Hawai'i's year-round growing season.

What Can We Do?

Encourage Funding for Vegetation Management that Reflects Ongoing Maintenance Needs

The value of prevention outweighs the cost many times over.

This becomes evident as we **tally the costs of wildfire from the emergency response costs, losses of property and resources, to long-term negative impacts on our communities and habitat.**

When it comes to prevention and hazard mitigation, maintenance is the key and requires stable, long-term funding.

Collaborative Action Planning Workshop participants discussed ways to encourage funding for vegetation management, including:

- Connect with legislators and raise awareness of the costs and impacts of wildfire to **increase wildfire prevention funding.**
- **Encourage maintenance funding for fire infrastructure** including development of local funding mechanisms.
- Leverage and coordinate existing funds from agencies and involved groups.
- Capture costs of wildfire suppression (e.g. emergency personnel, lives, resources, helicopter) and do a **cost/benefit analysis of prevention versus wildfire suppression and losses/impacts from wildfire.**



Even paved firebreaks require ongoing maintenance because vegetation grows. Photo Credit: HWMO



What's the Issue?

Fire Suppression and Hazard Mitigation Can Also Have Unintended Consequences

What Can We Do?

Balance Impacts: Protect Natural and Cultural Resources During Emergency Response and Hazard Mitigation Activities

The primary concern for firefighters during emergency response is lives, safety and property. With this in mind, it is also important to protect fragile ecosystems and cultural sites during wildfires and emergency response actions.

Therefore, **firefighters need to know where these important places are** at the right time.

Pre-fire planning and ongoing **communication** with the fire department can help **reduce damage to significant heritage resources during emergency response**.

Furthermore, actions to reduce wildfire hazards can also have unintended consequences such as increased runoff and erosion from firebreaks which can be mitigated with appropriate design.



Pu'u Koholā after the 2015 fire. Sensitive cultural areas need appropriate consideration in wildfire suppression which can cause more damage to cultural areas than the fire itself. Photo Credit: HWMO

Participants at the Collaborative Action Planning Workshops identified numerous important considerations to minimize unintended consequences, including:

- Ensure **cross-disciplinary review of plans to reduce negative impacts and unintended consequences** (for example, consider erosion control for firebreaks).
- Find a **balance between grazing benefits and damage to native ecosystems** using appropriate animal management, fencing, and exclosures for native plant communities.
- Account for **benefits of resource users/stewards** including hunters managing firebreak roads.
- **Enhance communications between emergency response agencies and local communities to inform areas to protect and sensitive areas to avoid.** This includes pre-fire communication and planning with the fire department and designated liaison between community and fire response team.



Erosion on firebreak road.



What's the Issue?

Biosecurity, Invasive Species, and Wildfire Are Linked

Through the years, land use choices by people have dramatically transformed vegetation across the landscape. Native dry forests have been destructively grazed and invaded by introduced, fire-prone grasses. Areas cleared for agricultural lands in a bygone era have been neglected and become overgrown.

Invasive, **fire-prone grasses** actually encourage wildfire because they ignite and spread wildfire quickly and are first to grow back after a burn. They spread and **colonize disturbed areas such as roadsides** when their seeds hitch a ride on equipment and animals.

By removing and **preventing the spread of problematic invasive grasses***, we **reduce the wildfire hazard to our landscapes**. Protecting our communities and ecosystems from wildfire requires actively managing landscapes.

*While all dry grass can spread fire, fountain grass (*Pennisetum setaceum*) and guinea grass (*Megathyrsus maximus*) are the two problem invasive grasses identified by workshop participants, whereas other grasses such as kikuyu grass (*Pennisetum clandestinum*) and buffel grass (*Cenchrus ciliaris*) are considered important grazing forage.



Fountain grass is quick to re-grow after wildfire. Photo Credit: HWMO

Enhancing biosecurity measures could reduce future wildfire problems.

For example, Rapid 'Ōhi'a Death (ROD) has resulted in a large fuel load of standing dead trees in affected areas.

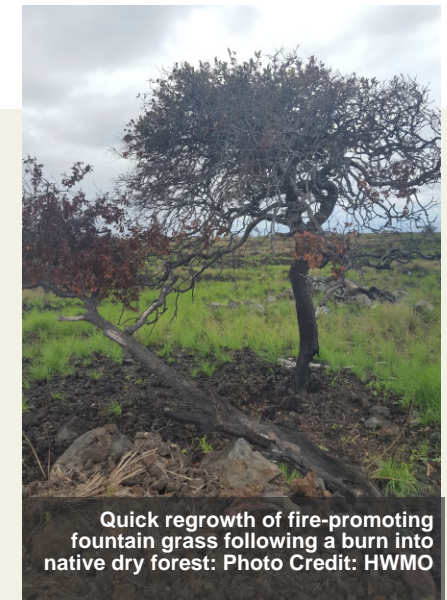
Preventing the spread of ROD and other biosecurity threats, including at ports of entry, has significant value for protecting our communities and environments from wildfire and other devastating impacts.

What Can We Do?

Connect People With the Land: Encourage Active Stewardship

Participant priorities at the Collaborative Action Planning Workshops included:

- Plan for post-fire restoration, including **reducing post-fire erosion impacts** on makai areas and **opportunity to replant and convert fuel**.
- **Restore land mauka to makai** for community food production and protection of cultural resources.
- Take a **landscape-scale approach** in coordination with other organizations and landowners to manage invasive species such as fountain grass.
- Encourage state government to take a **proactive role to prevent** more issues related to biosecurity, **invasive species**, and wildfire and encourage **tourism authority** to understand and tackle the issue (**if we don't protect what we value, we may lose the things we value**).



Quick regrowth of fire-promoting fountain grass following a burn into native dry forest: Photo Credit: HWMO



What's the Issue?

People's Behaviors Can Become Unsafe in Extreme Fire Weather Conditions

What Can We Do?

Raise Awareness of Extreme Fire Weather Conditions and Encourage Fire-Safe Behavior

During extreme fire weather conditions (i.e., hot, dry, windy), even the smallest spark can start a blaze. For example, the simple act of parking on dry grass or sparks from machinery have started numerous large wildfires.

Fire hazard varies based on conditions that vary by location and throughout the year due to wet/dry cycles. In our unique landscapes, one place may have extreme fire-weather conditions while another experiences wet-season.

For example, it rains in the summer in Kona, making fire season in Kona less of a threat than other areas during the summer with a reverse fire danger season.

Due to the variability of Hawai'i's climates and wildfire danger throughout the season, it is important to **raise situational awareness about localized extreme fire danger and educate visitors, residents, and decision-makers about how to be safe in extreme fire weather conditions.**



Fire-promoting Fountain grass spreads across lava on Hualalai. Photo Credit: HWMO.

Discussions and priorities from the Collaborative Action Planning Workshops included:

- Pursue **agency policy and legislation to address high risk wildfire behavior** including use of tools and machinery in high fire hazard conditions (dry, windy, hot).
- **Engage relevant parties in wildfire prevention discussions** including electric utilities, road maintenance crews, and the tourism industry (HTA).
- Educate homeowners and community members about defensible space and Firewise practices.
- Raise awareness of **location-specific extreme fire weather conditions** maintained by local leads and communicated to stakeholders/public (this could be included in more local media weather/news updates).



What's the Issue

Wildfires Are a Recurring Issue in Some Areas

What Can We Do?

Plan for Wildfire and Post-Fire Response

Certain places **will predictably have wildfires again**. Including areas with:

- fire weather (dry, hot and windy conditions);
- vegetation that is fire-promoting, including invasive species such as fountain grass;
- and a history of wildfires (such as adjacent to roads or other ignition prone areas).

Fire leaves the soil bare and **post-fire erosion impacts both denude mauka lands of soil fertility and smother makai areas with sediment and runoff**. Post-fire erosion can also be exacerbated by firebreak breaks created during an emergency response which is why **part of the fire response needs to include erosion mitigation** before heavy machinery leaves the scene of the fire.

Fire events can also be an **opportunity to re-establish less fire-prone vegetation** and reduce the recurrence of wildfire.



Post-fire sediment erosion in Kawaihae harbor following the 2015 fire. Photo Credit: HWMO

Collaborative Action Planning Workshop participants identified several opportunities to better plan for wildfire in areas with recurring wildfire problems, including:

- **Increase collaborative response in post-fire restoration** (e.g. Burned Area Emergency Response teams) such as:
 - Have deliberate post-fire response plans;
 - Be ready to mobilize within a short time frame;
 - Hold post-fire workshops to develop post-fire action team and develop plans including **emergency sediment control**, land-use goals, revegetation process in order to transition to a less fire-prone and locally-appropriate landscape (such as pili grass or forest restoration).
- **Establish and maintain strategic firebreaks** (including emergency access/multi-use paths around communities).
- Coordinate with ranchers to incentivize grazing/ **bring water and thus grazing pressure to high ignition areas**.
- Pursue legislative **permissions to share water** for firefighting purposes.
- Build local capacity in rural areas and coordinate **community rapid response** team to support fire department including opening gates, water sources, cutting firebreak lines and identifying sensitive areas.
- Integrate Firewise in fire-prone communities and fire-thinking in planning new development.

