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

2018-19 Vegetation Management

Rapid Mapping Assessment

and

Collaborative Action Planning

O‘ahu 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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Lele Kimball
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Cover Photo: View of Wai‘anae Mountains. Photo Credit: HWMO

Collaborative Action Planning Workshop at Mililani. Photo Credit: HWMO

O‘ahu Report

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

CONTENTS

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).

O‘ahu Report

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 O‘ahu 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.

O‘ahu Rapid Mapping Assessment Summary Findings:

- ~ **41,000 acres** and **200 miles** of **current** firebreaks, fuel reduction or fuel conversion mapped on O‘ahu.
- ~**12,000 acres** and **50 miles** of **needed** firebreaks, fuel reduction or fuel conversion mapped on O‘ahu.

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.

O‘ahu Collaborative Action Planning Workshop Summary:

A workshop was held on O‘ahu with a total **33** 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

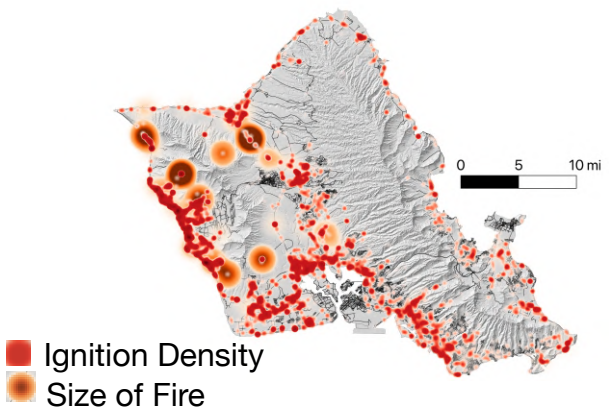
As a follow-up, HWMO conducted a brief online survey targeted at anyone managing vegetation. Selected results from the **87 survey respondents** are presented throughout the reports.

Wildfire Hazard Across O‘ahu

The Problem? — Fire follows fuel…and vegetation is fuel!

Wildfires do not recognize fences or ownership boundaries.

Ignitions	+	Fuel (Hazardous Vegetation)	=	Widespread Impacts



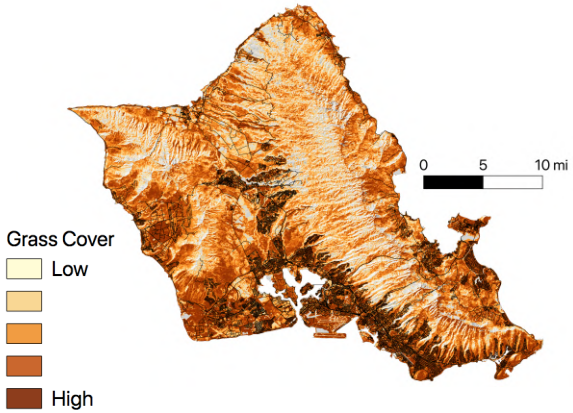
People Spark Fire

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



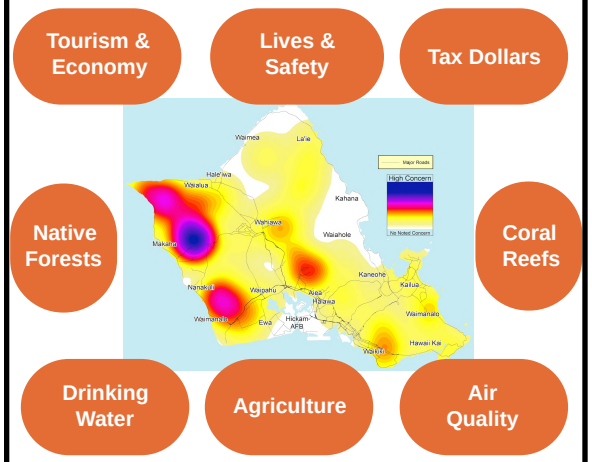
Fire Follows Fuel

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 wildfire 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**

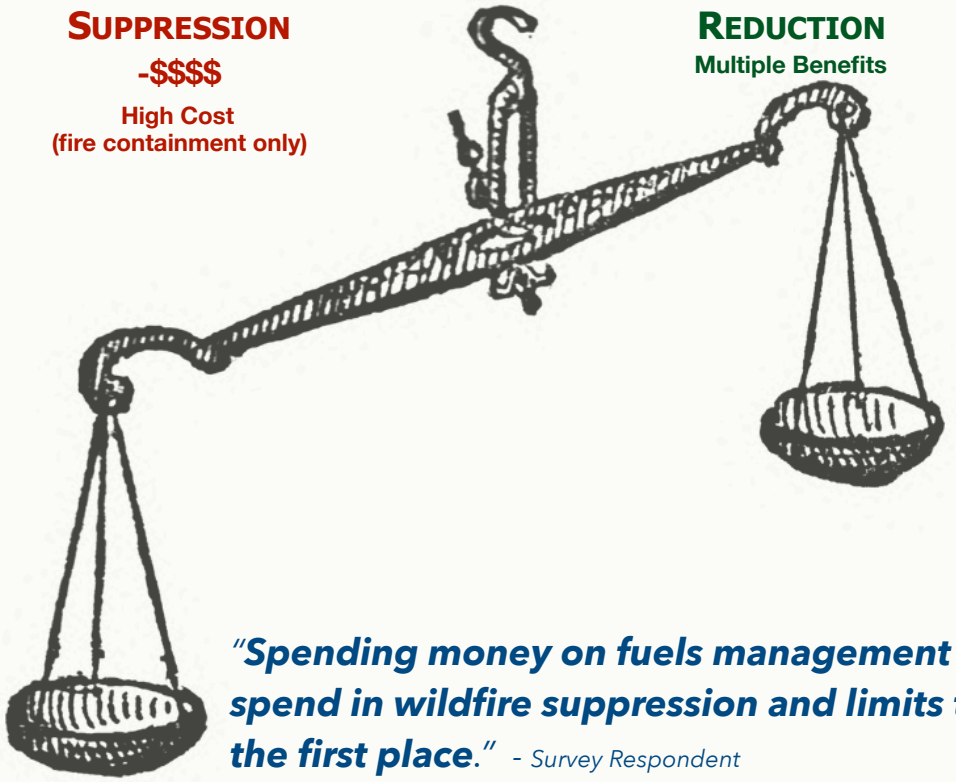
-$ **Damage to coastal resources** of community, and tourism and economic value

-$ **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



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**

"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?)

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)

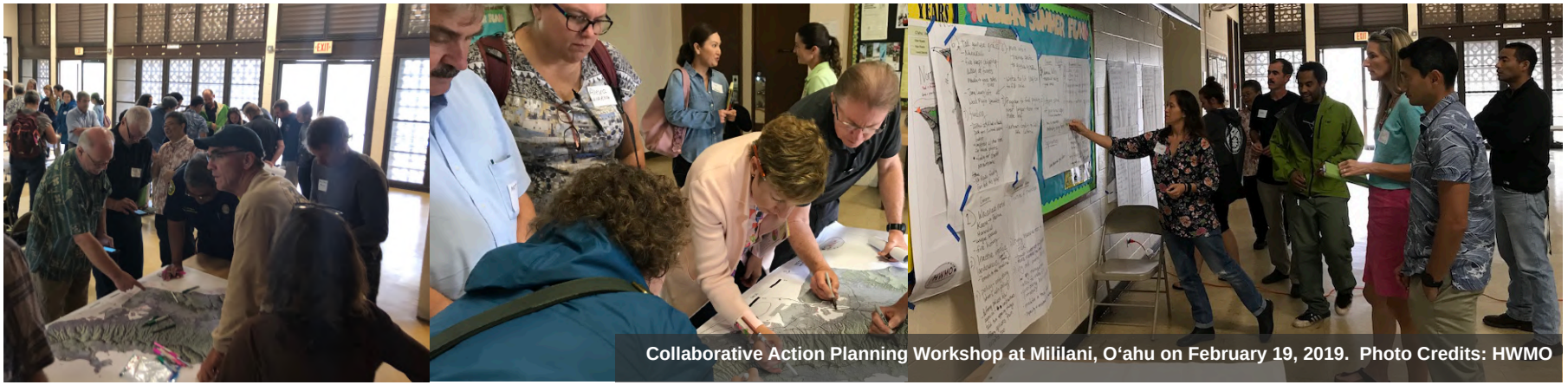
Adapted from the three “fire triangles”

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 at Mililani, O‘ahu on February 19, 2019. Photo Credits: HWMO

O‘ahu 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 O‘ahu with **33** 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 *O‘ahu 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.

O‘ahu Summary

2019 Collaborative Action Planning Workshop
Highlighted Concerns and Priority Actions

What Are the Issues?	What Can Be Done? (Top Recommendations)
• There Are Recurring Wildfire Issues in ‘Hotspot Areas’	• All-Hands Approach to Increase Local Capacity for Wildfire Prevention and Suppression in ‘Hotspot Areas’
• There Is Insufficient Policy and Funding Related to Fire Infrastructure and Vegetation Management	• Address the ‘Policy-Funding Gap’ Related to Fire Infrastructure and Vegetation Management
• Biosecurity, Invasive Species, and Wildfire are Linked	• Consolidate and Share Information on Best Practices for Locally Appropriate Fuel Conversion

Where To Start First for Addressing Wildfire Hazard?

As Determined by O‘ahu Participants at Workshop Held February 19, 2019 in Mililani

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 O‘ahu.
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.

