



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

2018-19 Vegetation Management

**Rapid Mapping Assessment
and**

Collaborative Action Planning

Moloka'i Report

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

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

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

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

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

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

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

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

Agency representatives responsibly managing heritage resources;

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

Project Lead

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

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

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HWMO Photo Credits:

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

Cover Photo: A patchwork of fuels management across Moloka'i. Photo Credit: HWMO

Fires mauka can impact makai resources. Where mauka and makai meet on Moloka'i. 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 Moloka'i Report is one of six island reports developed to share input from professionals and community that participated in the statewide 2018-19 Rapid Mapping Assessment of Vegetation Management and Collaborative Action Planning Workshops. Additionally, a Statewide Summary Report was created to summarize findings across the state.

Rapid Mapping Assessment of Vegetation Management

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

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

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

Moloka'i Rapid Mapping Assessment Summary Findings:

- ~ **65,000 acres** and **150 miles** of **current** firebreaks, fuel reduction or fuel conversion mapped on Moloka'i.
- ~**2,000 acres** and **15 miles** of **needed** firebreaks, fuel reduction or fuel conversion mapped on Moloka'i.

Collaborative Action Planning Workshops

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

Maui Collaborative Action Planning Workshop Summary:

A workshop was held on Moloka'i with a total **17** 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 MOLOKAʻI

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

Wildfires do not recognize fences or ownership boundaries.

Ignitions

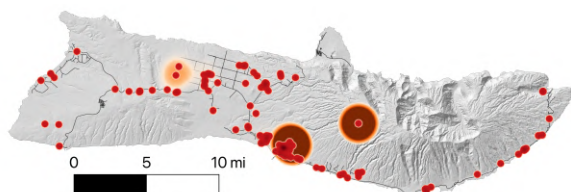


Fuel (Hazardous Vegetation)



High Wildfire Risk

■ Ignition Density
● Size of Fire



People Spark Fire

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

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

Source: HWMO 2002-2012 data

Grass Cover

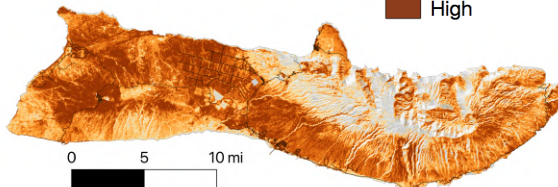
■ Low

■

■

■

■ High



Fire Follows Fuel

Dry grass and other fine fuel is quick to ignite.

Some invasive, fire-prone grasses including fountain grass and guinea grass benefit and spread with wildfire.

They are the first to regrow after a burn, choking out native plant communities and **increasing fire risk**.

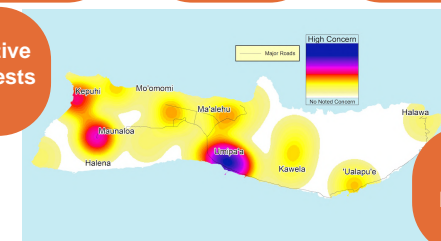
Source: UH Manoa 2018

Tourism & Economy

Lives & Safety

Tax Dollars

Native Forests



Coral Reefs

Drinking Water

Agriculture

Air Quality

Widespread Impacts

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

Source: HWMO 2019 Action Planning Workshop data

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

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

THE VALUE OF BEING PROACTIVE ABOUT WILDFIRE IS ENORMOUS!

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

Multiple Benefits — Value of Being Proactive:

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

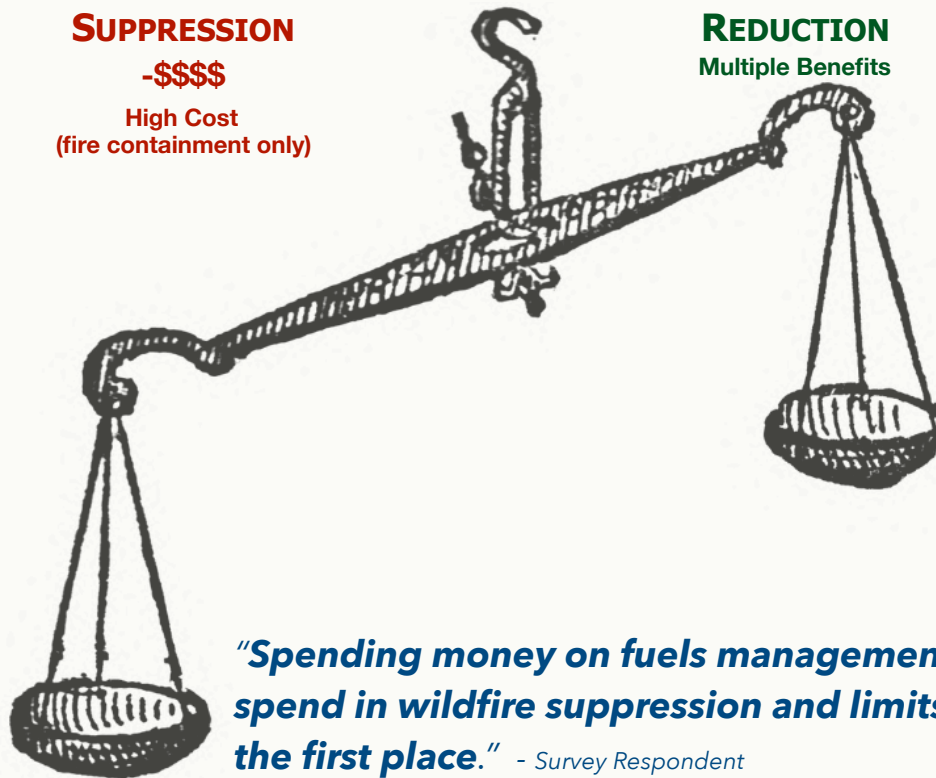
Reactive Cost of Fire Response:

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

REACTIVE FIRE SUPPRESSION

-\$\$\$\$
High Cost
(fire containment only)

PROACTIVE HAZARD REDUCTION Multiple Benefits



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

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

Proactive Benefit of Prevention:

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

WHY FOCUS ON VEGETATION MANAGEMENT?

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

Fire Can Only Burn Where There Is Fuel to Burn

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

Recipe for Fire

Long-term, big picture perspective
↓

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

Adapted from the three “fire triangles”

Vegetation as fuel is a key ingredient for wildfire.

Wildfire Hazard Mitigation Strategies

How to Reduce the Spread and Impacts of Wildfire:

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



Collaborative Action Planning Workshop at Kaunakakai, Moloka'i on April 2, 2019. Photo Credits: HWMO

Moloka'i Areas of Concern and Prioritized Actions:

2019 COLLABORATIVE ACTION PLANNING ON VEGETATION MANAGEMENT Qualitative Project Findings



Professionals and community came together to identify areas of concern and discuss and prioritize actions to reduce wildfire hazard. Input was gathered through an Action Planning Workshop held on Moloka'i with **17** participants representing diverse groups including:

- Land owners
- Agencies
- Emergency responders
- Community groups
- Community members
- Technical experts
- Businesses
- And more...

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

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

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

See *Appendix C* for more resources on best practices.



Moloka'i Summary

2019 Collaborative Action Planning Workshop Highlighted Concerns and Priority Actions

What Are the Issues?