What's Already Happening on Hawai'i Island?

2018-19 RAPID MAPPING ASSESSMENT OF VEGETATION MANAGEMENT

Quantitative Project Findings

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Fuel Conversion	25



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.

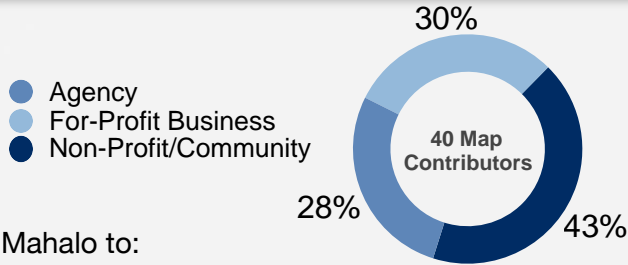
Proposed Areas: Mapping contributors were asked to identify priority areas in need of additional management of vegetation.

See *Appendix B* for all data collection methods.



Rapid Mapping Assessment: Hawai'i Island 2018-19 Snapshot

Mapping Contributors



Mahalo to:

- Ala Kahakai National Historic Trail
- County of Hawai'i Department of Water Supply
- County of Hawai'i Department of Parks and Recreation Maintenance Division and PONC
- County of Hawai'i Department of Public Works Highway Division
- Department of Hawaiian Homelands
- DLNR Division of Forestry and Wildlife
- dōTERRA - Kealakekua Mountain Reserve
- Forest Solutions
- Gomes Ranch
- Hawai'i Electric Light
- Hawai'i Army National Guard
- DLNR State Parks Hawai'i Island District
- Ho'ilina Ranch
- Kona Hills Coffee
- Ho'omau Ranch
- Kailapa Firewise Community
- Kanehoa Firewise Community
- Kohala Waterfront Firewise Community
- Kohala Watershed Partnership (representing Kahua Ranch, Kohala Ranch, Pono'holo Ranch, Queen Emma Foundation)
- Liliu'okalani Trust
- Mauna Kea Resort
- Mauna Kea Forest Restoration Project (<http://dlnr.hawaii.gov/restoremamaunakea/>)
- Mauna Kea Watershed Alliance
- Nā Mamo o Kāwā
- National Park Service
- Parker Ranch
- Pōhāhā I Ka Lani (PONC)
- Puakō Firewise Community
- Pu'ukapu Firewise Community
- South Kohala Coastal Partnership
- State Department of Transportation Hawai'i Island District
- The Nature Conservancy
- U.S. Army Garrison, Pohakuloa Training Area and Center for Environmental Management of Military Lands, Colorado State University
- U.S. Fish and Wildlife Service
- Waialea Firewise Community
- Waiki'i Ranch Firewise Community
- Waikoloa Dry Forest Initiative
- Waikoloa Fire Management Action Committee
- Yee Hop Ranch

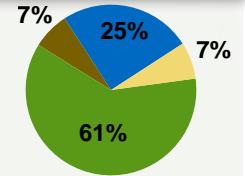
Current Vegetation Management and Proposed Vegetation Management Across Hawai'i Island



- Current Vegetation Management
- Proposed Vegetation Management
- Roads

Current Vegetation Management

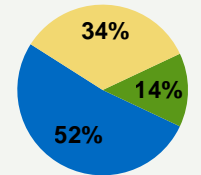
~755,000 Acres



Wildfire Hazard Mitigation Strategies

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

~ 2,900 Miles



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

Proposed Additional Vegetation Management

~ 120 Miles

~310,000 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.



Firefighters using a firebreak as a strategic line of defense. Photo Credit: HWMO

Waikoloa Fire 2005. A firebreak completed just two weeks before the largest wildfire in modern Hawai'i history was exactly what first responders needed to fend the wildfire off from homes in Waikoloa. Photo Credit: HWMO

Wildfire Hazard Mitigation Strategies: FIREBREAKS

Snapshot 2018-19: Existing & Proposed Firebreaks on Hawai'i Island

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

~ **1,000 Miles** of firebreaks

~ **1,500 Miles** of **enhanced** firebreaks

~ **57,000 Acres** with firebreaks

Maintenance Frequency

Multiple times per year

Once every few years

Irregularly or Unmaintained

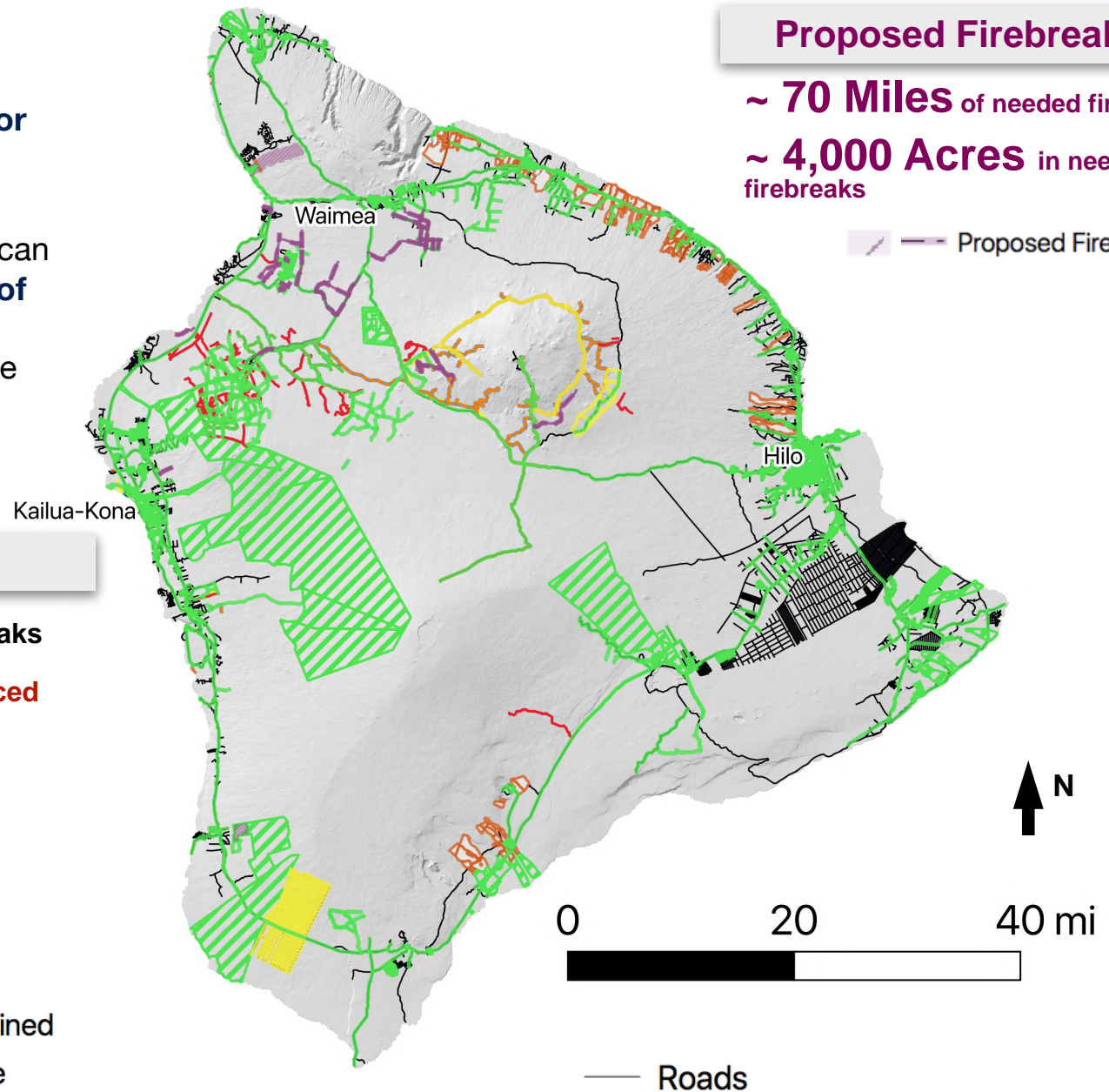
Unknown Maintenance

Proposed Firebreaks

~ **70 Miles** of needed firebreaks

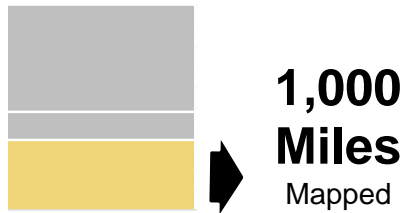
~ **4,000 Acres** in need of firebreaks

Proposed Firebreak



Wildfire Hazard Mitigation Strategies: FIREBREAKS

Hawai'i Island Snapshot 2018-19: Miles of Existing Firebreaks



Roughly 1,000 miles of firebreaks were mapped by Hawai'i Island land stewards.