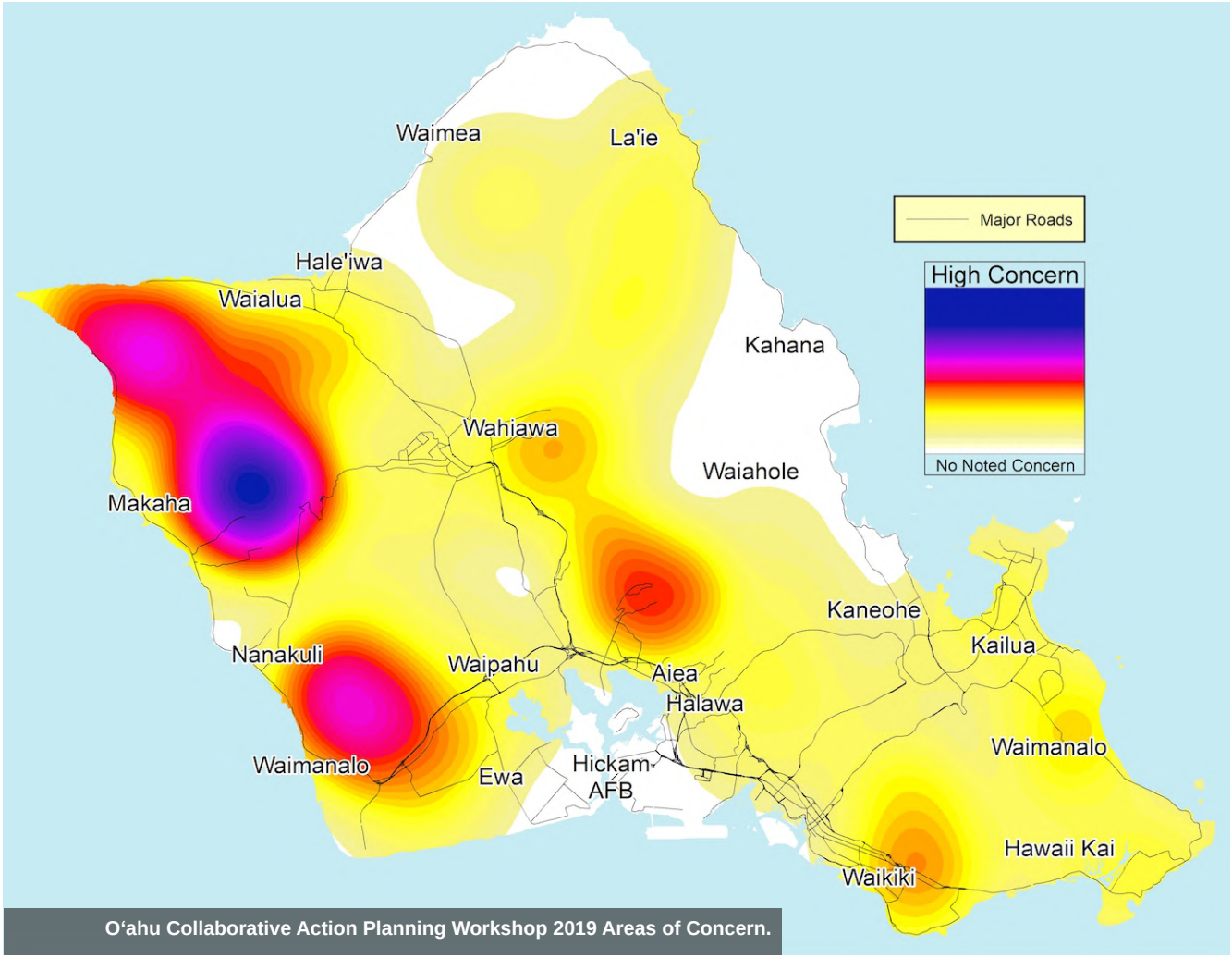
Collaborative Prioritization Process

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 *O‘ahu 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.*



O‘ahu Collaborative Action Planning Workshop 2019 Areas of Concern.

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)

2019 Collaborative Action Planning: Concerns and Priorities

As Determined by O‘ahu Participants at Workshop Held February 19, 2019 in Mililani, O‘ahu

What’s the Issue?

There Are Recurring Wildfire Issues in ‘Hotspot Areas’

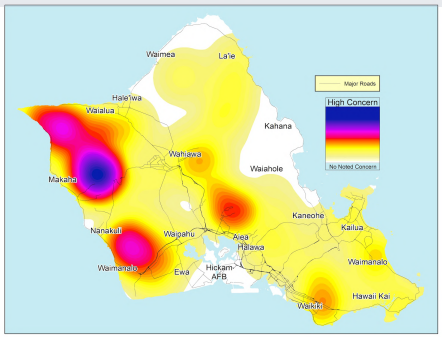
What Can We Do?

All-Hands Approach To Increase Local Capacity for Wildfire Prevention and Suppression in ‘**Hotspot Areas**’

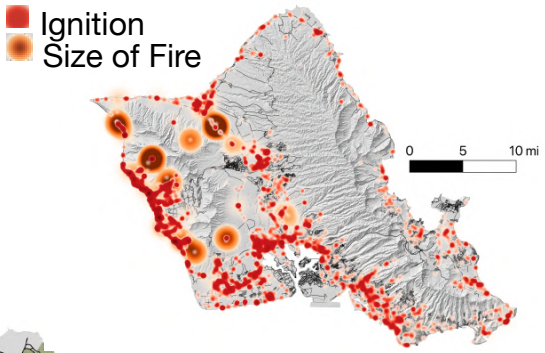
The **west side of O‘ahu is a priority area** for action planning workshop participants due to concerns about **recurring wildfires in the region, unmanaged vegetation, proximity of community areas and lives at risk, and unique and important native ecosystems in the mauka uplands,** to name a few.

Furthermore, it was a priority area for mapping contributors, as suggested by the **numerous areas proposed for fuels management**.

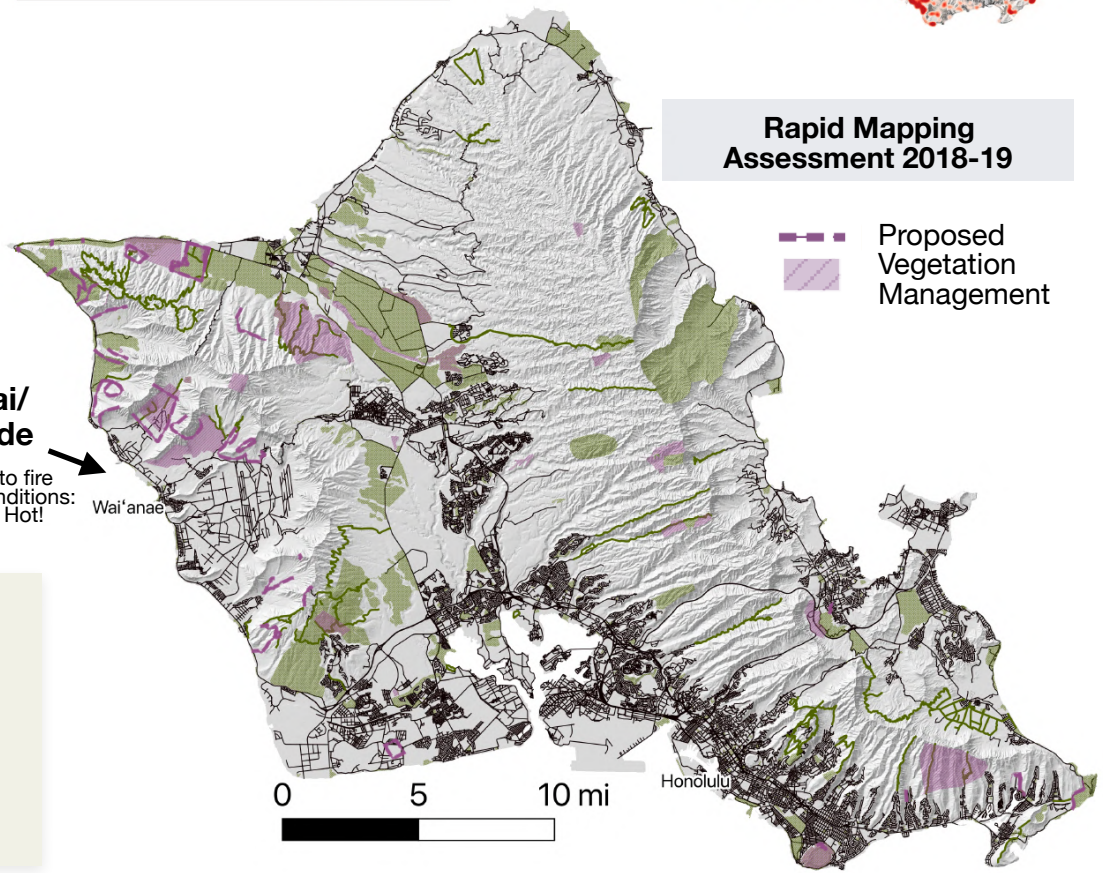
O‘ahu 2019 Action Planning Workshop Highest Concern



O‘ahu Fire History 2002-2012



Rapid Mapping Assessment 2018-19



Collaborative Action Planning Workshop Participants Stressed an "all-Hands Approach" Including:

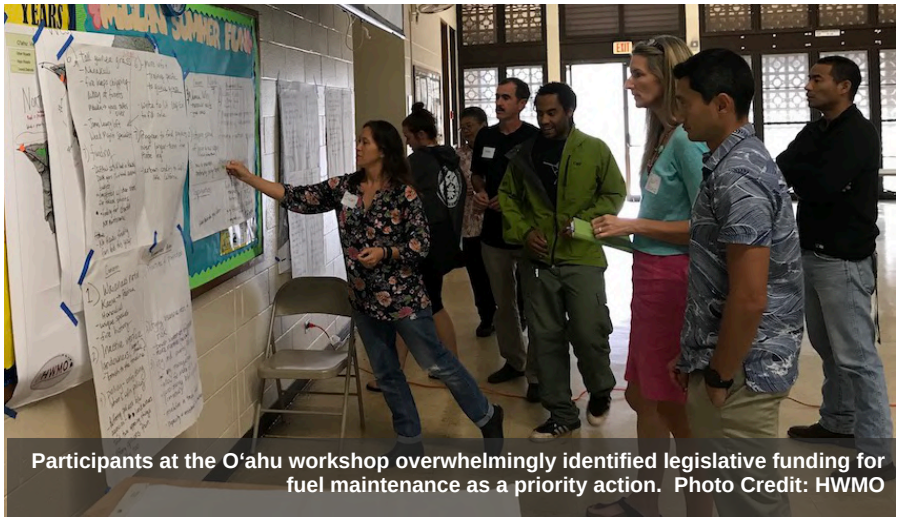
- Explore models for **developing local/community response capacity to address know hotspot areas.**
- Keep inviting people to the table because **tackling the issue together is so important.**

2019 Collaborative Action Planning: Concerns and Priorities
As Determined by O‘ahu Participants at Workshop Held
February 19, 2019 in Mililani, O‘ahu

What’s the Issue?