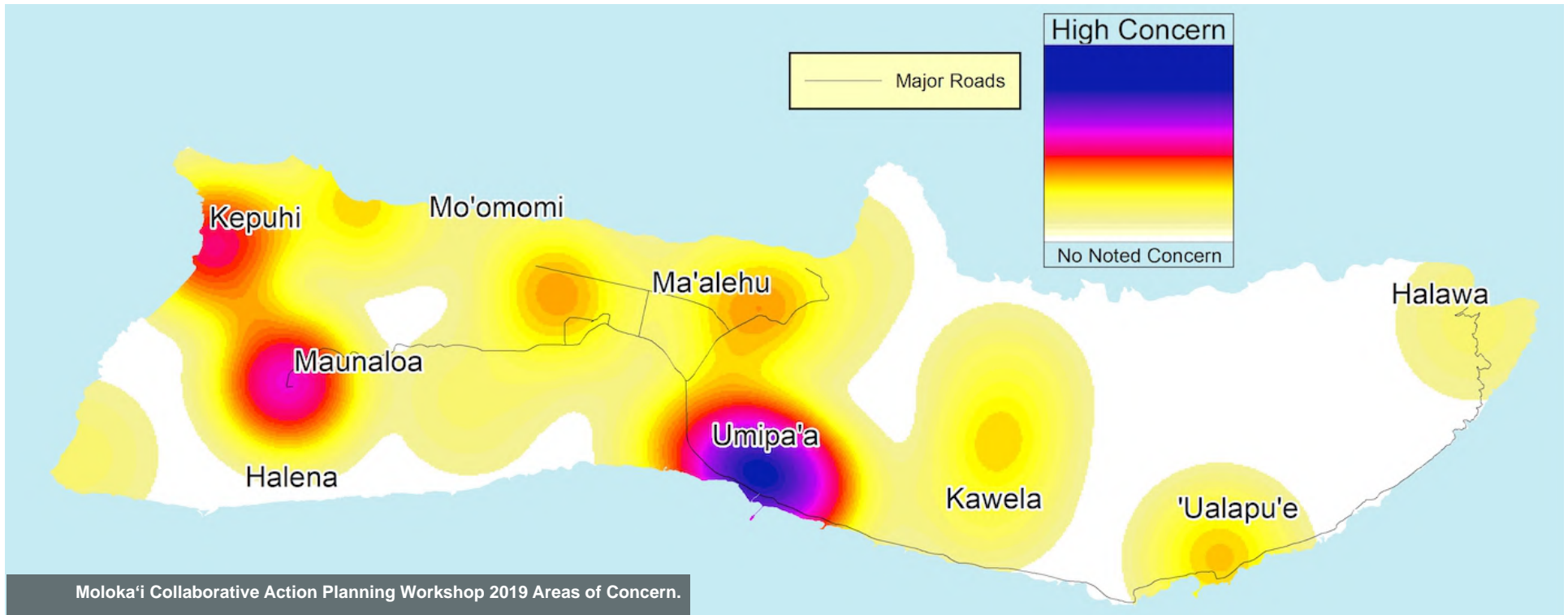
- **Response Time is Critical To Reduce Wildfire Impacts, and There Is Limited Capacity in Rural Areas**

- **People Cause Fire (near roadsides, communities, and power lines, etc.) That Threaten Areas and Resources We Value**

What Can Be Done? (Top Recommendations)

- **Increase Local Capacity for wildfire Prevention and Suppression Response with an All-Hands Approach**

- **Prioritize Fuels Management around Communities, Important Resources and Critical Infrastructure**



Moloka'i Collaborative Action Planning Workshop 2019 Areas of Concern.

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 Moloka'i.
2. Next participants identified areas where there are **hazardous fire conditions** due to **fuel load, fire weather, and a history of ignitions**.
3. Once all of these areas were drawn on the map, each participant was asked to use stickers to identify their priorities for **where to start first for hazard reduction activities**.

This process generated the heat map above.

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 *Moloka'i Priorities* are summaries of priority actions voted on by workshop participants.

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

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

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

These include:

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

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



What's the Issue?

Response Time is Critical To Reduce Wildfire Impacts, and There Is Limited Capacity in Rural Areas

What Can We Do?

Increase Local Capacity for Wildfire Prevention and Suppression Response With an All-Hands Approach

Response time is critical to reduce potential exponential spread of wildfire and disastrous landscape-level impacts.

Building local capacity through training and pre-fire communication in coordination with the fire department could **drastically reduce the impact of wildfires that do start** and would be particularly beneficial in rural areas with recurring wildfire issues.



Collaborative Action Planning Workshop participants prioritized actions to increase local capacity, including:

- Coordinate official agreement/**public-private partnership** with large landowners (e.g. Molokai Ranch) so that all can contribute to wildfire response and **pool equipment and water resources** to address long fire response time in rural communities like Maunaloa.
- Enhance **community awareness** to include community as part of the solution. **Community has the power to take action** with greater awareness so **share existing resources** including Wildfire LOOKOUT! and Ready Set Go!
- Address and **reduce fuel hazards at all scales.**
- **Engage neighborhoods** (including those in fire-prone areas adjacent to Paniolo Hale) in **Firewise** outreach, planning, and hazard reduction activities.
- **Build community capacity** to respond to wildland fire in rural communities including:
 - Revive volunteer fire crews and provide equipment (e.g. federal excess property program to transfer older equipment to volunteer fire departments);
 - **Support training** including CERT and Red Card certifications for **community groups.**
 - Establish fire station at Kaluakoi.



What's the Issue?

People Cause Fire (near roadsides, communities, and power lines, etc.) **That Threaten Areas and Resources We Value**

What Can We Do?

Prioritize Fuels Management Around Communities, Important Resources and Critical Infrastructure

There are **multiple benefits** for fire infrastructure around communities. Fuel breaks and emergency egress **protect communities and provide safe evacuation routes** when threatened by wildfire.

In addition, they can **prevent fires that start in community areas from spreading** to precious natural resources.

These features may also provide an opportunity to integrate other uses such as walking paths, recreation areas, food production, etc.



Roads provided critical defensive line for firefighters in the recent 2018 fire near Waikoloa, Hawai'i Island. Photo Credit: HWMO

During the Moloka'i Action Planning Workshop participants stressed the need to prioritize efforts around communities and critical infrastructure including:

- **Establish and maintain firebreak buffers around communities** including old fire roads, particularly around Kaunakakai town with a history of high ignitions and fire spreading out from town.
- **Prioritize funding for regular, annual maintenance of strategic firebreaks** such as Kawela 3 access road which has been key to stopping past wildfires but also prone to erosion.
- **Address fuel and hazard mitigation at all scales in community areas** such as Paniolo Hale; remove debris from gutters, limb up trees, and separate tree canopies from roofs.
- **Prioritize fuels management (e.g. strategic grazing) around critical infrastructure** (e.g. water supply, airport, power, roads, communication towers).
- Engage large landowners **to enhance fuels reduction and strategic grazing near community areas** such as Moloka'i Ranch surrounding Paniolo Hale.
- Prioritize wildfire prevention in mauka areas to **protect the water supply and reef areas** — "Protect what is mauka to protect makai".

What's Already Happening on Moloka'i?

2018-19 RAPID MAPPING ASSESSMENT OF VEGETATION MANAGEMENT

Quantitative Project Findings

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Firebreaks	12
Fuel Reduction	17
Fuel Conversion	20



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.