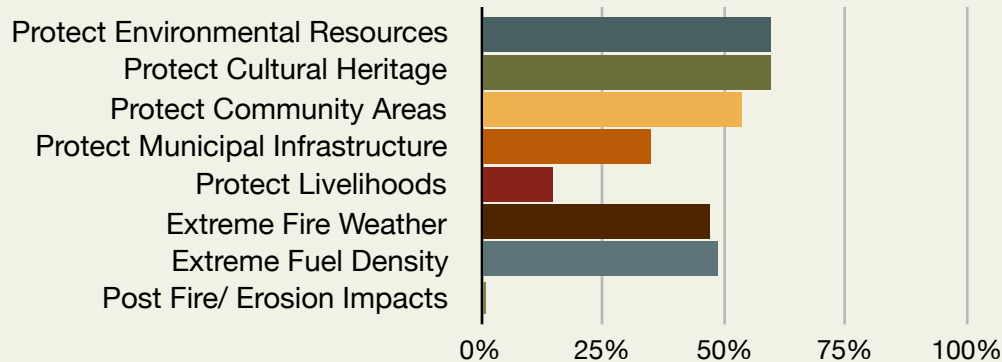
Maintenance Frequency of Existing Firebreaks



Self-reported maintenance frequency by mapping contributors.

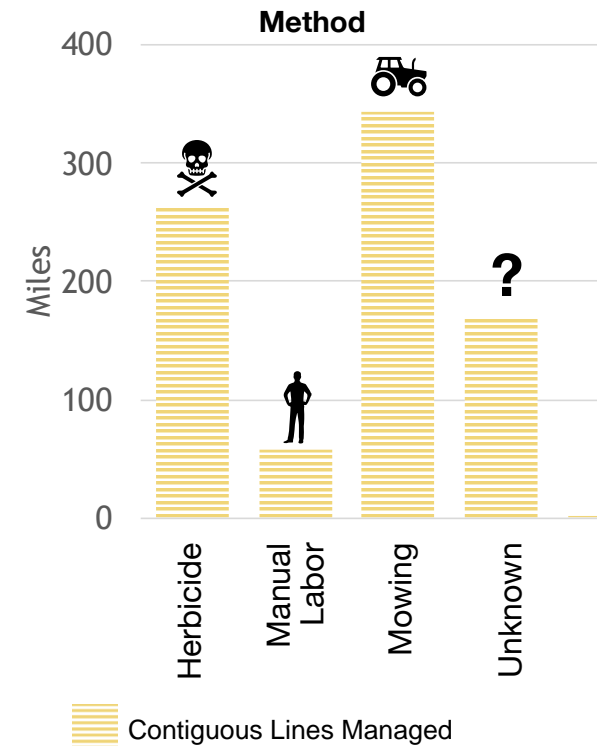
Only 33% of these miles are maintained *multiple times per year*. Firebreaks with *irregular or unknown maintenance* reported may not be as effective or safe for firefighters due to the rapid growth of vegetation in Hawai'i.

Reasons Why Firebreaks Are Established and Maintained on Hawai'i Island



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

How Are Hawai'i Island Land Stewards Creating and Maintaining Firebreaks?



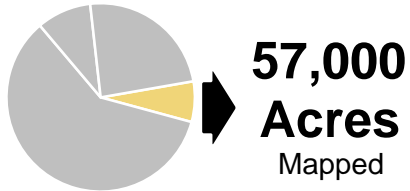
In some instances multiple methods are used to manage the same area.

The most common methods used are *mowing* and *herbicide*.

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

Hawai'i Island Snapshot 2018-19: Acres of Existing Firebreaks



Some mapping participants identified general areas where there are firebreaks, including roughly 57,000 acres on Hawai'i Island.

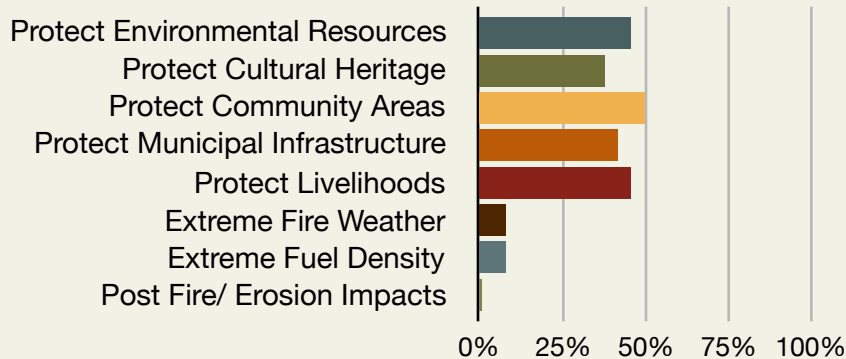
Maintenance Frequency of Existing Firebreaks



Self-reported maintenance frequency by mapping contributors.

While half of the areas with firebreaks are *maintained multiple times per year*, the other half have *unknown maintenance*. Firebreaks with irregular or unknown maintenance reported may not be as effective or safe for firefighters due to the rapid growth of vegetation in Hawai'i.

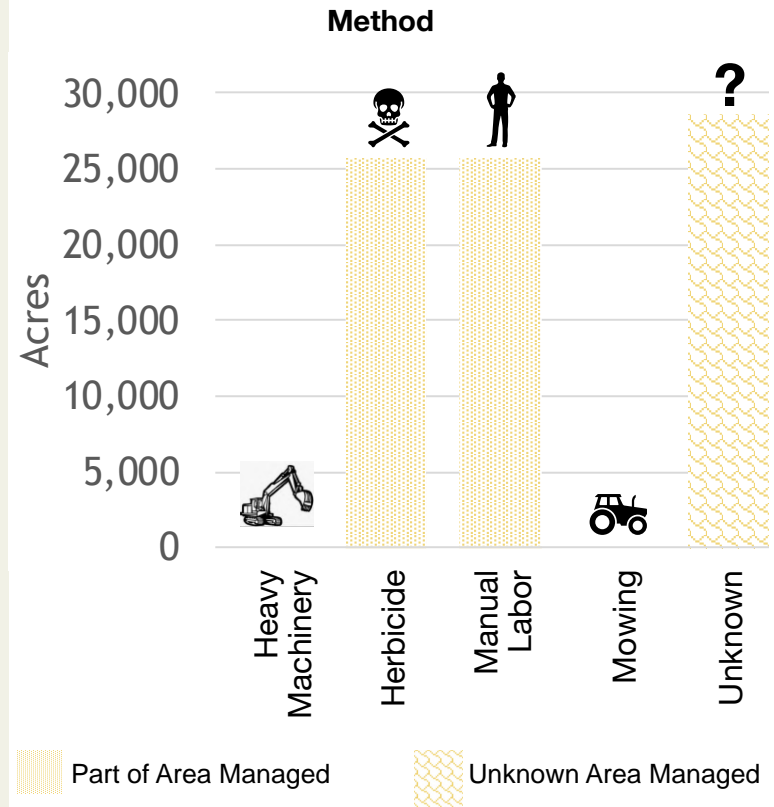
Reasons Why Firebreaks Are Maintained on Hawai'i Island



Firebreaks are created for diverse reasons.

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

How Are Hawai'i Island Land Stewards Creating and Maintaining Firebreaks?

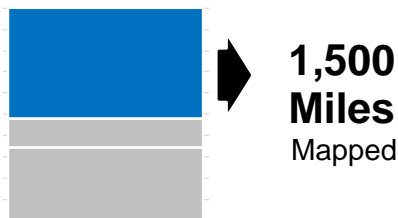


In some instances multiple methods are used to manage the same area.

In these areas, firebreaks are primarily maintained with *herbicide and manual labor*. Herbicide is used in wide swaths over lava fields to break continuity of fuel such as fountain grass, an invasive, fire-promoting grass. Manual labor may include weed-whacking of flashy, herbaceous, fuels or chainsawing overgrown woody vegetation.

Wildfire Hazard Mitigation Strategies: **Enhanced FIREBREAKS**

Hawai'i Island Snapshot 2018-19: Miles of Enhanced Firebreaks

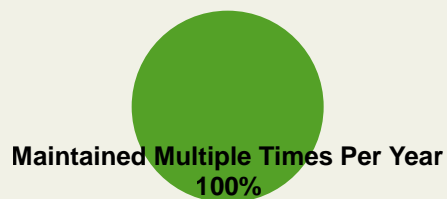


Enhanced firebreaks provide the greatest protection for firefighters because as a wildfire approaches, it loses intensity if there is less fuel to burn. When there is also adequate access to water, even better!

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 fuel reduction on either side.