There Is Insufficient Policy and Funding Related to Fire Infrastructure and Vegetation Management

**Every action planning workshop group across the state highlighted the need for maintenance funding.


Participants at the O‘ahu workshop overwhelmingly identified legislative funding for fuel maintenance as a priority action. Photo Credit: HWMO

What Can We Do?

Address the **‘Policy-Funding Gap’** Related to Fire Infrastructure and Vegetation Management

Collaborative Action Planning Workshop participants prioritized numerous policy actions, including:

- Overwhelmingly, Action Planning Workshop participants’ **#1 priority** was to **pursue legislative funding support** to address the lack of long-term funding for maintaining fuels treatments.

- Encourage **state legislature to create program to provide consistent funding** for projects on a longer-term basis that are reflective of Hawai‘i’s multiple growing seasons.
- Align/develop **agency policies for vegetation management** to **enable agencies to take action** and get funding for appropriate vegetation management (agencies only fulfill mandates).
- Explore carbon sequestration credits for grazing.

- **Enhance policy consistency/ consensus between agencies** — develop process for reconciliation/ compromise between competing priorities, values, and policies related to vegetation management for resolution in a timely fashion.
- **Tie insurance rates to risk abatement or wildfire prevention education and awareness** to encourage maintenance by inactive landowners with ”brush backing up to fence lines”.

2019 Collaborative Action Planning: Concerns and Priorities

As Determined by Oʻahu Participants at Workshop Held
February 19, 2019 in Mililani, Oʻahu

What's the Issue?

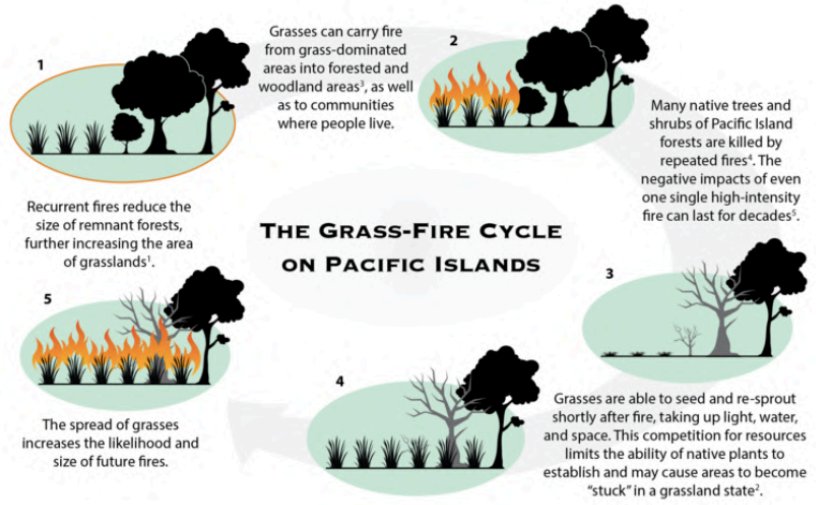
Biosecurity, Invasive Species, and Wildfire are Linked

Our landscapes are dynamic and reflect our management actions, or lack thereof. Through the years, land use choices by people have dramatically transformed vegetation across the landscape. Native dry forests have been destructively overgrazed 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 spread of problem invasive grasses*, we reduce the wildfire hazard to our landscapes.

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



Source: Pacific Fire Exchange

What Can We Do?

Consolidate and Share Information on Best Practices for **Locally Appropriate Fuel Conversion**

Hawai'i's ecosystems are unique and are varied. Therefore, better understanding of **effective and cost efficient methods** are needed.

Collaborative Action Planning Workshop participants stressed the importance of sharing local best practice including:

- Provide more information and training specific to **removing Guinea grass.**
- Consolidate and share information on **dry forest restoration.**

*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.


Guinea grass.

Guinea Grass: A Common Headache Identified by Oʻahu Land Stewards

Removal of Guinea grass can be challenging due to its persistent seed bank and ability to regrow from a single root nodule. Effective restoration of Guinea grass invaded areas include:

- Manual removal of all plant material and proper disposal;
- Establishment of ground cover and mitigating the continued disturbance of the area;
- Consistent follow-up maintenance to remove new sprigs before they flower.

Containing and preventing the further spread of problematic invasive species and the introduction of new biosecurity threats is of paramount importance!

What's Already Happening on O'ahu?

2018-19 Rapid Mapping Assessment of Vegetation Management

Quantitative Project Findings

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.

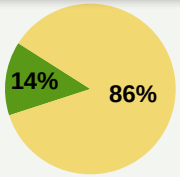
Proposed Areas: Mapping contributors were asked to identify priority areas in need of additional management of vegetation.

See *Appendix B* for all data collection methods.

Rapid Mapping Assessment: O‘ahu 2018-19 Snapshot

Current Vegetation Management

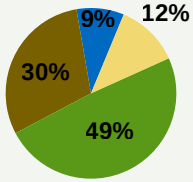
~ 200 Miles



Wildfire Hazard Mitigation Strategies

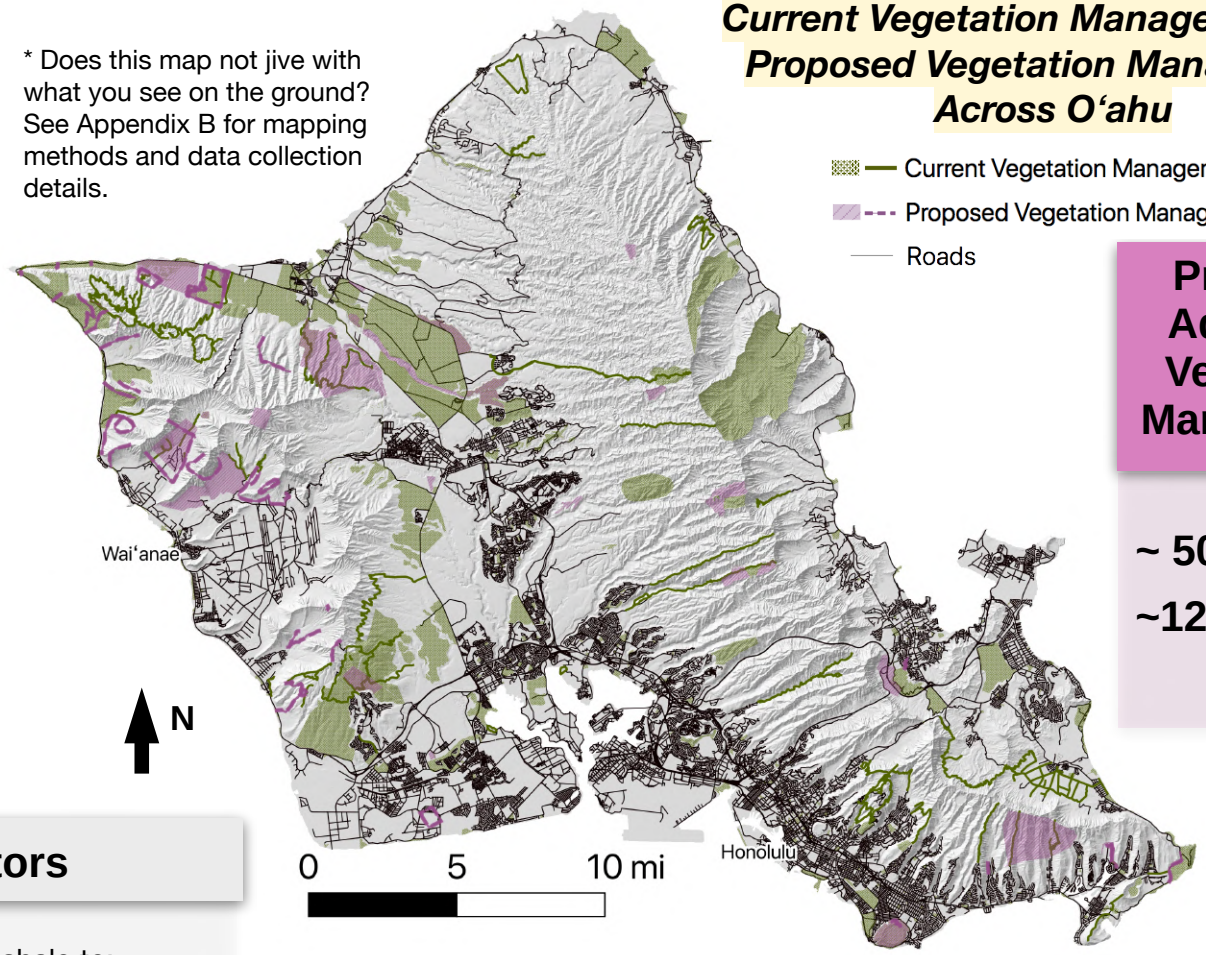
- Firebreaks
- Fuels Reduction/ Fuel Breaks
- Fuels Conversion
- Mixed