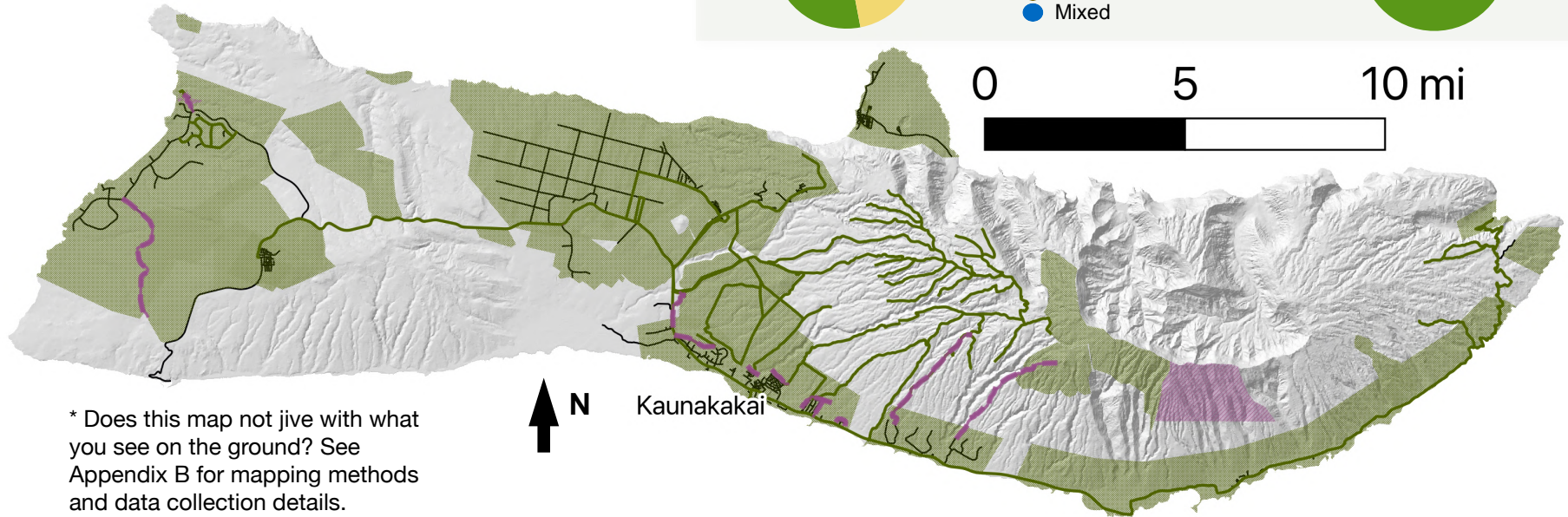
See *Appendix B* for all data collection methods.



Rapid Mapping Assessment: Moloka'i 2018-19 Snapshot

Current Vegetation Management and Proposed Vegetation Management Across Moloka'i

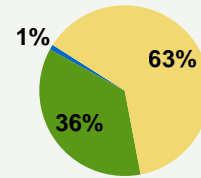
-  Current Vegetation Management
-  Proposed Vegetation Management
-  Roads







* 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

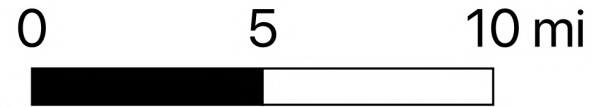
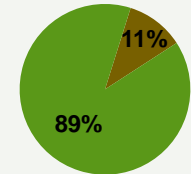
~ 150 Miles



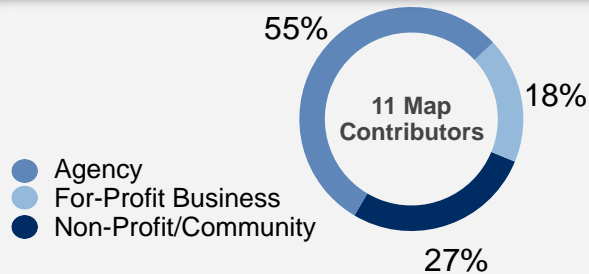
Wildfire Hazard Mitigation Strategies

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

~65,000 Acres



Mapping Contributors



Mahalo to:

1. Bayer
2. Maui County Department of Water Supply
3. State Department of Transportation Maui District
4. DLNR Division of Forestry and Wildlife - Maui Nui
5. Maui Electric
6. Maui County Fire Department
7. Moloka'i-Lāna'i Soil & Water Conservation District (debra.kelly@hi.nacdnet.net)
8. Moloka'i Fire Task Force
9. National Park Service
10. Paniolo Hale
11. The Nature Conservancy

Proposed Additional Vegetation Management

~ 15 Miles

~2,000 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.



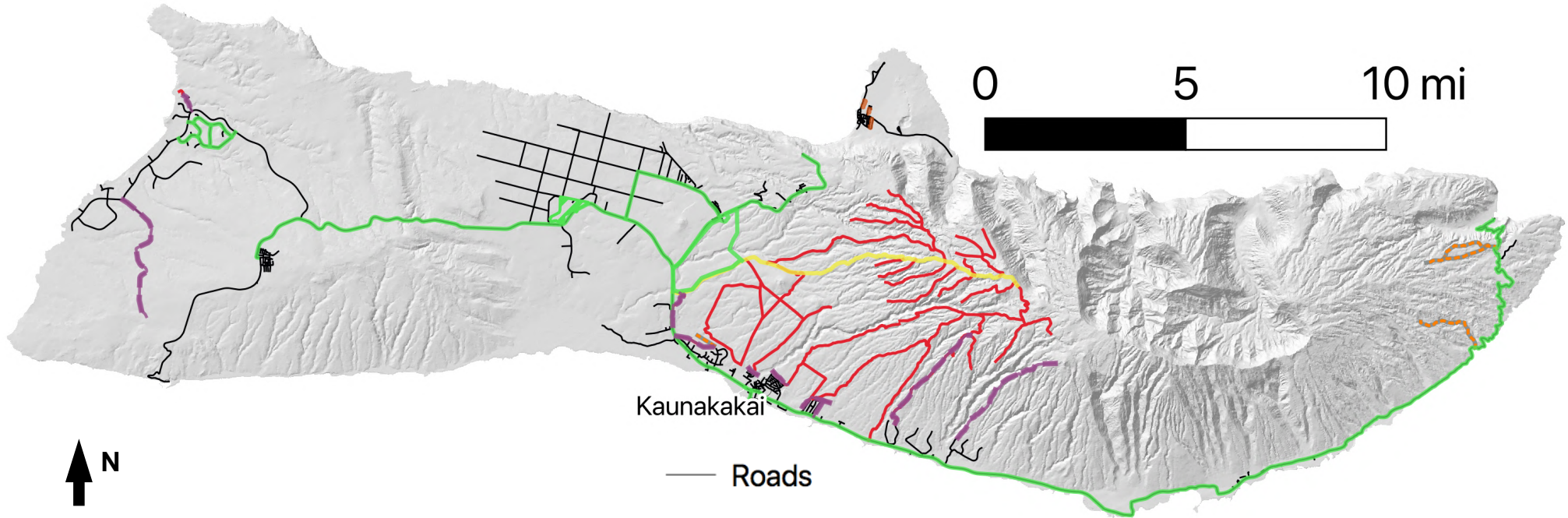
Even paved firebreaks need maintenance as vegetation is quick to grow in Hawai'i. Photo Credit: HWMO