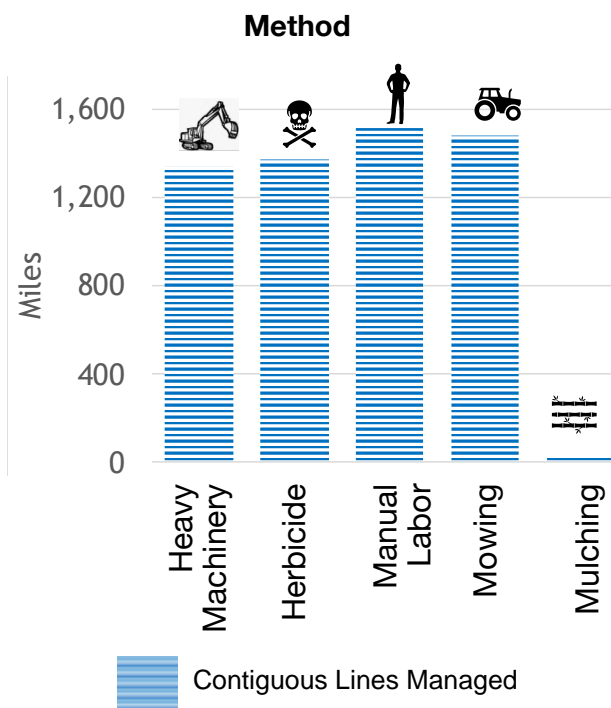
Maintenance Frequency of **Enhanced** Firebreaks



Self-reported maintenance frequency by mapping contributors.

All miles of enhanced firebreaks are *maintained multiple times per year*. This likely reflects the ongoing fuel reduction needs of vigorous vegetation growth and multiple growing seasons in Hawai'i.

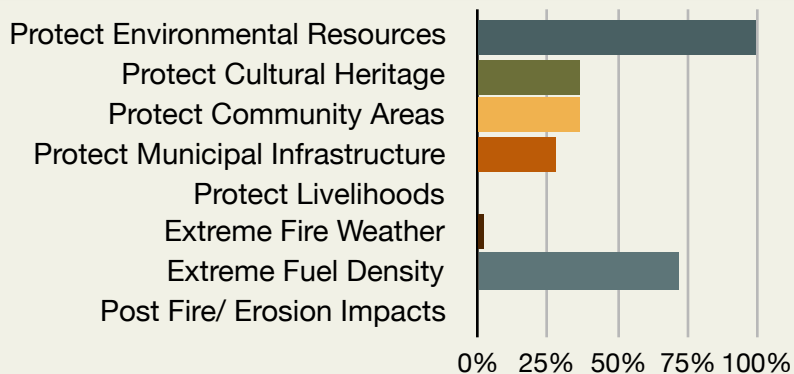
How Are Hawai'i Island Land Stewards Creating and Maintaining **Enhanced** Firebreaks?



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

Heavy machinery, herbicide, manual labor, and mowing are used in combination to maintain enhanced firebreaks.

Reasons Why **Enhanced** Firebreaks Are Maintained on Hawai'i Island



Land managers reported that vegetation is managed to *protect environmental resources* for all miles of enhanced firebreaks mapped, in addition to other reasons.

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

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.**

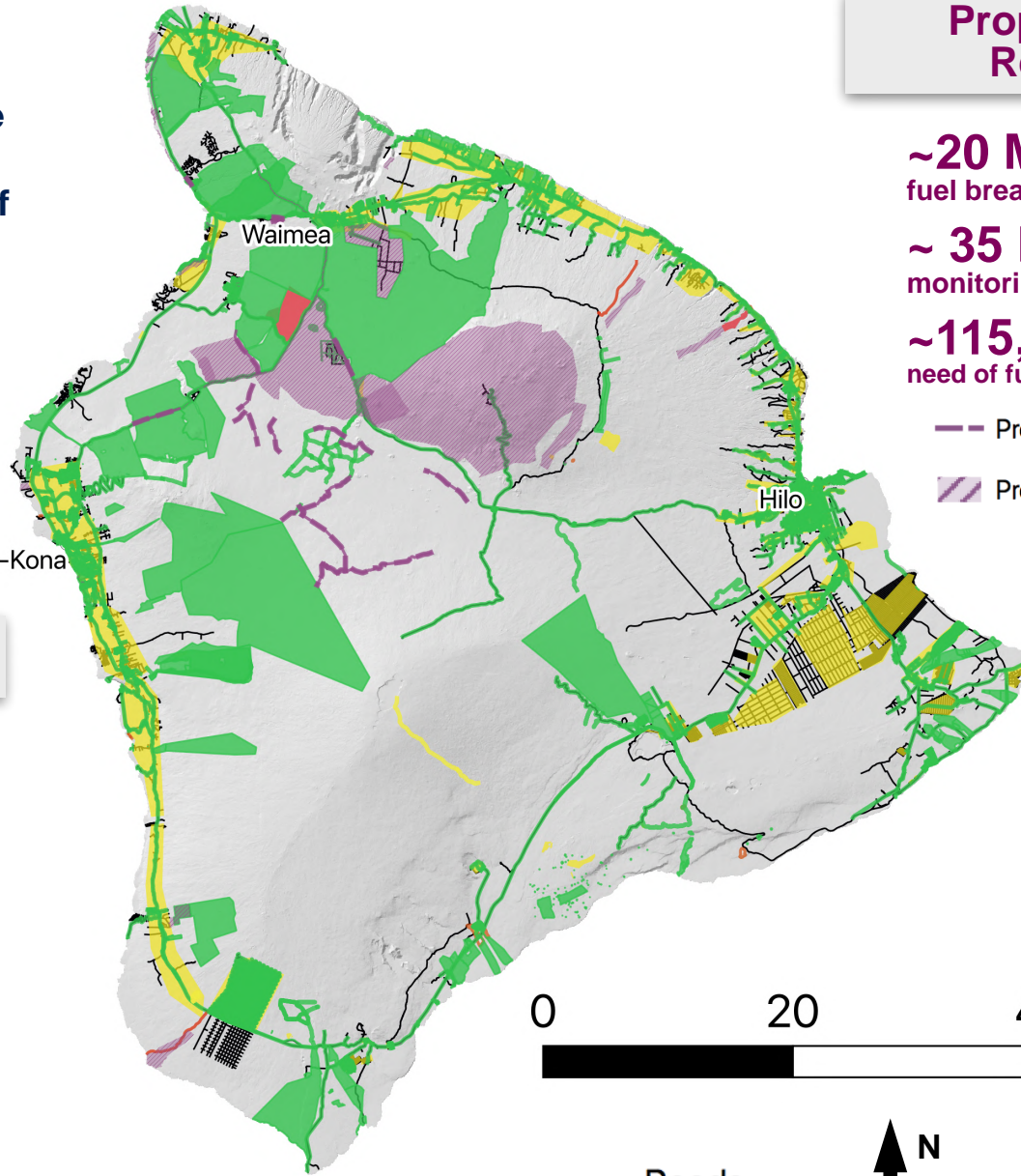


Fuels reduction occurring in Waimea Nature Park along the edge of a stream bank, a project that HWMO helped fund several years ago. Credit: South Kohala Coastal Partnership.

Wildfire Hazard Mitigation Strategies: **FUELS REDUCTION**

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

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

~20 Miles of needed fuel breaks

~ 35 Miles of fuel monitoring corridors

~115,000 Acres in need of fuels reduction

— Proposed Fuels Reduction

▨ Proposed Fuels Reduction

Existing Fuel Reduction

— **~ 400 Miles** of fuel breaks

▨ **~ 455,000 Acres** with fuel reduction

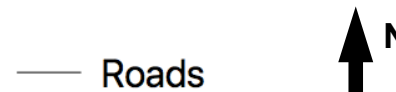
Maintenance Frequency

▨ Multiple times per year

▨ Once every few years

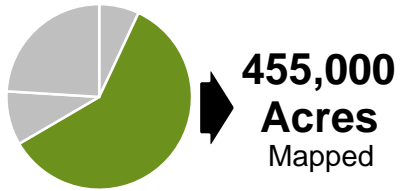
▨ Irregularly or Unmaintained

▨ Unknown Maintenance



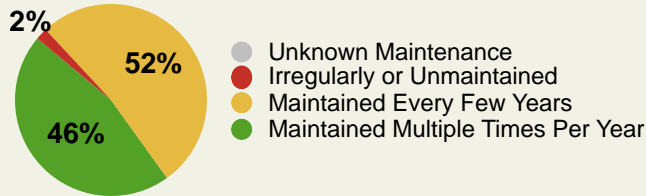
Wildfire Hazard Mitigation Strategies: **FUELS REDUCTION**

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



On Hawai'i Island roughly 455,000 acres of fuel reduction were mapped.