~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 and Proposed Vegetation Management Across O‘ahu

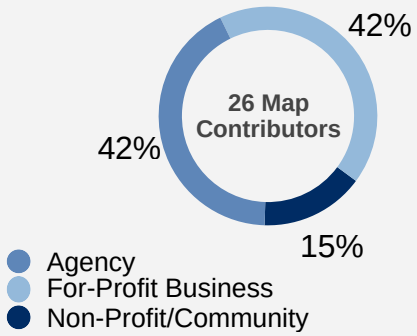


Proposed Additional Vegetation Management

~ 50 Miles

~12,000 Acres

Mapping Contributors



Mahalo to:

1. Agribusiness Development Corporation
2. Army Natural Resources Program
3. Bayer
4. City & County of Honolulu Department of Facility Maintenance
5. Department of Hawaiian Homelands
6. Dillingham Ranch
7. DLNR Division of Forestry and Wildlife
8. Dole Food Company Hawaii
9. Corteva Agriscience
10. Gill ‘Ewa Lands LLC
11. Hawai‘i Army National Guard
12. Hawaiian Electric Co.
13. Honolulu Board of Water Supply (www.boardofwatersupply.com)
14. Ka‘ala Ranch
15. Kamananui
16. Kamilonui-Mariner’s Cove Firewise Community
17. Ko‘olau Mountains Watershed Partnership (representing Queen Emma Foundation)
18. Livable Hawai‘i Kai Hui
19. Makaīwa Hills
20. National Park Service
21. Olson Trust
22. University of Hawai‘i at Mānoa CTAHR
23. U.S. Fish and Wildlife Service
24. Wai‘anae Mountains Watershed Partnership (A project of the University of Hawai‘i in partnership with Ka‘ala Farm)
25. Waimea Valley Hi‘ipaka

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.

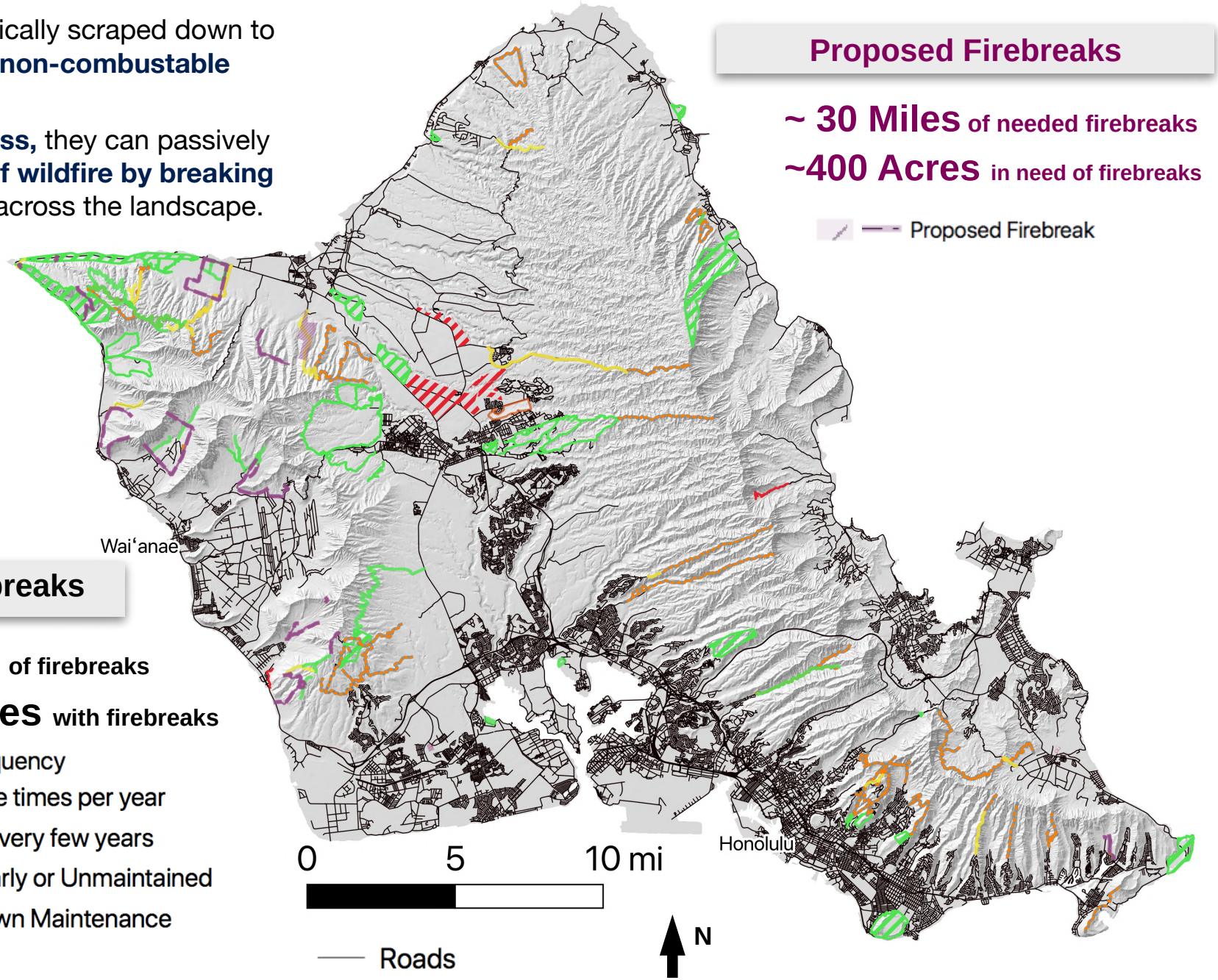
A firebreak that was utilized during the 2016 Nānākuli Fire.
Photo Credit: Dr. Clay Trauernicht, UH CTAHR Cooperative Extension.

Wildfire Hazard Mitigation Strategies: **FIREBREAKS**

Snapshot 2018-19: Current & Proposed Firebreaks on O‘ahu

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

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



Proposed Firebreaks

~ 30 Miles of needed firebreaks

~400 Acres in need of firebreaks

Proposed Firebreak

Existing Firebreaks

~ 110 Miles of firebreaks

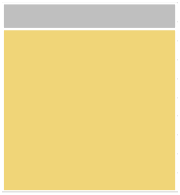
~ 5,000 Acres with firebreaks

Maintenance Frequency

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

Wildfire Hazard Mitigation Strategies: **FIREBREAKS**

O‘ahu Snapshot 2018-19: Miles of Existing Firebreaks



110 Miles Mapped

Roughly 110 miles of firebreaks were mapped by O‘ahu land stewards and an additional 30 miles of firebreaks were proposed, mostly in the Wai‘anae region.

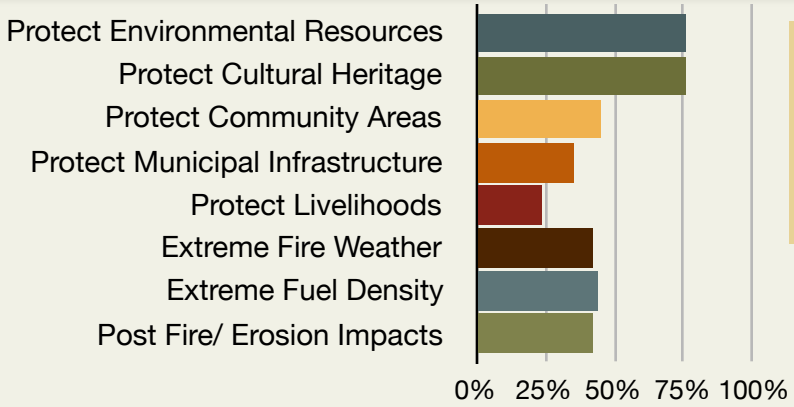
Maintenance Frequency of Existing Firebreaks

Self reported maintenance frequency by mapping contributors.

Only 32% of firebreaks mapped 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.

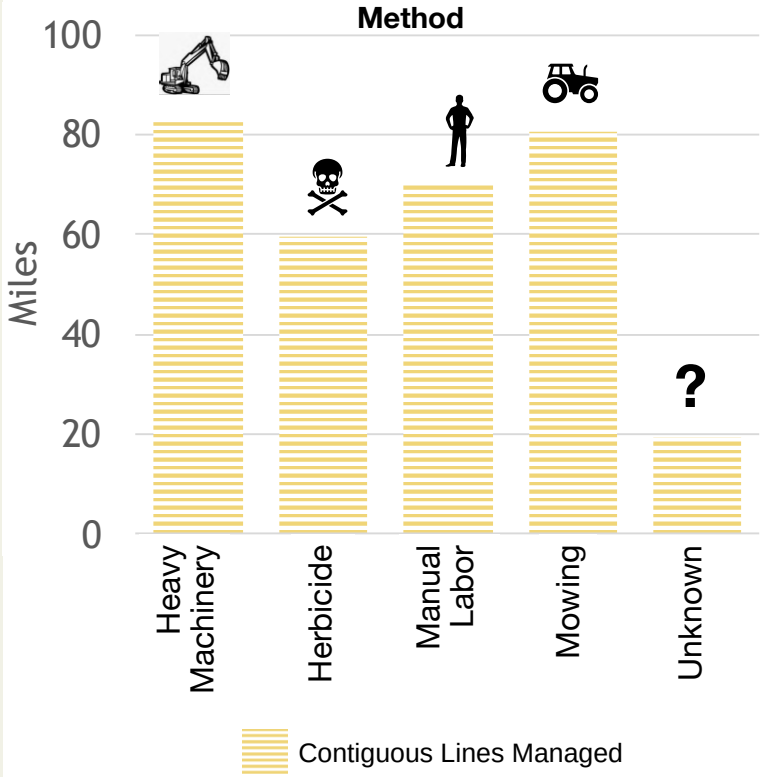
Reasons Why Firebreaks Are Established and Maintained on O‘ahu



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

Firebreaks on O‘ahu are maintained for diverse reasons.