Wildfire Hazard Mitigation Strategies: FIREBREAKS

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

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

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



Existing Firebreaks

- ~ **90 Miles** of firebreaks
- ~ **55 Miles** of **enhanced** firebreaks
- ~ **180 Acres** with firebreaks

Maintenance Frequency

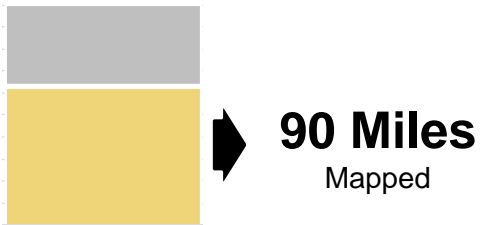
- Multiple times per year
- Once every few years
- Irregularly or Unmaintained
- Unknown Maintenance

Proposed Firebreaks

- ~ **15 Miles** of needed firebreaks
- Proposed Firebreak

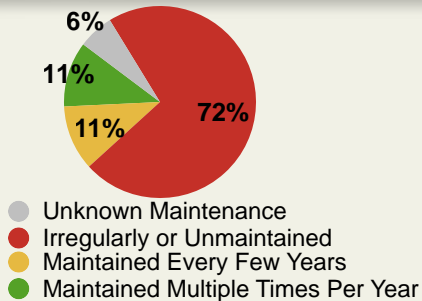
Wildfire Hazard Mitigation Strategies: FIREBREAKS

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



Roughly 90 miles of firebreaks were mapped by Moloka'i land stewards.

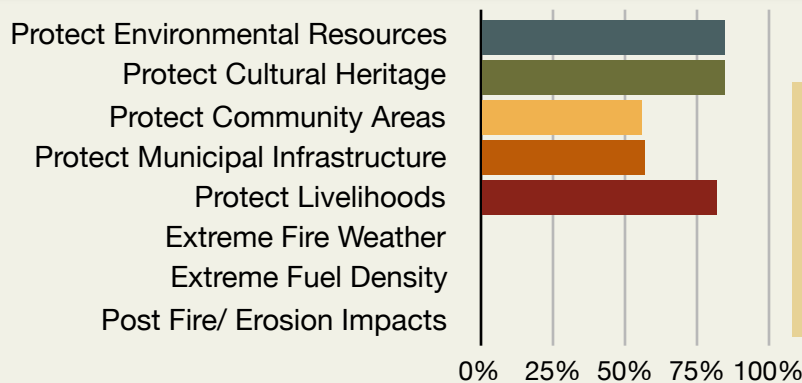
Maintenance Frequency of Existing Firebreaks



Self-reported maintenance frequency by mapping contributors.

Only 11% of these miles are maintained multiple times per year. In order to function as fire infrastructure during an emergency, these firebreaks and fire roads require regular maintenance. Not only does vegetation grow on them, but firebreaks on steep slopes are prone to erosion and require periodic maintenance to be accessible by firefighting vehicles.

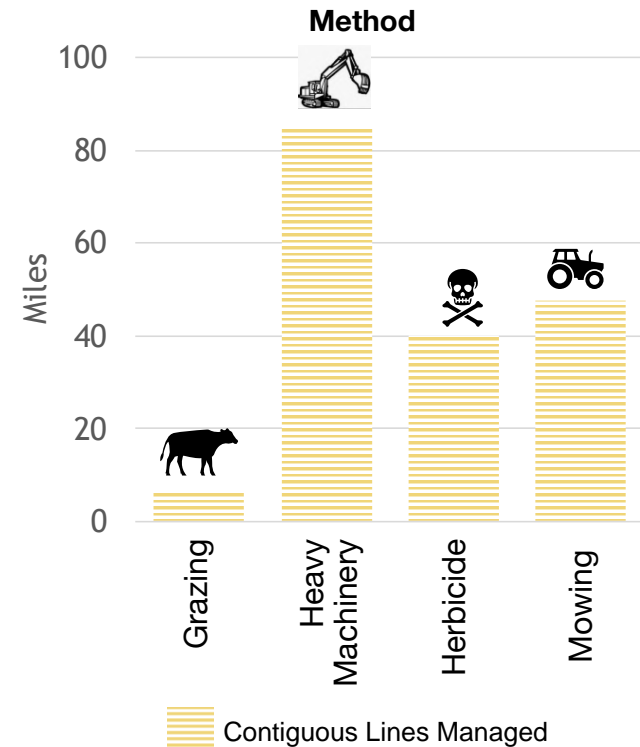
Reasons Why Firebreaks Are Established and Maintained on Moloka'i



There are multiple reasons for maintaining firebreaks on Moloka'i.

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

How Are Moloka'i Land Stewards Creating and Maintaining Firebreaks?



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

The most common methods used to create and maintain firebreaks on Moloka'i are *heavy machinery* followed by *mowing* and *herbicide*.

Wildfire Hazard Mitigation Strategies: FIREBREAKS

Moloka'i Snapshot 2018-19: Acres With Existing Firebreaks

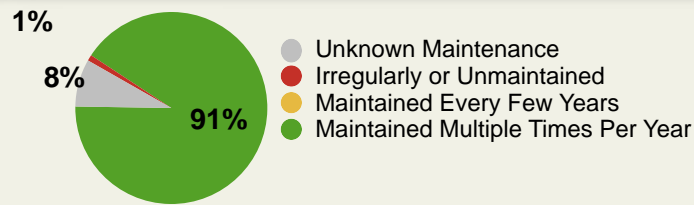


180 Acres
Mapped

Some mapping participants identified general areas where there are firebreaks, roughly 180 acres on Moloka'i.

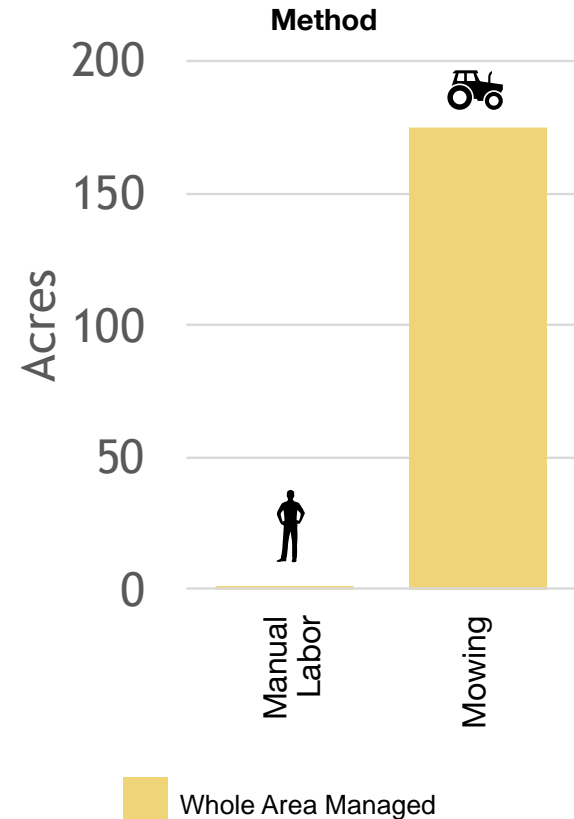
How Are Moloka'i Land Stewards Creating and Maintaining Firebreaks?