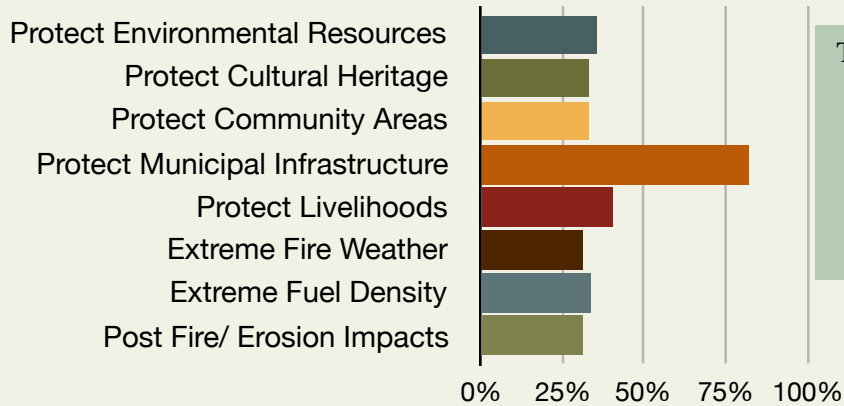
Maintenance Frequency of Fuel Reduction



Self-reported maintenance frequency by mapping contributors.

A sizable 54% of these acres are only *maintained every few years* or over longer intervals. Due to the vigorous growth of vegetation and year-round growing seasons in Hawai'i, it doesn't take long for a wildfire hazard to re-grow.

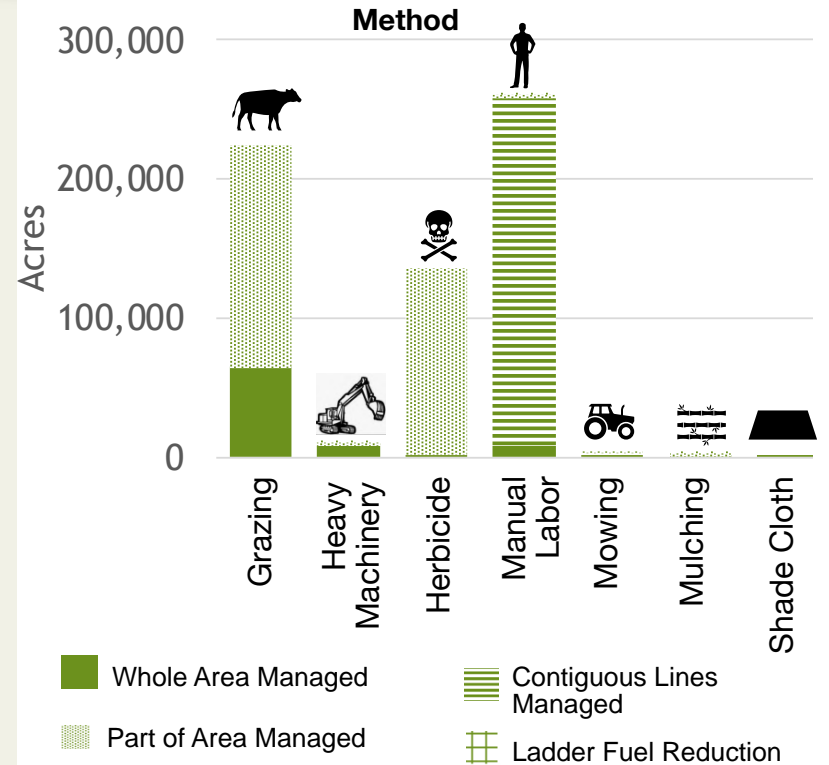
Reasons for Acres of Fuel Reduction on Hawai'i Island



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

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

How Are Hawai'i Island Land Stewards Reducing Fuel?



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

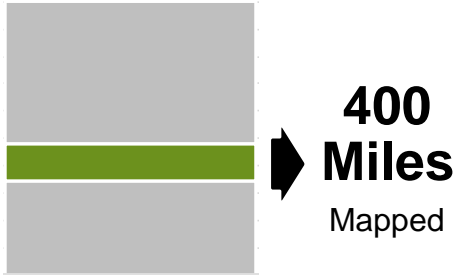
Common management methods include *manual labor*, *grazing*, and *herbicide*. Both reduction of flashy fuels such as grasslands and reduction of woody vegetation is occurring.

While only *part of the area is managed* for most fuel reduction mapped, even a patchwork of reduced fuels can significantly slow the spread of wildfire across a landscape.

Areas where contiguous lines are managed with *manual labor* are primarily areas beneath and around power lines.

Wildfire Hazard Mitigation Strategies: **FUELS REDUCTION**

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

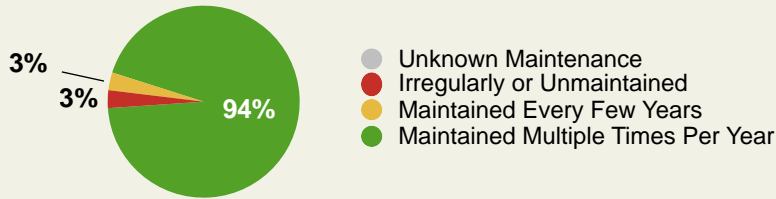


Land stewards on Hawai'i Island mapped roughly 400 miles of fuel breaks, or linear fuels reduction.

Due to the unique active volcanic landscape of Hawai'i Island, land stewards are taking advantage of the "natural fuel breaks" that occur on sparsely vegetated lava flows. Mapping contributors also identified roughly 35 miles of "fuel monitoring corridors" where targeted removal of invasive grasses will be prioritized to maintain these natural fuel breaks.



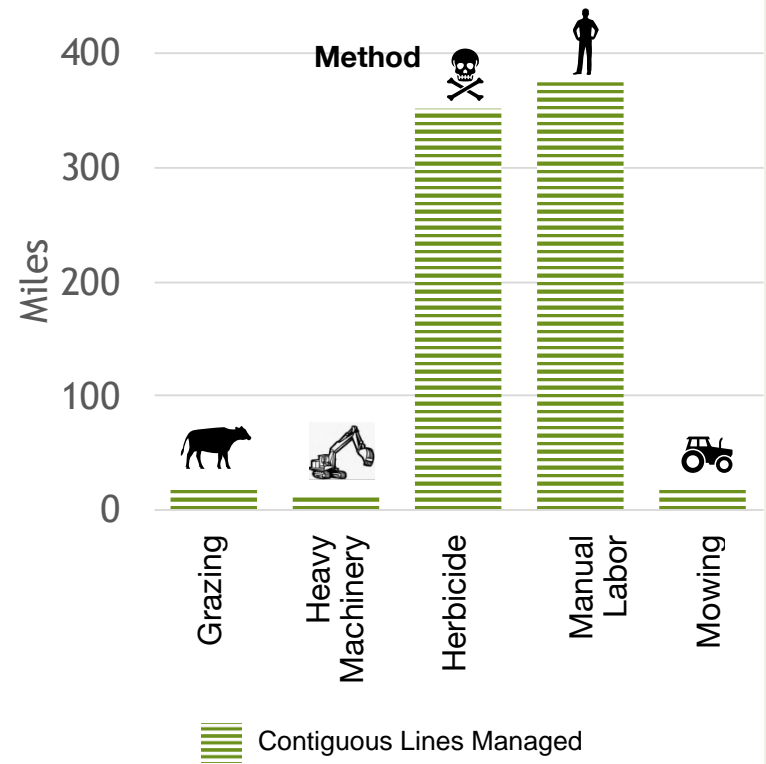
Maintenance Frequency of Fuel Breaks



Self-reported maintenance frequency by mapping contributors.

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

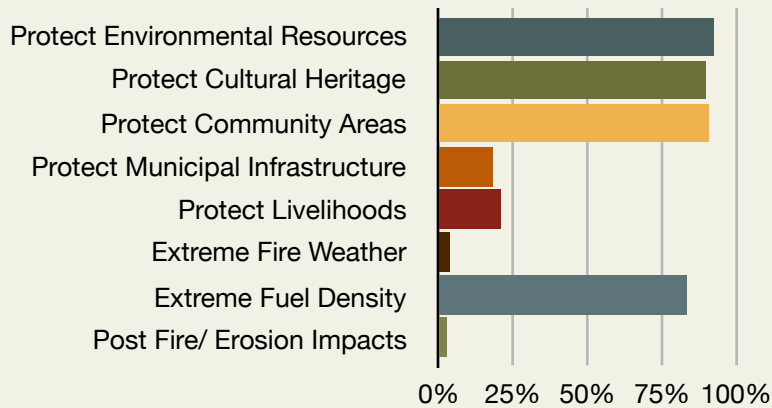
How Are Hawai'i Island Land Stewards Reducing Fuel?



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

The most common method used is *manual labor* and *herbicide*.

Reasons for Miles of Fuel Breaks on Hawai'i Island



These linear fuel breaks are predominately managed to protect *environmental resources, cultural heritage and community areas* due to *extreme fuel density*.

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

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.