How Are O‘ahu Land Stewards Creating and Maintaining Firebreaks?



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

The most common methods used are *heavy machinery, mowing, manual labor*, 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.

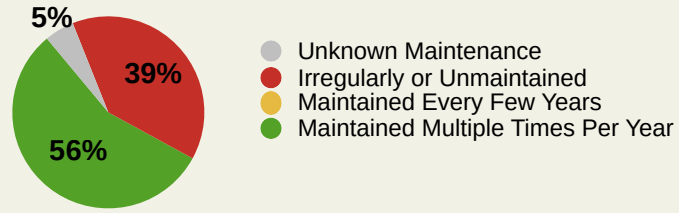
Wildfire Hazard Mitigation Strategies: **FIREBREAKS**

O‘ahu Snapshot 2018-19: Acres With Existing Firebreaks

5,000 Acres Mapped

Some mapping participants identified general areas where there are firebreaks, roughly 5,000 acres on O‘ahu.

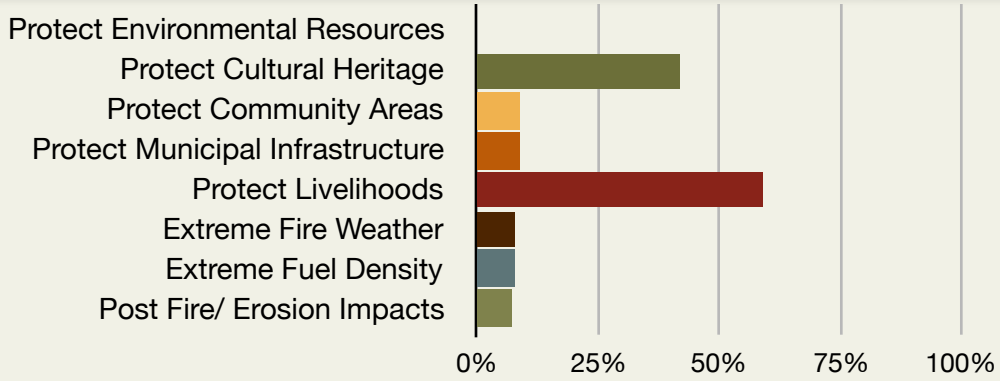
Maintenance Frequency of Existing Firebreaks



Self reported maintenance frequency by mapping contributors.

Most areas mapped that are unmaintained are reportedly because conditions/circumstances have changed and or they are no longer needed.

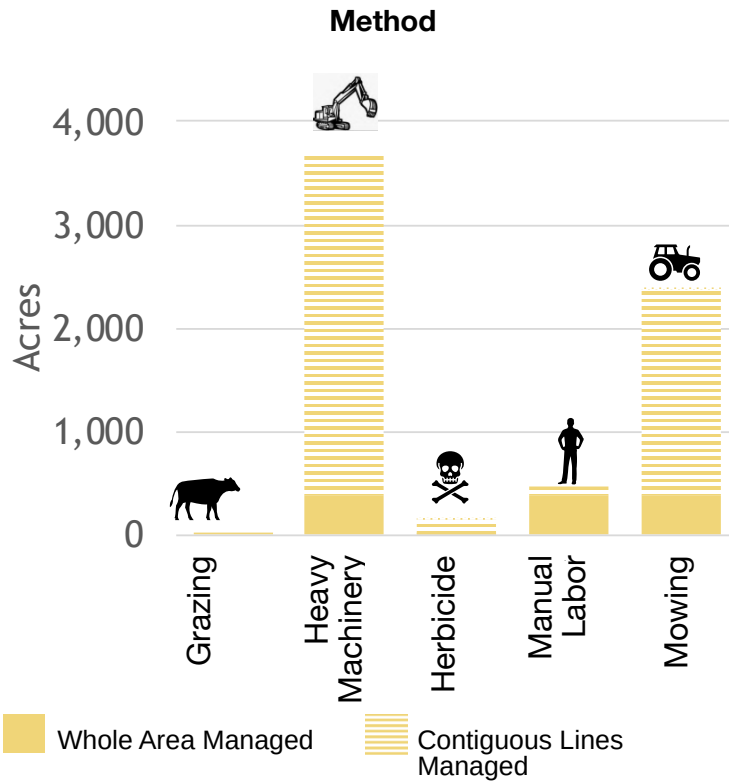
Reasons Why Firebreaks Are Established and Maintained on O‘ahu



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

Based on the data, these areas are managed with firebreaks to *protect livelihoods* such as agricultural operations and *cultural heritage* including culturally significant ecosystems.

How Are O‘ahu Land Stewards Creating and Maintaining Firebreaks?



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

In these areas, the most commonly reported methods are *heavy machinery* and *mowing*. Likely, these methods are combined using heavy machinery to mulch otherwise hazardous woody vegetation.

Although mulch can still burn, it does so much more slowly than standing fuel and only burns on the ground, thus slowing the progression of wildfire and making it safer for firefighters to put out.

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.**

Volunteers created a fuel break on the edge of Kamilonui-Mariner’s Cove in 2018 to reduce the community’s wildfire hazard and work towards Firewise Communities recognition. Photo Credit: Livable Hawai‘i Kai Hui / Aloha ‘Āina o Kamillo Nui

Wildfire Hazard Mitigation Strategies: **FUELS REDUCTION**

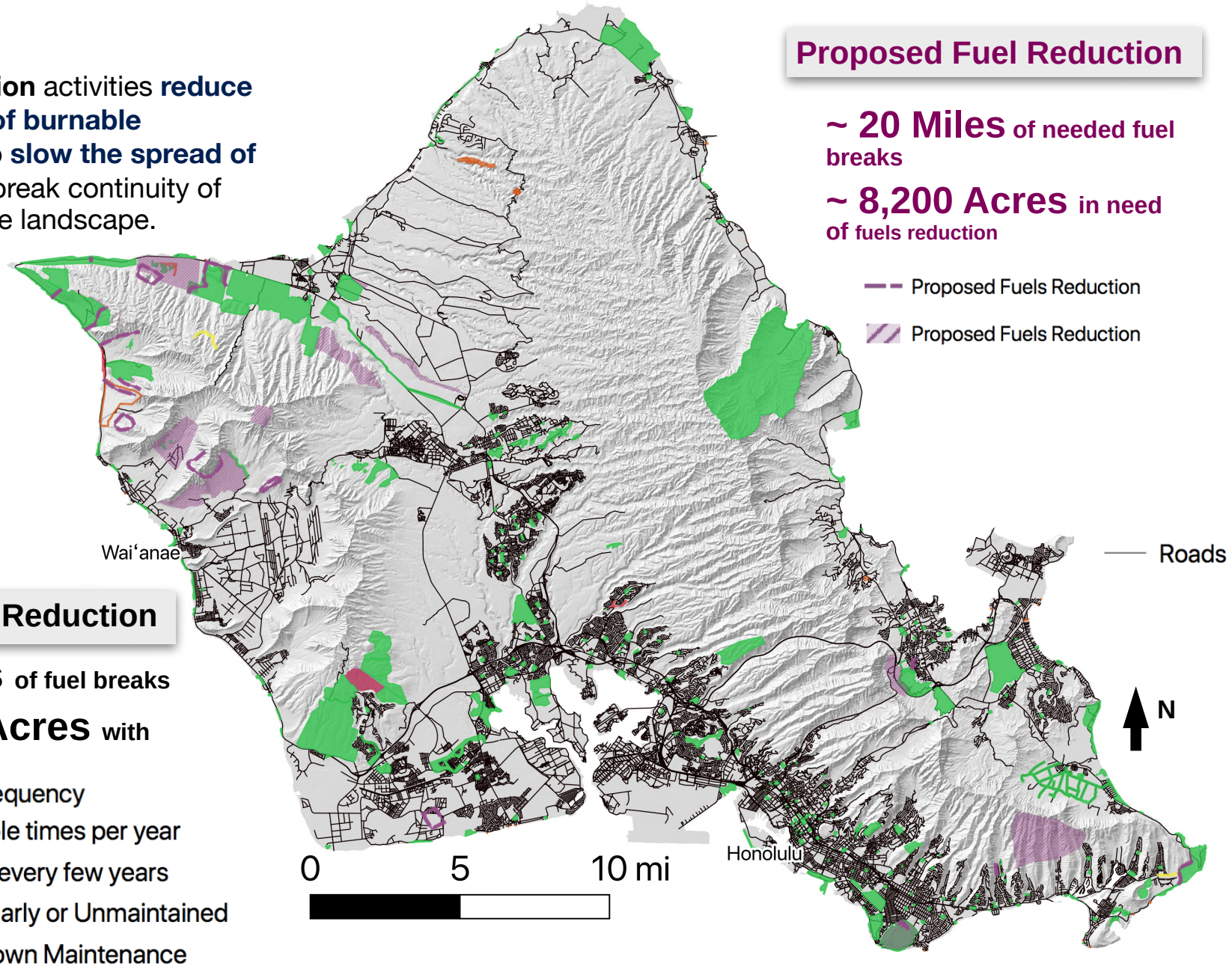
Snapshot 2018-19: Current & Proposed Fuels Reduction on O‘ahu

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

~ 8,200 Acres in need of fuels reduction



Existing Fuel Reduction

~ 20 Miles of fuel breaks

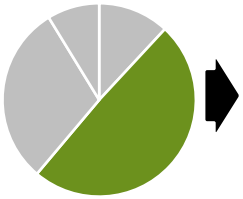
~ 21,000 Acres with fuel reduction

Maintenance Frequency

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

Wildfire Hazard Mitigation Strategies: **FUELS REDUCTION**

O‘ahu Snapshot 2018-19: Acres of Active Fuels Reduction



21,000 Acres Mapped

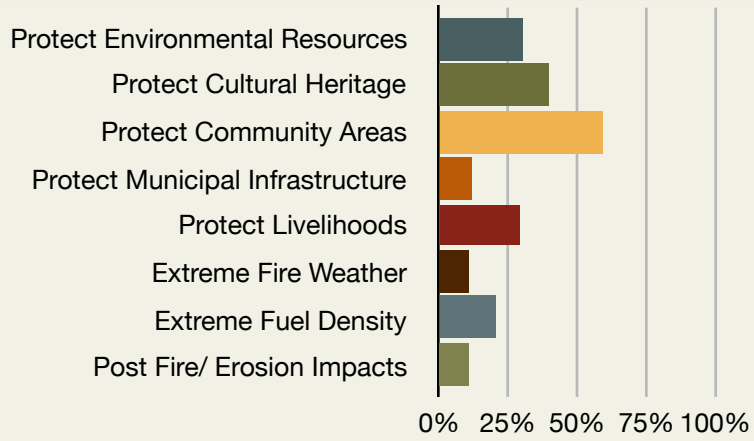
On O‘ahu, roughly 21,000 acres of fuels reduction were mapped.