Maintenance Frequency of Existing Firebreaks



Since these areas are *maintained multiple times per year*, linear fuel reduction may be effective at slowing the spread and reducing the intensity of a wildfire.

Self-reported maintenance frequency by mapping contributors.

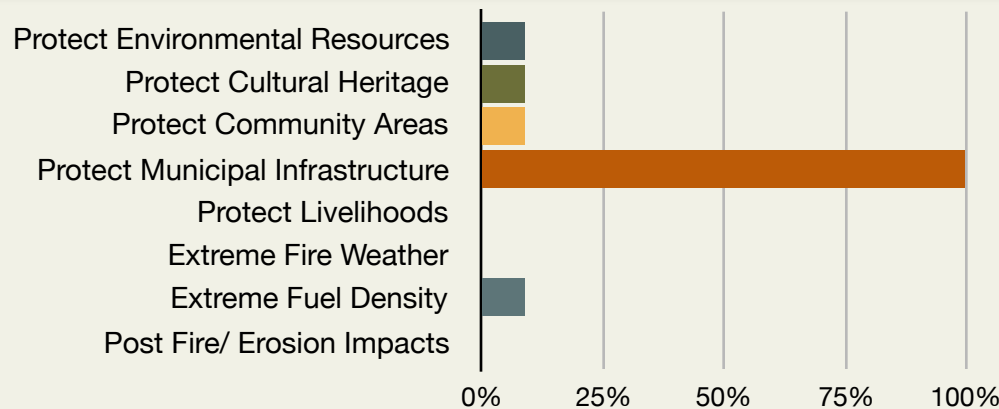


In some instances multiple methods are used to manage the same area.

In these areas, the most commonly reported method is *mowing*.

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

Reasons Why Firebreaks Are Established and Maintained on Moloka'i

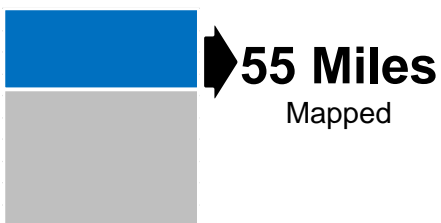


Percentage of total acres with firebreaks on Moloka'i maintained for each reason. In several instances, multiple reasons were reported for managing the same areas.

These mowed strips are maintained primarily to *protect municipal infrastructure*.

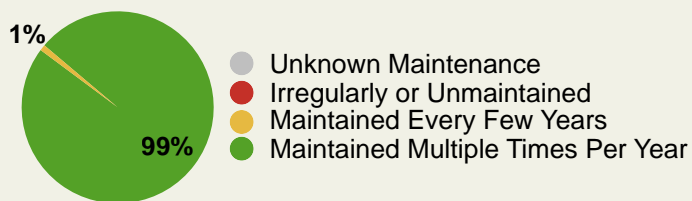
Wildfire Hazard Mitigation Strategies: **Enhanced FIREBREAKS**

Moloka'i Snapshot 2018-19: Miles of Enhanced Firebreaks



Lines mapped as both firebreaks and fuels reduction are considered enhanced firebreaks. Many roads are enhanced firebreaks due to wide pavement or gravel surfaces and fuels reduction on either side.

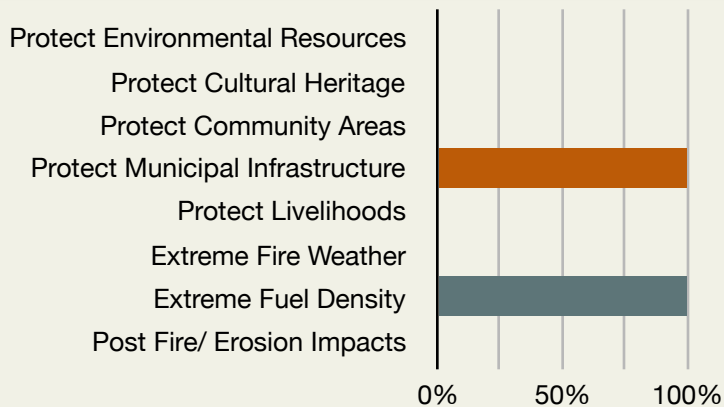
Maintenance Frequency of **Enhanced** Firebreaks



Self-reported maintenance frequency by mapping contributors.

Interestingly, nearly all miles of enhanced firebreaks are *maintained multiple times per year*, likely reflecting the ongoing fuels reduction needs of vigorous vegetation growth and year-round growing seasons in Hawai'i.

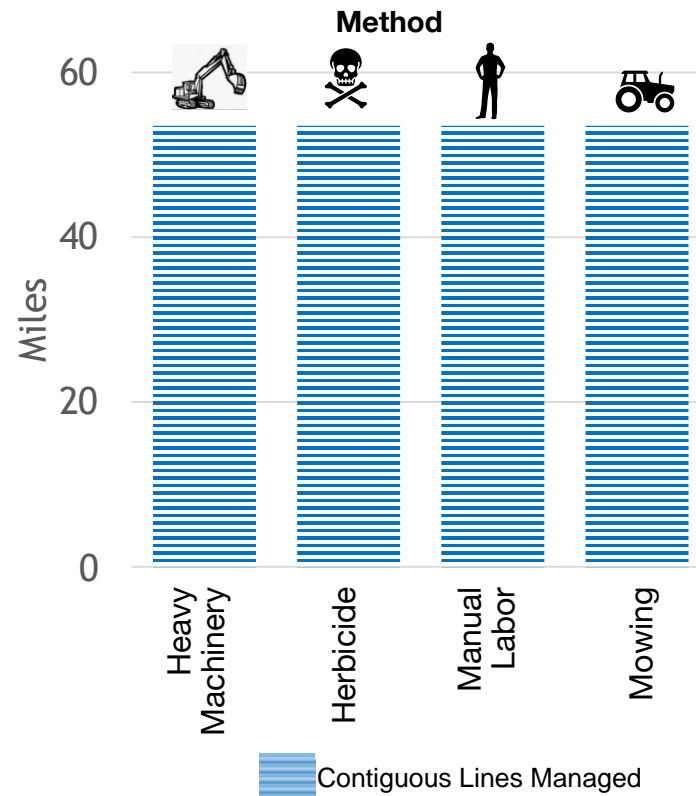
Reasons Why **Enhanced** Firebreaks Are Established and Maintained on Moloka'i



Enhanced firebreaks are maintained to *protect municipal infrastructure* and due to *extreme fuel density*.

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

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



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

Multiple methods are used in combination to maintain enhanced firebreaks including *heavy machinery, herbicide, manual labor, and mowing*.