Koai'a Tree Sanctuary on Kohala Mountain where fuels are being converted to a koai'a forest (among other native, less fire-prone species. Photo Credit: HWMO)

Wildfire Hazard Mitigation Strategies: **FUELS CONVERSION**

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

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

~**52,000 Acres** fuel conversion only

~**186,000 Acres** with multiple management strategies

Maintenance Frequency

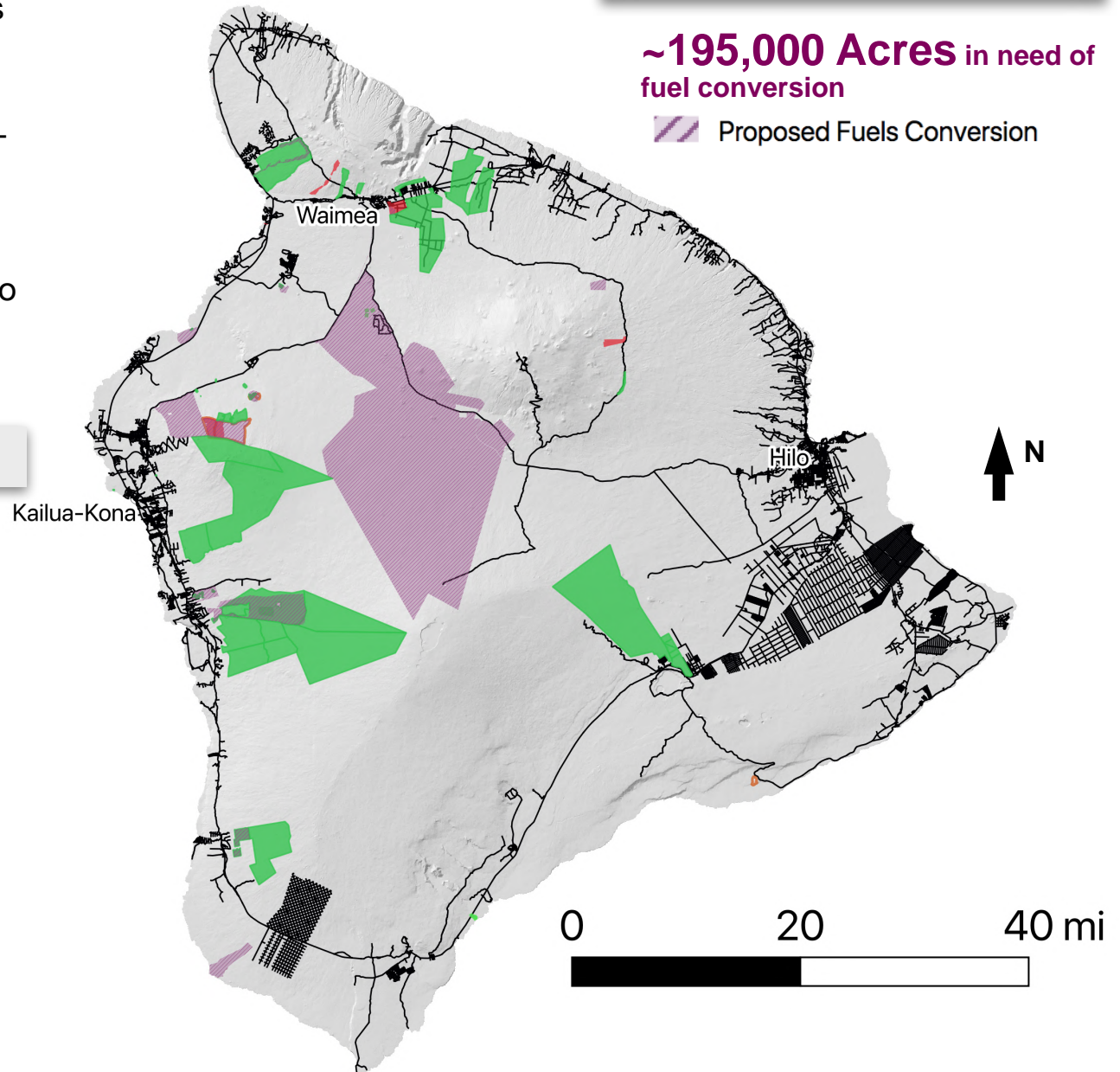
- Multiple times per year
- Once every few years
- Irregularly or Unmaintained
- Unknown Maintenance

— Roads

Proposed Fuel Conversion

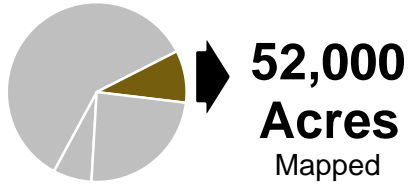
~**195,000 Acres** in need of fuel conversion

Proposed Fuels Conversion



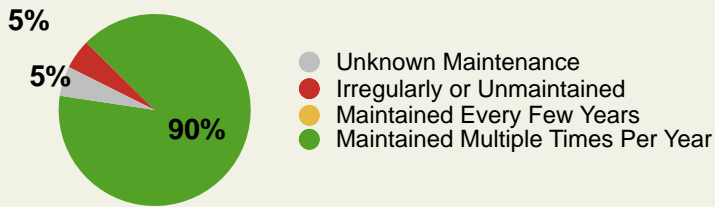
Wildfire Hazard Mitigation Strategies: **FUELS CONVERSION**

Hawai'i Island Snapshot 2018-19: Acres of Active Fuels Conversion



Mapping participants identified roughly 52,000 acres of fuels conversion on Hawai'i Island. These areas likely represent both forest restoration projects as well as working ranch lands.

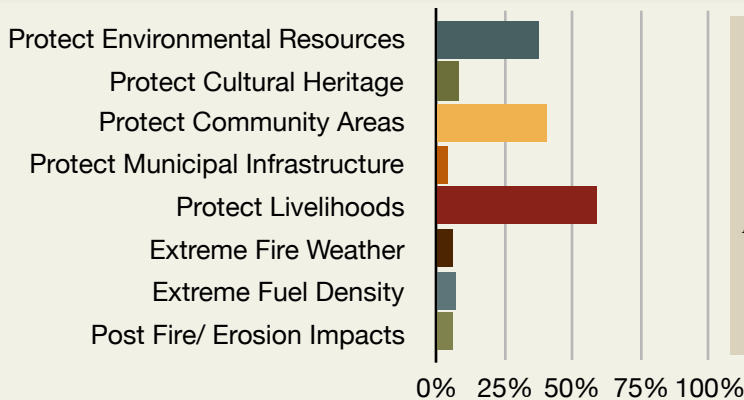
Maintenance Frequency of Active Fuel Conversion



Self-reported maintenance frequency by mapping contributors.

Most areas are actively managed landscapes that are *maintained multiple times per year*.

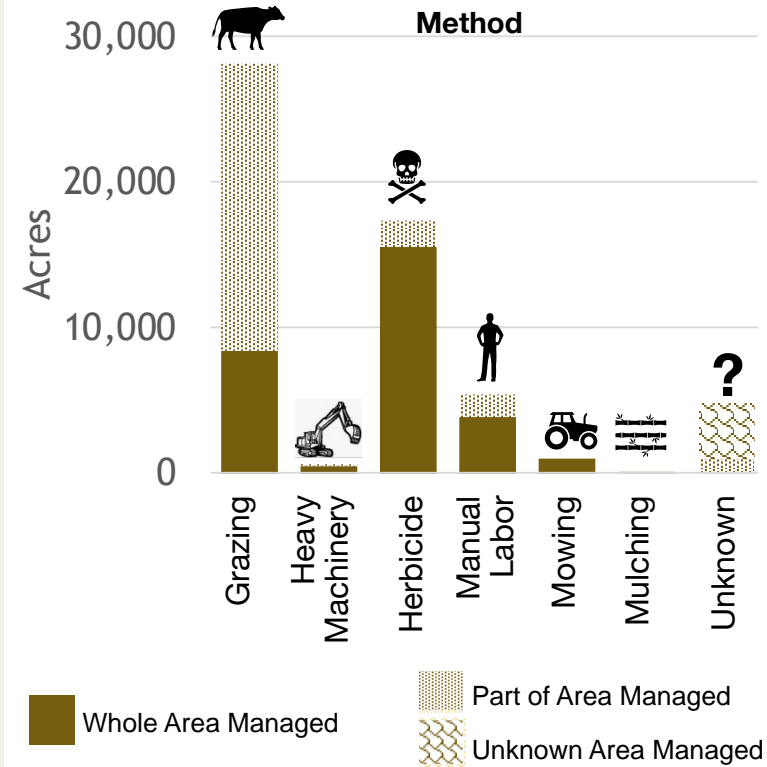
Reasons for Acres of Fuel Conversion on Hawai'i Island



There are diverse reasons for managing these areas including *protecting livelihoods, protecting community areas and protecting environmental resources*.

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

How Are Hawai'i Island Land Stewards Are Implementing Fuel Conversion?

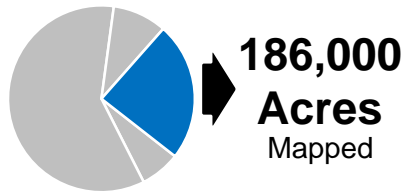


In some instances multiple methods are used to manage the same area.