Maintenance Frequency of Fuel Reduction

Self-reported maintenance frequency by mapping contributors.

Most of the areas mapped are maintained *multiple times per year,* a necessity given the vigorous growth of vegetation and year-round growing seasons in Hawai‘i.

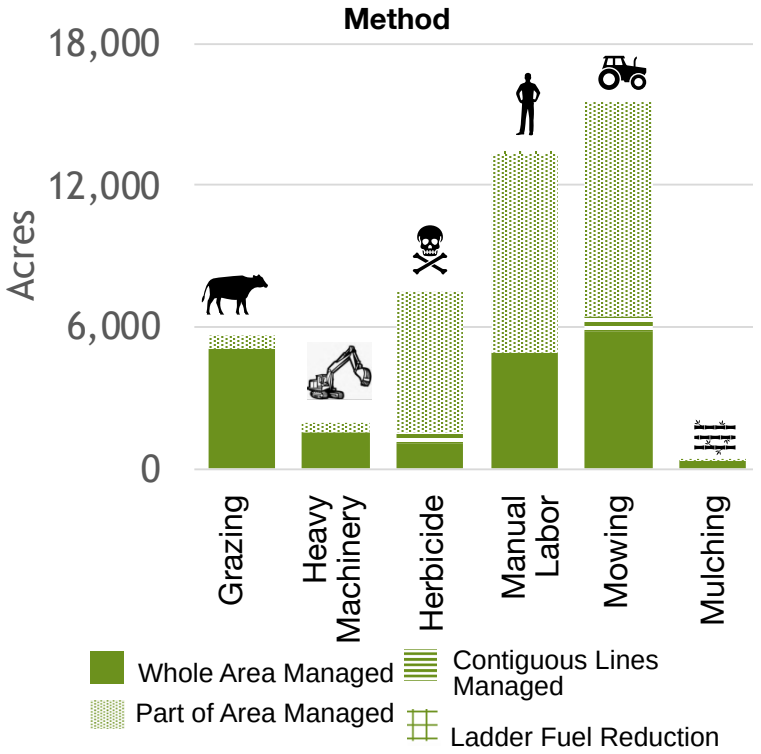
Reasons for Acres of Fuels Reduction on O‘ahu



There are multiple reasons for reducing fuel. More than half the acres are managed to *protect community areas.*

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

How Are O‘ahu Land Stewards Reducing Fuel?



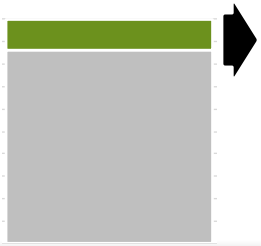
In some instances multiple methods are used to manage the same area.

Common management methods to reduce fuel include *mowing*, *manual labor, grazing*, and *herbicide*.

These methods may reflect urban maintenance due to the high level of urbanization of O‘ahu.

Wildfire Hazard Mitigation Strategies: **FUELS REDUCTION**

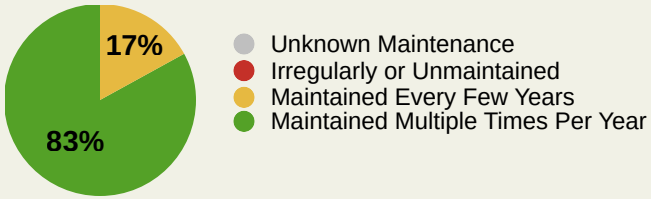
O‘ahu Snapshot 2018-19: Miles of Active Fuels Reduction



20 Miles
Mapped

Land stewards on O‘ahu mapped roughly 20 miles of fuel breaks, or linear fuels reduction.

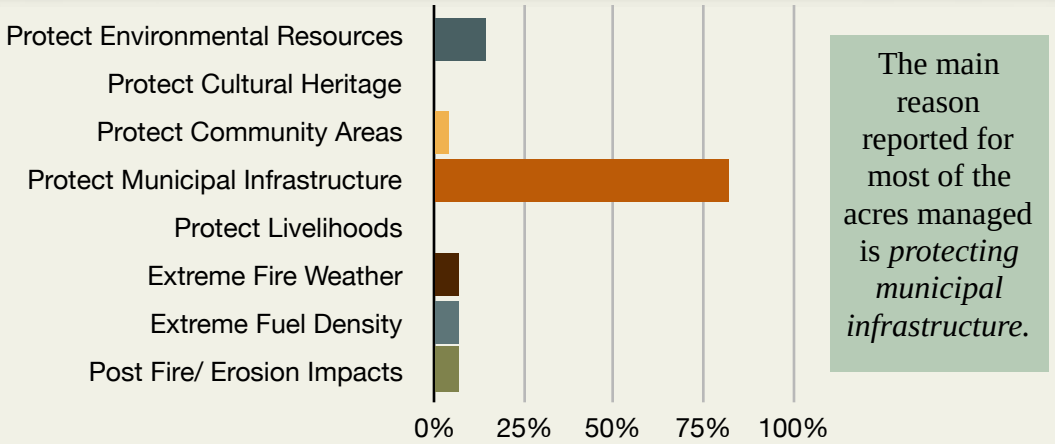
Maintenance Frequency of Fuels Breaks



Self-reported maintenance frequency by mapping contributors.

Most of area mapped is maintained *multiple times per year.* When it comes to reducing wildfire hazard, regular, consistent maintenance is important and reliable maintenance funding is needed to respond to year-round growing seasons.

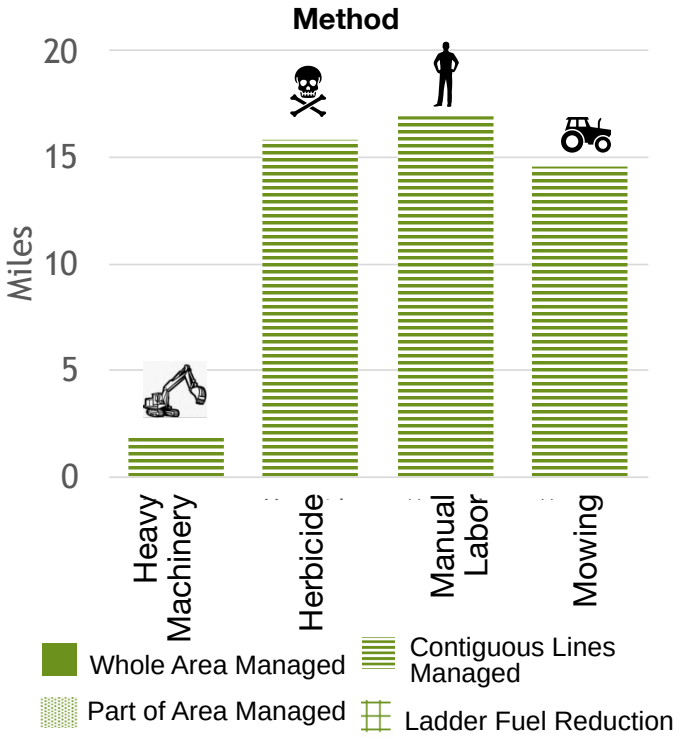
Reasons for Fuels Breaks on O‘ahu



Percentage of total miles of fuel breaks on O‘ahu maintained for each reason. In several instances, multiple reasons were reported for managing the same areas.

The main reason reported for most of the acres managed is *protecting municipal infrastructure.*

How Are O‘ahu Land Stewards Reducing Fuel?



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

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

These methods are used in combination to to manage linear fuel breaks.

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.