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.**



Grazing is a common form of fuels reduction on Moloka'i. Photo Credit: HWMO

Wildfire Hazard Mitigation Strategies: **FUELS REDUCTION**

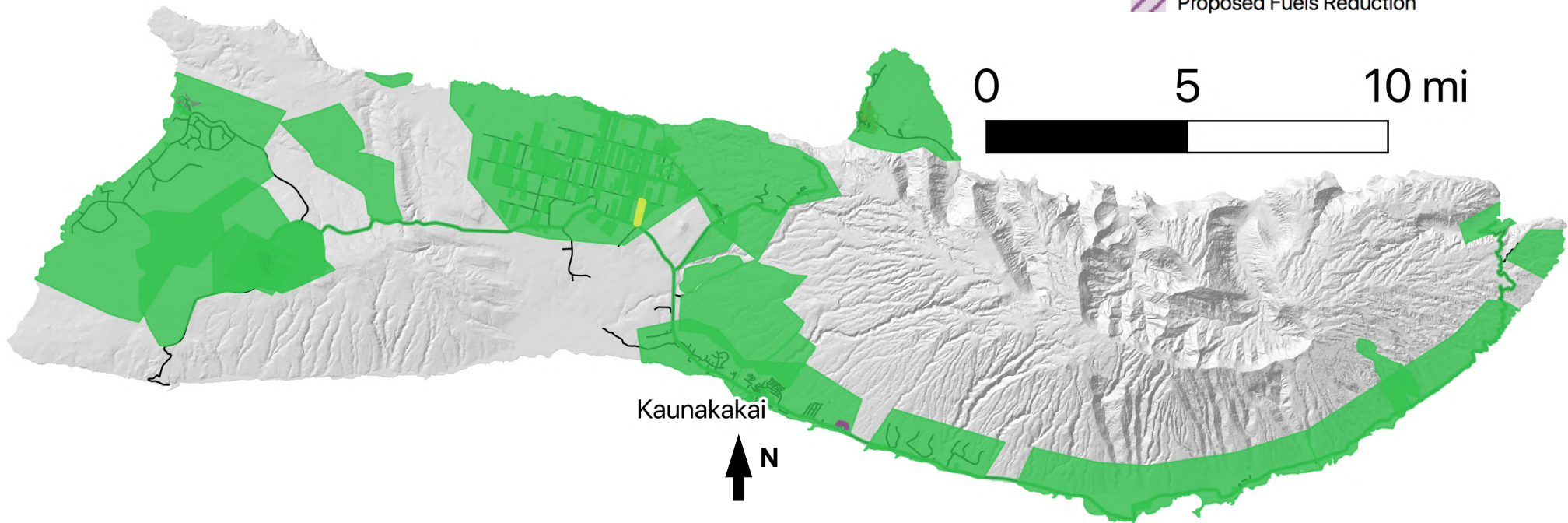
Snapshot 2018-19: Current & Proposed Fuels Reduction on Molokaʻi

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

~ 40 Acres in need of fuels reduction

Proposed Fuels Reduction



— Roads

Existing Fuel Reduction

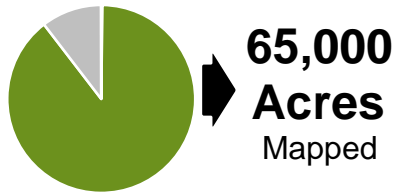
~ 65,000 Acres with fuel reduction

Maintenance Frequency

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

Wildfire Hazard Mitigation Strategies: **FUELS REDUCTION**

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



On Moloka'i, roughly 65,000 acres of fuels reduction were mapped.

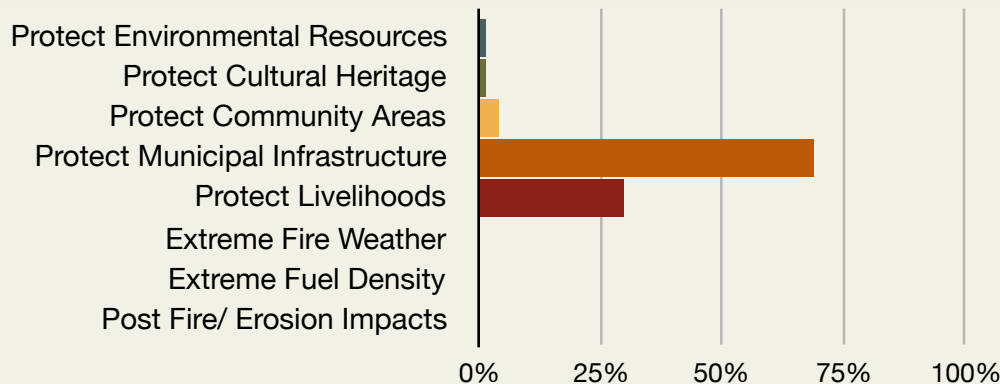
Maintenance Frequency of Fuel Reduction

Maintained Multiple Times Per Year
100%

All areas require maintenance *multiple times per year*.

Self-reported maintenance frequency by mapping contributors.

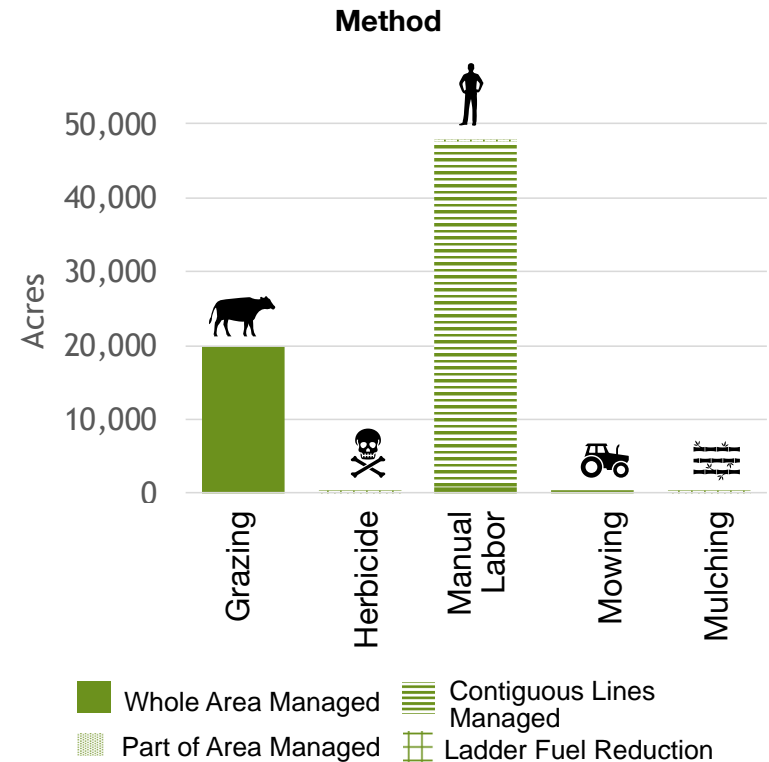
Reasons for Acres of Fuels Reduction on Moloka'i



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

Most of the areas are maintained for the primary purpose of *protecting municipal infrastructure or protecting livelihoods*.

How Are Moloka'i Land Stewards Reducing Fuel?



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

Common management methods include *manual labor* and *grazing*.

The areas where contiguous lines are managed with *manual labor* are likely areas beneath and around power lines.

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.