Interestingly, *grazing* is used extensively in areas mapped as fuel conversion. While grazing could be implemented through a long-term approach to strategically reduce fuels around plantings in enclosures, grazing typically encourages grassland ecosystems which are more fire-prone and spread wildfires quickly compared to native dryland forests. Additionally, *herbicide* that targets removal of wildfire promoting species may be considered fuels conversion strategy as it prevents additional fire-prone landscapes or reduces fuel in already invaded landscapes.

Wildfire Hazard Mitigation Strategies: **MULTIPLE STRATEGIES**

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



Land stewards on Hawai'i Island mapped roughly 186,000 acres where integrated strategies are implemented including maintaining firebreaks, fuels reduction, and fuels conversion. These areas may reflect grazing lands, agriculture, and ecosystem restoration projects.

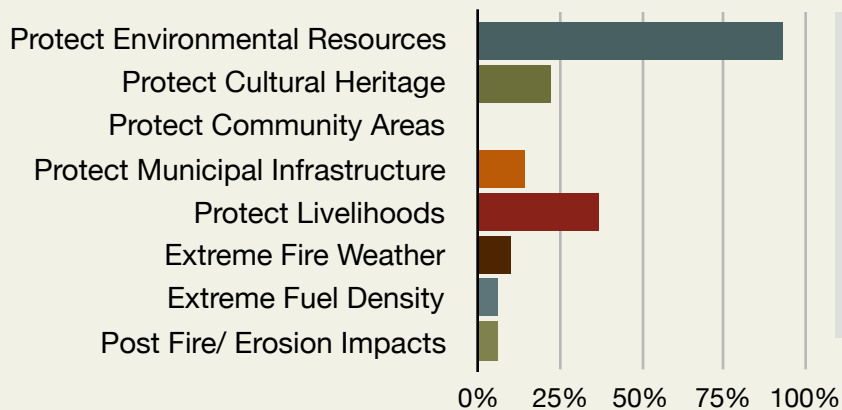
Maintenance Frequency of Areas With Multiple Strategies



Areas with integrated vegetation management strategies tend to have active management with all areas reported as *maintained multiple times per year*.

Self-reported maintenance frequency by mapping contributors.

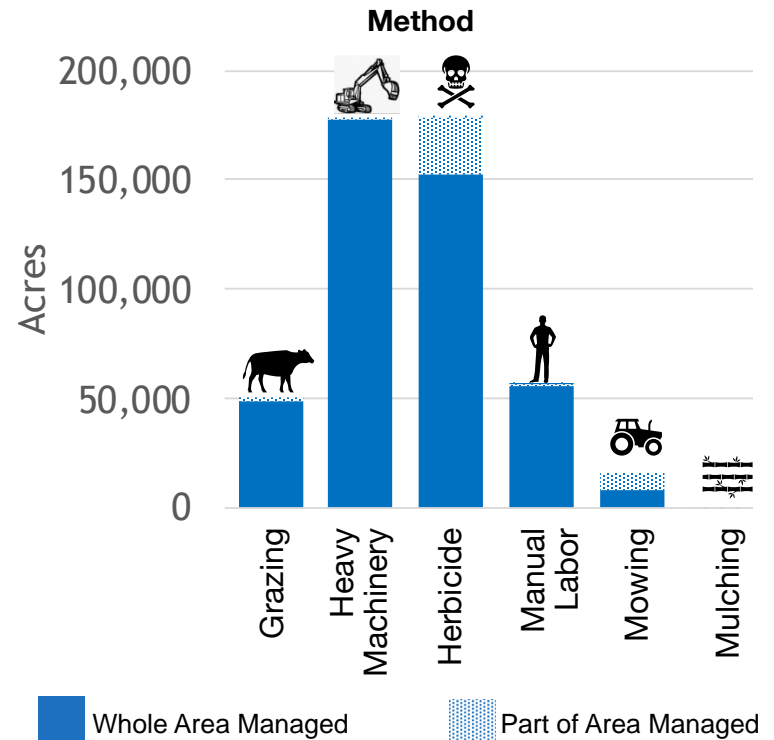
Reasons for Acres of Multiple Vegetation Management Strategies on Hawai'i Island



Interestingly, most of these areas are managed to *protect environmental resources*, along with other motivations.

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

How Are Hawai'i Island Land Stewards Implementing Multiple Vegetation Management Strategies?



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

Methods reported are mixed between the various vegetation management strategies. For example, use of *heavy machinery* may be for implementing firebreaks or preparing areas for planting for fuels conversion; whereas, *herbicide* could be used to reduce fuel and convert fuel by removing fire-promoting species.

Manual labor and *grazing* are also used across large acreages.

APPENDIX A: COLLABORATIVE ACTION PLANNING PARTICIPANT INPUT LISTS

Hawai'i Island - Hilo Participant Input List	30
Hawai'i Island - Kailapa Participant Input List	32



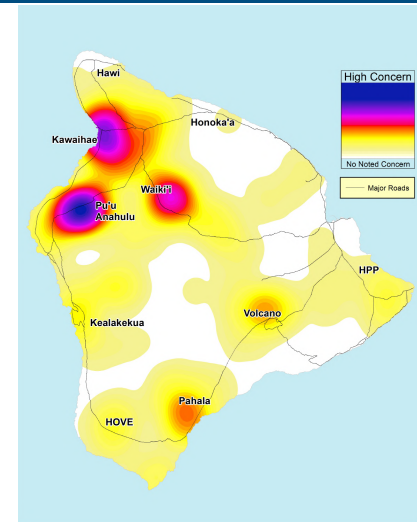
For the following participant input lists:

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



GENERAL CONCERNS

1. Limited aerial suppression resources (expensive, big ticket items)
 - Contract aerial wildfire suppression resources (for island and state)
2. Decision-makers unaware of costs and impacts of wildfire (why they should care)
 - Field trips with legislators (annual tour/workshop)
 - Coordinated approach to communicate with legislators
 - Opportunities for data sharing between different agencies
 - "Mauka to makai" framework for coordinated messaging
 - Sign-on letter for workshop participants or develop petitions
 - Encourage more people to contact their representatives about wildfire issues.
 - Reach out to Community Development Plan (CDP) action committees in outreach to include Firewise principles in CDPs and County General Plan.
 - Develop template slides for partners to use and spread awareness
 - Connect with legislators to capture and communicate all expenses and costs of wildfire including restoration and work years later like removing dead standing snags
3. Limited recording and reporting of costs/impacts of wildfire (\$ numbers are important for communicating importance to legislators)
 - **Connect with legislators (include them in wildfire hazard mitigation dialogue) (1)**
4. Capture costs of wildfire across agencies and groups and communicate that cost
5. Collaborate with invasive species groups to capture costs
6. Collect records and develop recommendations on how information is recorded so that costs are more easily traceable
4. Electric utility hazard
 - Engage power companies in the wildfire hazard mitigation discussion
5. Use of tools and machinery in high fire hazard conditions
 - **Pursue policy/legislation (4)**
6. Lack of enforcement/consequences for ignitions, high fire risk behaviors, and negligence of hazardous vegetation
 - Juvenile fire start education program
 - Identify models/precedents for enforcement
7. Mitigation measures can have unintended consequences
 - **Ensure cross-disciplinary review of plans for reducing negative impacts (for example, consider erosion control for firebreaks) (1)**
8. Maintenance of fire infrastructure not typically funded
 - **Fund the maintenance (2)**
 - Explore funding from Hawai'i Tourism Authority (part of tourism tax could go toward preserving natural and cultural resources that people are coming to see)
 - Develop strategy/recommendations for plant community conversion to low maintenance and low wildfire hazard
9. Spread of invasive species and lack of biosecurity defense so that new invasive species can still get in
 - Develop cohesive strategy for landscape-scale vegetation management
 - Connect the dots and communicate to funders the issue of biosecurity, invasive species, and wildfire
 - Encourage tourism authority to understand and take on the issue (if we don't protect what we have of value, we will lose the things we have of value)
 - Elevate the issue and encourage state government to take proactive role to prevent more issues
10. Ignitions in dead vegetation along roadsides managed with herbicide
 - **Explore vegetation type conversions along roadways and replanting (acknowledging limitations and safety concerns) (2)**



maintenance and low wildfire hazard

Hawai'i Island Participant Input From Hilo Workshop Held February 22, 2019

NORTHWEST Area Specific Concerns:

1. Lack of water resources in much of South Kohala
 - **Pursue legislative permission to share water for firefighting purposes (1)**
 - Expand water resources
 - Utilize Waikoloa well pump flush water for wildfire suppression such as helicopter dip tanks or wildfire mitigation
 - Explore possible tax incentives (such as donation of water to HWMO non-profit for wildfire mitigation) for landowners cooperatively sharing fire infrastructure
 - Expand definition of water for agricultural use to include firefighting
 - Seek grant funding to assist ranchers with dip tanks (dual use for livestock and firefighting)
2. Pu'u Anahulu wildfire hazard
 - Increase prescribed burning
 - Increase grazing
3. Kawaihae area — high ignition density along with dense and flammable vegetation hazard
 - Convert area to lower fire hazard vegetation type
 - Coordinate with ranchers to bring water for livestock to high ignition areas to

reduce fuel (where there is water, there is higher grazing pressure and thus more fuel reduction)