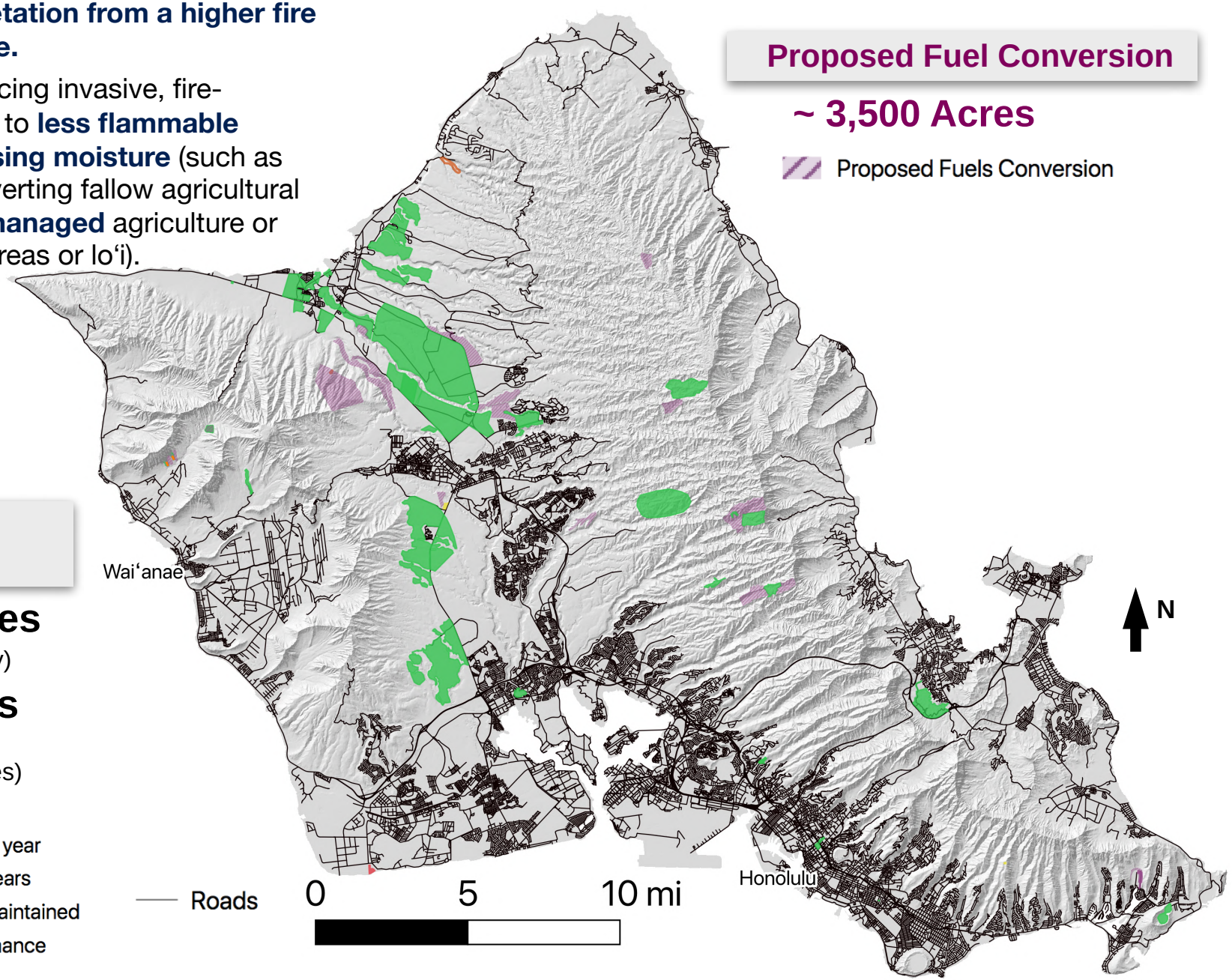
Loʻi restoration area at Kaʻala Farm in Waiʻanae is a much lower risk area for burning than the areas surrounding it, as shown in the photo of a recent Waiʻanae Fire. Photo Credit: DLNR.

Wildfire Hazard Mitigation Strategies: **FUELS CONVERSION**

Snapshot 2018-19: Current & Proposed Fuels Conversion on O‘ahu

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

~ 13,000 Acres

(Fuels conversion only)

~ 4,000 Acres

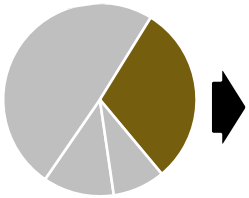
(Multiple vegetation management strategies)

Maintenance Frequency

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

Wildfire Hazard Mitigation Strategies: **FUEL CONVERSION**

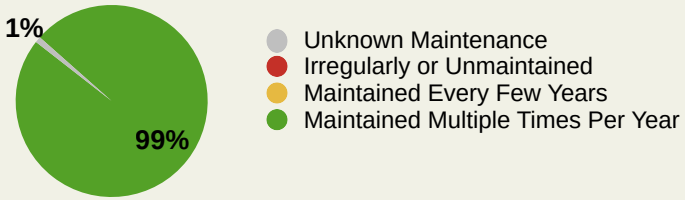
O‘ahu Snapshot 2018-19: Acres of Active Fuel Conversion



13,000 Acres
Mapped

Mapping participants identified roughly 13,000 acres of fuels conversion on O‘ahu.

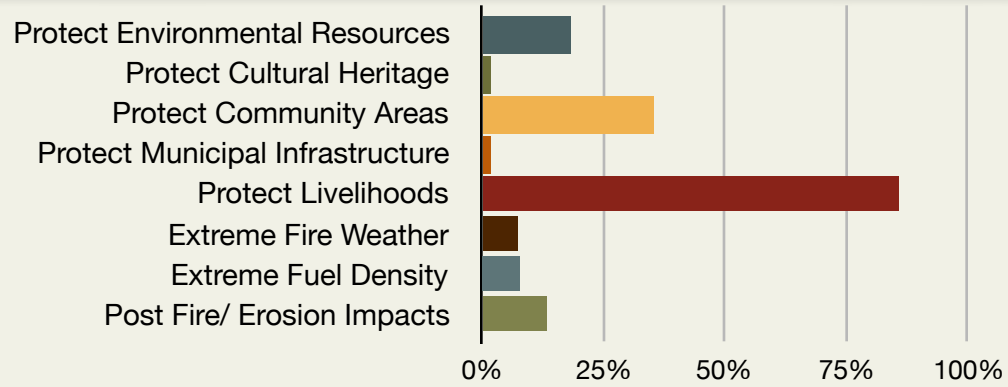
Maintenance Frequency of Active Fuel Conversion



Self-reported maintenance frequency by mapping contributors.

In nearly all cases these are actively managed landscapes where maintenance occurs *multiple times per year.*

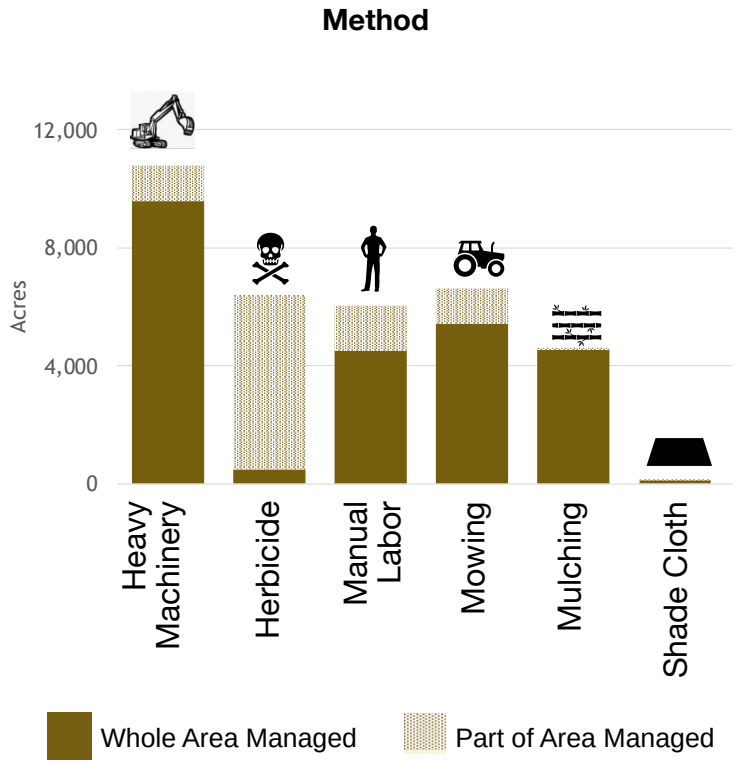
Reasons for Acres of Fuels Conversion on O‘ahu



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

The predominate reason for managing these lands is *protecting livelihoods*, suggesting that a substantial proportion are working agricultural lands. Other areas mapped may include maintenance of community areas and forest restoration projects.

How Are O‘ahu Land Stewards Are Implementing Fuel Conversion?



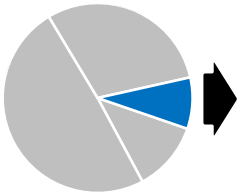
In some instances multiple methods are used to manage the same

While multiple methods are used in combination to convert fuels, the most common is *heavy machinery*.

Most areas with *herbicide* are targeted removal of invasive species.

Wildfire Hazard Mitigation Strategies: **MULTIPLE**

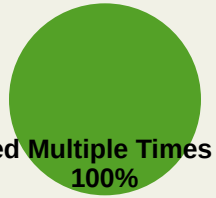
O‘ahu Snapshot 2018-19: Acres With Multiple Hazard Mitigation Strategies



4,000 Acres Mapped

Land stewards on O‘ahu mapped roughly 4,000 acres where they are implementing multiple vegetation management strategies including firebreaks, fuels reduction, and fuels conversion.

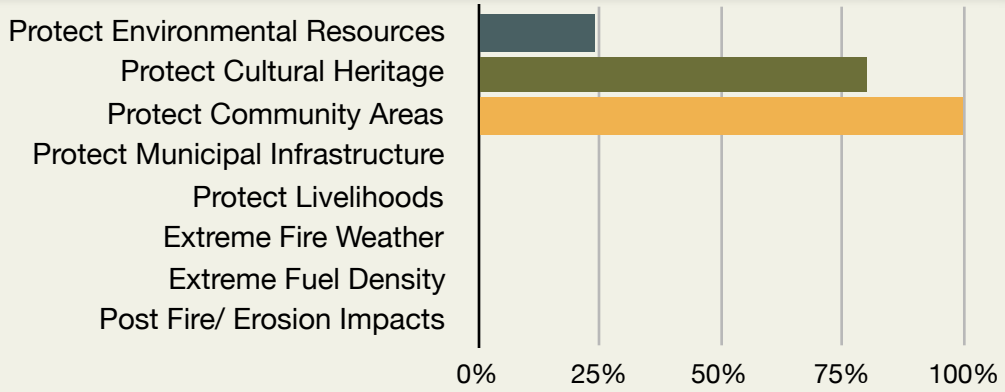
Maintenance Frequency of Areas With Multiple Strategies



Self-reported maintenance frequency by mapping contributors.