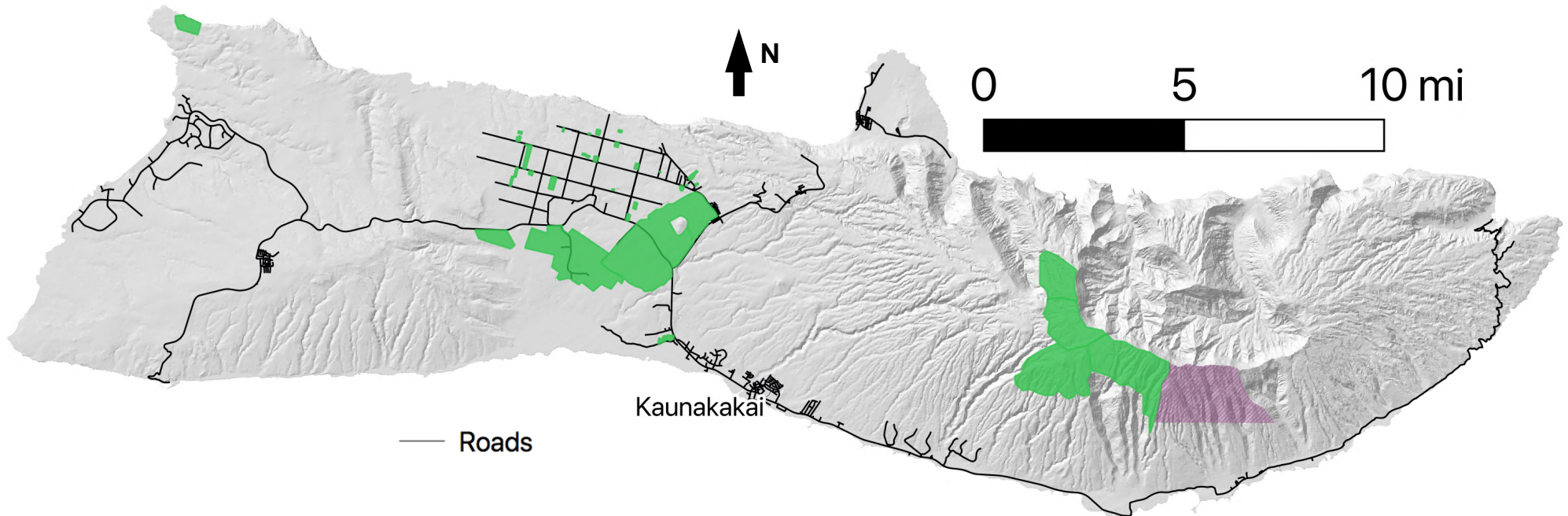
Actively managed agriculture on Moloka'i. Photo Credit: HWMO

Wildfire Hazard Mitigation Strategies: **FUELS CONVERSION**

Snapshot 2018: Current & Proposed Fuels Conversion on Molokaʻi

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 loʻi).



Proposed Fuel Conversion

~ 2,100 Acres

Proposed Fuels Conversion

Existing Fuel Conversion

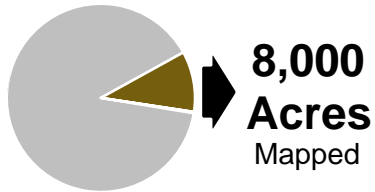
~ 8,000 Acres

Maintenance Frequency

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

Wildfire Hazard Mitigation Strategies: FUEL CONVERSION

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



Mapping participants identified roughly 8,000 acres of fuels conversion on Moloka'i. These areas likely represent both forest restoration projects as well as working agricultural lands.

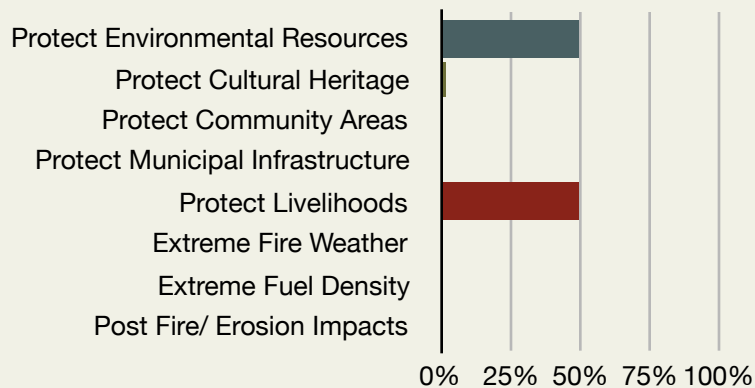
Maintenance Frequency of Active Fuel Conversion



All of the areas mapped as fuels conversion are *maintained multiple times per year*.

Self-reported maintenance frequency by mapping contributors.

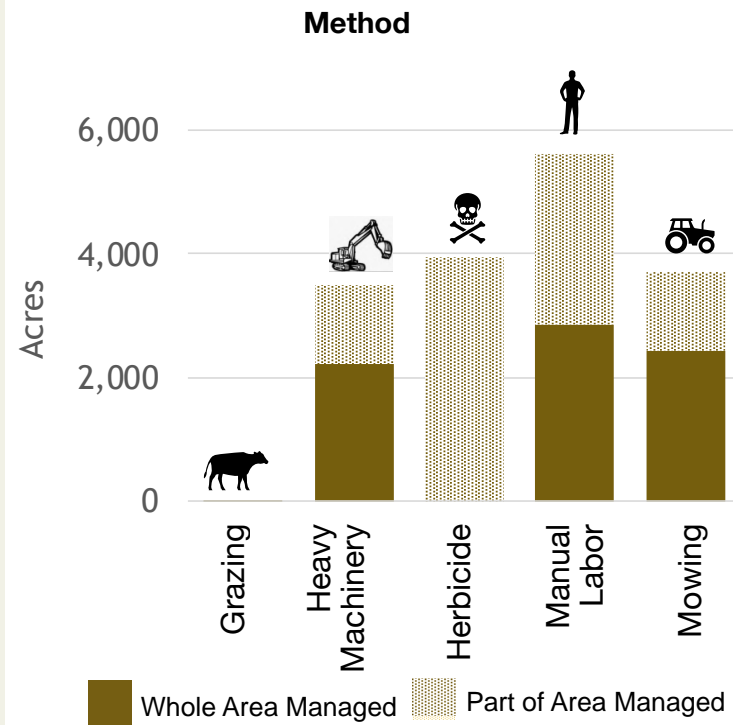
Reasons for Acres of Fuels Conversion on Moloka'i



The reasons for managing these areas include *protecting livelihoods and protecting environmental resources*.

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

How Are Moloka'i Land Stewards Implementing Fuel Conversion?



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

The most commonly used methods for fuels conversion include *manual labor, herbicide, mowing and heavy machinery*.

Manual labor may be used for agricultural operations as well as restoration projects for removing invasive species, out-planting, and managing weeds for plant establishment.