1. Waikoloa Road hazard
 - Funding resources for water infrastructure both for livestock and wildfire suppression that is resilient to fire hazards and long-lasting (not damaged by wildfire or not exposed to fire)
 - Discuss benefits of strategic grazing and integrate into new developments
 - Explore installation of green breaks that people want to use and maintain (biocultural restoration)

SOUTHERN Area Specific Concerns:

1. Faya in Volcano Golf Course area
 - **Education of homeowners about defensible space and Firewise practices (1)**
 - Integrate Firewise into CDPs and the county General Plan
2. Fountain Grass in Hawaiian Ocean View Estates (HOVE)
 - Continue to support education and outreach to homeowners (identify community leader to spread the word)
 - Encourage agency-led fountain grass removal assistance (e.g. BIISC)

3. In Manukā, fountain grass is encroaching on previously natural fuel breaks (bare lava flows) and native forests
 - Conduct prescribed burns
 - Coordinate with adjacent landowners that harbor fountain grass reserves
 - Continue ongoing communication and outreach
 - Prioritize target limited resources in areas to maintain existing fuel breaks
 - Landscape-scale approach in coordination with other organizations/ owners makes it easier to get funding and more effective fuels reduction projects for fine fuels management

NORTHEAST Area Specific Concerns

1. Saddle Road roadside fuels
 - MOU with Kilohana G.S camp (ongoing)
 - Keamoku grazing program
 - Expand grazing on north side of DKI with appropriate exclosures to protect threatened and endangered species from grazing herds (fences for herds)
2. Fountain grass and gorse along Mauna Kea Access Road
 - Work with county to reduce fuels along road (also reduces ant habitat)



GENERAL CONCERNS

1. Rapid 'Ōhi'a Death (ROD) leads to standing fuels (particular area of concern in Puna and South Kona)
 - Map and incorporate ROD areas into fuels and hazard planning
2. Need to communicate location-specific wildfire danger rating because of high variability in Hawai'i
 - **Identify leads to maintain weather stations and communicate info on each island (1)**
 - App in development at UH for real-time weather/fire weather conditions for Hawai'i
 - Site specific data collecting and reporting – citizen science and web platform
3. Need critical information to be available for emergency response during a wildfire (e.g. pre-fire planning / road access info for emergency response vehicles)
 - Develop centralized source / GIS data to gather information needed during an emergency response and provide workshops to agencies on how to access information and increase familiarity between groups
 - Resurrect HWMO resource mapping project and coordinate with fire department
4. Lack of financial sustainability for projects — need for more stable funding sources for wildfire prevention and hazard mitigation
 - **Capture cost of wildfire suppression (e.g. emergency personnel, lives, resources, helicopters, etc.). Do cost/benefit analysis of upfront capital costs or maintenance costs of prevention versus costs of suppression plus losses, destruction, and impact of wildfire (3)**
 - Communicate urgency and costs of wildfire issue to those making funding decisions

- Leverage and coordinate funds from different agencies and stakeholder groups
 - Develop local funds for wildfire prevention/hazard mitigation and post-fire restoration
4. Because of high variability in climate, geology, vegetation in Hawai'i, need locally appropriate approaches for fire prevention and suppression
 - Consolidate and communicate research on what methods are more effective and appropriate tools in specific areas; Lots of tools in the toolkit so that we can “use the right hammer” – e.g. grazing, back burning, firebreaks, etc.
 - Data collection, analysis, and communication of effectiveness of different tools
 5. Recurring wildfire in invasive grass landscapes
 - **Increase collaborative response in post-fire restoration. Have deliberate plans for after wildfires happen; be ready to mobilize within a short time frame; hold post-fire workshops to develop post-fire action team and planning (e.g. Burned Area Emergency Response) including emergency sediment control, land-use goals, revegetation process in order to transition to a less fire-prone landscape (3)**



- **Take opportunity that wildfire events provide to replace invasive plants like Fountain Grass by reseeding with less fire-prone and more desirable species (e.g. pili grass or forest restoration, as appropriate) (2)**
 - Accept and expect wildfire to return – plan for fire, use existing infrastructure such as roads and natural bare lava flows for firebreaks
6. High wildfire hazard in areas that have been deforested and converted to dry grasslands (for example, in Kohala)
 - Get more people to plant and restore the forests and watersheds
 - Need to find a balance of feral animal grazing as a fuels reduction tool and their destructive impacts (for example, Pelekane and Honokoa watersheds)
 - Identify areas where grazing is an appropriate fuels reduction tool
 - When using grazing as a tool, recognize it as a service and “sweeten the pot” for ranchers to make strategic grazing worth their while
 - Develop access and water resources within appropriate grazing areas in coordination with fire department

Hawai'i Island Participant Input From Kailapa Workshop Held February 26, 2019

KA'Ū Area Specific Concerns

1. Need to protect critical infrastructure such as Waste Water Treatment Plant above Na'alehu from wildfire hazard
 - **Develop wildfire plan for waste water treatment plant (1)**
2. Protect Kāwā community resources including food and cultural resources mauka to makai
 - **Restoration mauka to makai (1)**
 - Become a Firewise community in Kāwā
3. Need to protect Waikapuna and Kalae cultural resources during wildfire response/ and suppression activities (because of sensitivity and value of resource; regular occurrence of wildfire in those landscapes; and the destructive potential of uniform firebreaks bulldozed)
 - Communication (on maps or other) about endangered species and cultural resources (e.g. areas to protect and avoid)
 - Pre-fire communication with the fire department (proactive approach)
 - Designated liaison between community/ stewards and fire response team
 - Locate, map, and communicate species of concern and areas of sensitivity to emergency response team
4. Ka'ū has recurring wildland fires and community is underserved regarding wildfire emergency response capacity
 - **Build/ assist capacity of on-the-ground groups in Ka'ū so that community can support wildfire suppression effort (1)**
 - Organize community rapid response team and resource/contact for fire department (e.g. to open up water lines; cut firebreak lines; point of contact for fire department; consider training needs; provide info to drivers and vehicles; maps; levels of accessibility for different vehicles of different roads; open gates/gate codes; provide phone numbers; identify sensitive areas such as cultural and natural resources)

- Develop more connectivity with CERT (Community Emergency Response Team)
- Establish well-known firebreaks for areas that burn regularly
- Apply for WUI (Wildland Urban Interface Grant Application period June to August 2019 for FY2020)

KOHALA and HĀMĀKUA Area Specific Concerns

1. Roadside fuels and traffic both increasing in fire-prone area along Daniel K. Inouye highway and Saddle Road near Waiki'i Ranch community, thus increased wildfire risk
 - Additional roadside fuels management
 - Fuels reduction (grazing) buffer along Keamoku area
 - Establish consortia of agencies to share assets to improve roads to make "good roads" that have less roadside fuel hazard
2. Spread of invasive fire-prone grasses and high fuel load in Ka'ōhe area of Mauna Kea in part due to sheep eradication; hunters no longer maintaining roadway fuel breaks; lack of DOFAW resources to control invasive grasses
 - **Reintroduce sheep as a managed population of grazers in strategic areas (2)**
 - **DOFAW to continue to improve roads as firebreaks (widen and mulch) (1)**
 - Gather data and examine trade-offs of ungulate removal/reintroduction and make information available, such as cost/benefit analysis; include benefits from resource users (e.g. hunters maintaining firebreaks as a result of use)
 - Close access to area in extreme conditions
 - Get word out ("don't park on dry grass" to prevent ignitions; use and spread Wildfire LOOKOUT! materials)
 - Expand/enhance fire danger and risk communication in fire-prone areas (considering road signage constraints)
3. Need for expanded roadside fuels management near Pu'u Wa'a Wa'a due to high fire risk and

significant potential impact of wildfire to critical ecosystems and Kona's watersheds

- **Engage DOT and partners (4)**
4. Erosion onto coral reefs after wildfire, in particular in Honokoa and Pelekane watersheds due to unique geology/soils, increased potential for human caused ignitions in the area, and increased development
 - **Target ignition risks along highway (prevention and hazard mitigation) (1)**
 - **Increase engagement and coordination among landowners and regional partners (e.g. DHHL and Queen Emma) (1)**
 - Balance feral animal grazing to maintain enough vegetation cover to prevent erosion
 - As development and access to area increases, make sure that fire department and other agencies engaged in pre-planning phase to ensure appropriate water access and adequate ingress/egress improvements
 5. High fuel loads along Hāmākua area roads
 - Convert fuel areas to food crops (creates shaded fire breaks, plus food security and jobs)



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

<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



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