In nearly all cases, these are actively managed landscapes where maintenance occurs *multiple times per year*.

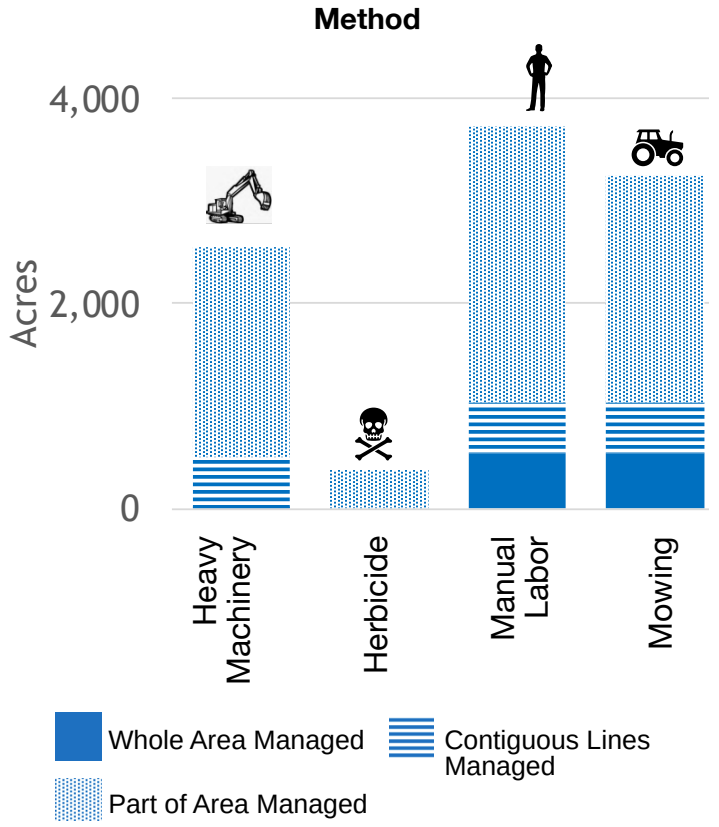
Reasons for Acres of Multiple Vegetation Management Strategies on O‘ahu



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

These areas are primarily managed to *protect community areas* and *cultural heritage*.

How Are O‘ahu Land Stewards Implementing Multiple Vegetation Management Strategies?



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

The most common methods reported are *manual labor*, *mowing*, and *heavy machinery*.

Appendix A: Collaborative Action Planning Participant Input List

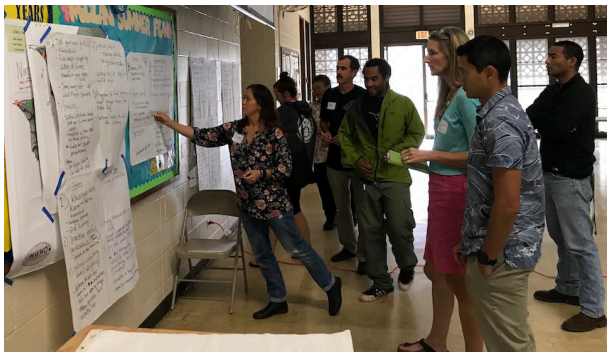
For the following participant input list:

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

O‘ahu Participant Input From Workshop Held February 19, 2019

GENERAL CONCERNS

1. Lack of long-term funding for maintaining fuels treatments
    - **Pursue legislative funding support (14)**
    - **Encourage State of Hawai‘i legislature to create program to provide consistent funding (i.e., quarterly) for projects on a longer-term basis that are reflective of Hawai‘i’s multiple growing seasons (e.g. carbon credit fund for fire mitigation like California’s) (2)**
    - Coordinate with volunteer groups like Team Rubicon for manpower on fire mitigation work (Mike: 808-785-9723)
    - Integrate efforts and provide input into County Hazard Mitigation Plan Update (Crystal: 808-723-8956 www.honolulu.gov/dem)
2. Stop spread of invasive grasses to new areas particularly mauka areas; Most native plants in Hawai‘i aren’t adapted to

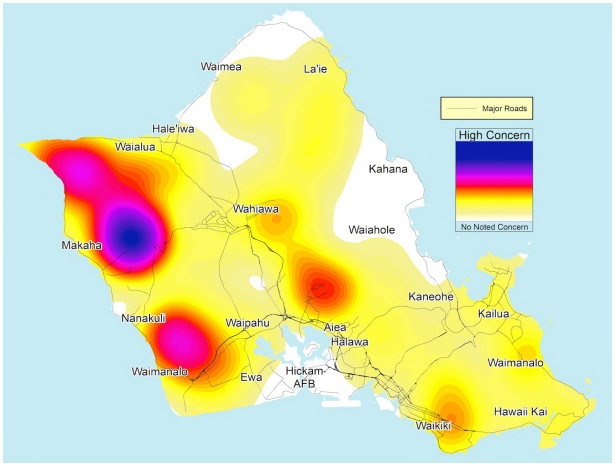


wildfire — they do not regenerate well after wildfire; Dryland forests do not develop closed canopy so cannot “shade out” grasses.

- **Utilize grazing as a tool and carbon sequestration to fund restoration efforts (2)**
- Explore alternative strategies to manage grass invasion including strategic grazing
- Research and compile information specific to dry forests

NORTH Area Specific Concerns

1. Waimea Valley – Limited manpower for restoration efforts and intense invasive grasses pressure
    - **Continue to develop access roads and work with adjacent landowners for access (1)**
    - Enhance restoration unit protection with interagency collaboration



- Enhance outreach and education and volunteer capacity

EAST Area Specific Concerns

1. Limited information/recommendations for native plant restoration and transitioning plant communities to lower fire risk — particularly an issue in difficult terrain such as Hawai‘i Kai
    - Identify techniques and methods; research on plant flammability, wildfire spread, and methods for plant community conversion
    - Develop clearinghouse for info and ways to share it that is accessible to both experts and lay people
    - High hazard urban interface in Hawai‘i Kai (ignitions plus flammable fuels and rugged terrain)

WEST Area Specific Concerns

1. Waiʻanae area has many very important and unique native species from Kaʻena to Palehua to Honouliuli, and repetitive fires
   - Prioritize area for protection
2. Inactive interface landowners (large and small) resulting in "brush backing up to fencelines"
   - **Tie insurance rates to risk abatement or wildfire prevention education and awareness (2)**
   - More brush abatement enforcement
   - More incentives (tax breaks) for active management
   - Develop communication with landowners that currently do not maintain vegetation
3. Lack of adequate and consistent policies amongst agencies regarding vegetation management; Different policies between agencies so landowners are told two opposing things — there are differing opinions from experts, too
   - **Develop city, county, and state policies for vegetation management because agencies only fulfill mandates and can't take action or get funding without it them (4)**
   - **Enhance consistency/consensus between agencies — develop process for reconciliation/ compromise between competing priorities, values, and policies related to vegetation management for resolution in a timely fashion (2)**
   - Provide capacity building, assistance, and incentives for landowners to mitigate hazards as opposed to fining
4. Combination of high fire hazard factors in Waiʻanae including lots of fallow ranch land that develops high fuel loads, frequent large wildfires in the region, lots of ignitions due to population, and need to protect critical habitat due to rare/unique species
   - Increase education about wildfire hazard of unmanaged areas, encourage management of lands "waiting for development"
   - Increase agriculture including ranching and farming
   - Plant koa/koaiʻa and enhance forest restoration in strategic areas.
5. Power lines arcing and often have dry grass underneath (e.g. Palehua)
   - Reach out and engage HECO
   - Establish firebreaks along power lines
   - Invest in new technology to prevent arcing
   - Send letters to HECO and Public Utilities commission to encourage policies to require wildfire prevention
6. Invasive grasses such as Guinea grass continue to spread, specifically in Nānākuli; wildfires keep converting more mauka forests to grasslands (weed management specialist at position at UH remains vacant)
   - **Provide more info and training specific to Guinea grass (3)**
   - Write to UH cooperative extension to fill weed management specialist role
7. Waiʻanae Valley wildfire issues in "hot spot areas" — need local response team for known problem areas (near Kaʻala Farm) because emergency response time is too long and recurring burns every summer; Lives and safety of ʻohana in the valley at risk; Complex social issues including drugs and juvenile fire starts
   - **Keep inviting people to the table (people tackling the issue together is so important) (2)**
   - Develop volunteer fire department / local response team (with consideration of HFD concerns about liability)
   - Increase initial attack capabilities
   - **Explore models in other areas for developing local capacity response to wildfire (2)**

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

Appendix B: Rapid Mapping Assessment Data Collection Details

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

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

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

In an effort to maximize data quality, mapped areas and associated attributes were confirmed with mapping collaborators after all data was converted in a compiled QGIS database. In some cases, areas were mapped by multiple groups, therefore efforts were made to minimize duplicate areas mapped when reporting acres using 'Dissolve' and 'Difference' geo-processing functions in QGIS 3.4

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

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

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

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

Appendix C: Resources

1) Hawai‘i Wildfire Management Organization Website

http://www.hawaiiwildfire.org

2) Pacific Fire Exchange

http://www.pacificfireexchange.org

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

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

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

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

5) Native Plants Hawai‘i

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

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

http://www.ctahr.hawaii.edu/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

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


HWMO
HAWAII WILDFIRE MANAGEMENT ORGANIZATION