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)**



GENERAL CONCERNS

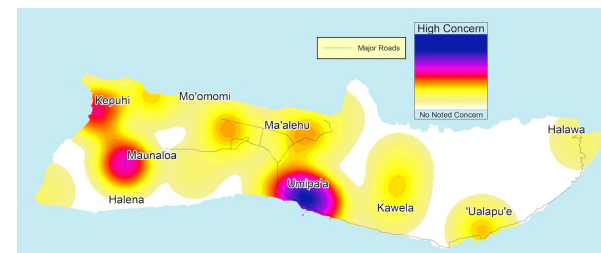
- Potential for wildfire situation to get worse if there is the introduction of certain fire-prone species including fountain grass and Guinea grass
 - Interisland agricultural inspections
 - Work with Invasive Species Council (MISC) to safeguard against introduction of new problematic species
- Management of feral animals; need to balance benefit of fuels reduction with damage from feral ungulates.
 - Strategic fencing to manage appropriate grazing (1)**
 - Open hunting — 'walk only'
 - Balance feral animal introduction and grazing domesticated animals with negative impacts

EAST SIDE Area Specific Concerns

- Kaunakakai Town — Lots of values at risk including community areas and important infrastructure for the island (schools, harbor, wastewater treatment, etc.); Area is 'heartbeat of the island'; has hazardous vegetation both from surrounding private landowners and homeowners dumping green waste "across fencelines"; Lots of ignitions and history of fire spreading out from town
 - Establish and maintain firebreak buffers around town including old fire roads (3)**
 - Enhance community awareness to include community as part of the solution. Community has the power**

to take action with greater awareness so share existing resources including Wildfire LOOKOUT! and Ready Set Go! (1)

- Continue to engage private landowners (including through Moloka'i Fire Task Force)
 - Encourage landowners to implement firebreaks or fuels reduction (grazing) buffers around town
 - Seek funding for fuels management in coordination with large landowners using in-kind match, such as existing grazing efforts
- Kawela 3 Access Road to Preserve Areas — Critical and strategic firebreak that has been key to stopping past wildfires spreading East; Maintenance is underfunded and needs yearly maintenance as road is prone to erosion
 - Prioritize funding to keep road maintained on a regular, annual basis (6)**
 - Kilohana School Wave Crest – Community area to protect; community hub
 - Keep community areas maintained
 - Pu'u o Hoku Ranch – Area is difficult for wildfire response; only has one ingress/egress and a 5 ton bridge capacity limit that may restrict firefighting access, plus long distance from fire station
 - Create additional emergency access (1)**
 - Increase helicopter options
 - Mauka Watershed Areas and South Shore Reefs – Fire impacts to mauka areas



negatively impact watershed collection areas and important reef areas which provide food for the community

- Prioritize wildfire prevention in mauka areas to protect the water supply and reef areas — "Protect what is mauka to protect makai" (2)**
- Kamakou Preserve — Pine and eucalyptus plantations have potentially hazardous fuel loads
 - Thinning and ladder fuel reduction; Silviculture management
 - Contain the spread of invasive trees beyond plantation and use plantation as a buffer to prevent wildfire spread to native forest more mauka
 - DOFAW and TNC Base Yard — Need to protect infrastructure to coordinate and fight fires
 - Prioritize fuels reduction and hazard mitigation around base yard areas



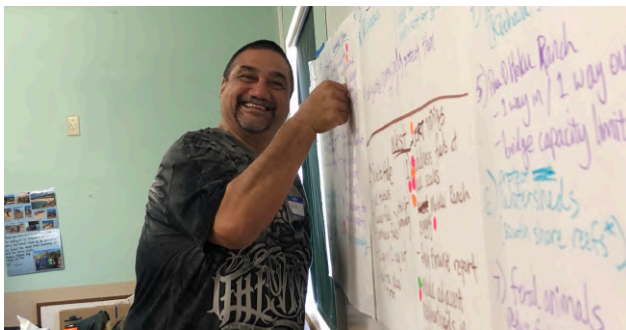
Moloka'i Participant Input From Workshop Held April 2, 2019

WEST SIDE Area Specific Concerns

1. Paniolo Hale — Community area to protect along with trees that are important and valuable to the community; Community has numerous fire hazards including wooden structures, woody ladder fuels leading to shingle roofs, contiguous canopy fuels and dry grass surrounding the area, and only one ingress/egress
 - **Address fuel and hazard mitigation at all scales; remove debris from gutters, limb up trees, and separate tree canopies from roofs (5)**
 - **CERT trainings for community residents (2)**
 - **Engage and include adjacent neighborhoods in Firewise outreach, planning, and hazard reduction activities (2)**
 - **Engage Moloka'i Ranch to enhance fuels reduction and grazing near community (1)**

2. Maunaloa town — Area is community hub surrounded by fuel and has long fire response time; With the loss of plantation, there was a loss of manpower for fire response
 - **Engage Moloka'i Ranch as a partner in wildfire suppression; Coordinate official agreement/public-private partnership so that all can contribute to wildfire response and pool equipment and water resources (similar to Parker Ranch and Waiki'i Ranch on Hawai'i Island) (7)**
 - **Revive volunteer fire crews; Capacity building of community response to wildland fire with training and equipment (federal excess property program to transfer older equipment to volunteer fire departments; CERT trainings) (6)**

3. Protect important infrastructure including water supply, airport, communication towers
 - **Establish fire station at Kaluakoi (3)**
 - Continue ranch grazing
 - Community-driven approach
4. North Coast area is important to prevent wildfire and protect native habitat, fishing, subsistence gathering, and unique cultural sites and burials
 - Prioritize fuels reduction and native plant restoration in the area; Remove keawe and chip to mulch to reduce fuel
5. DHHL Lands – Agricultural lands and homes surrounded by fuel
 - Prioritize fuel management around inhabited areas



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.

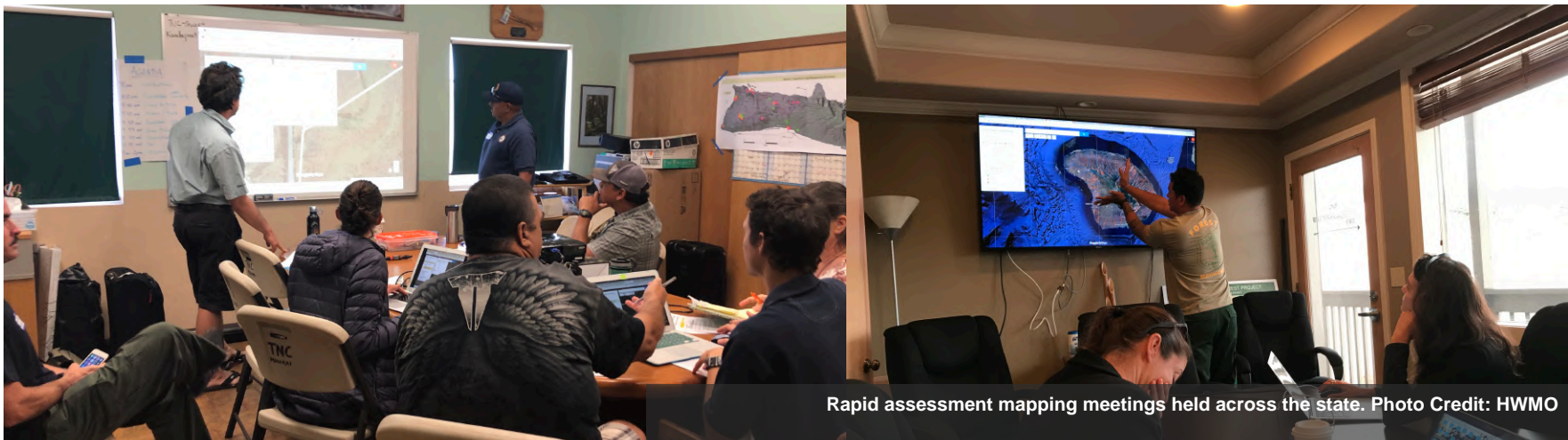
In an effort to maximize data quality, mapped areas and associated attributes were confirmed with mapping collaborators after all data was

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



HWMO



HAWAII WILDFIRE MANAGEMENT ORGANIZATION