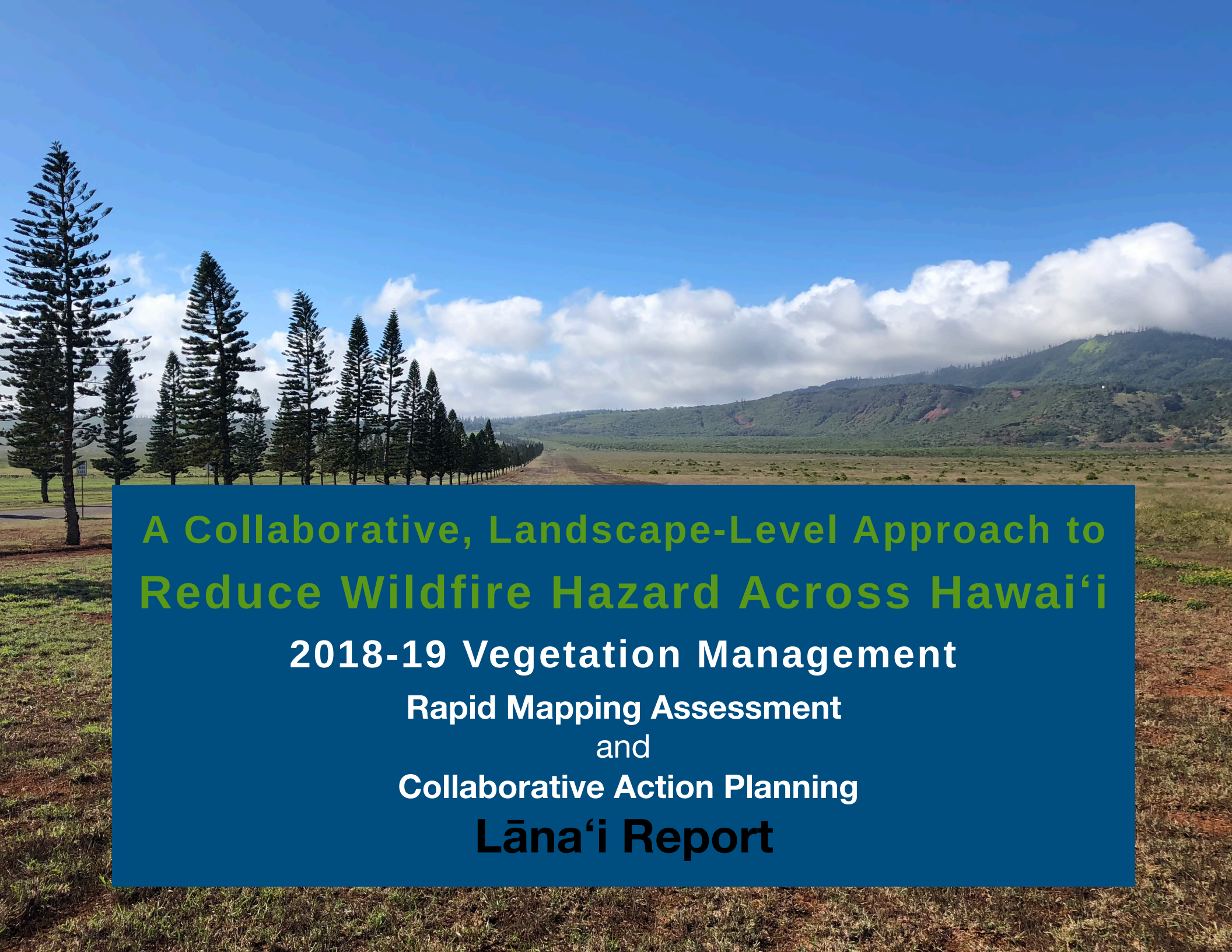


A Collaborative, Landscape-Level Approach to

Reduce Wildfire Hazard Across Hawai‘i

2018-19 Vegetation Management

Rapid Mapping Assessment

and

Collaborative Action Planning

Lāna‘i Report

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

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

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

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

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

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

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

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

Agency representatives responsibly managing heritage resources;

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

Project Lead

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

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

Funding

- Hawai‘i State Grant-in-Aid Program, 2016
- U.S. Forest Service, Pacific Southwest Region, under the terms of Grant No. 16-11052012-146 and No. 17-DG-11052012-143. USDA is an equal opportunity provider and employer.

HWMO Photo Credits:

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

Cover Photo: Enhanced firebreak east of Manele Road on Lāna‘i. Photo Credit: Mike Donoho.

Lāna‘i 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).

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 Lāna‘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.

Lāna‘i Rapid Mapping Assessment Summary Findings:

- ~ **217,000 acres** and **560 miles** of **current** firebreaks, fuel reduction or fuel conversion mapped on Lāna‘i.
- ~**132,000 acres** and **90 miles** of **needed** firebreaks, fuel reduction or fuel conversion mapped on Lāna‘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.

No Collaborative Action Planning Workshop was held on Lāna‘i due to the small number of land managers involved. However, issues that emerged during workshops on other islands may still have relevance (see separate island reports).

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

Online Survey

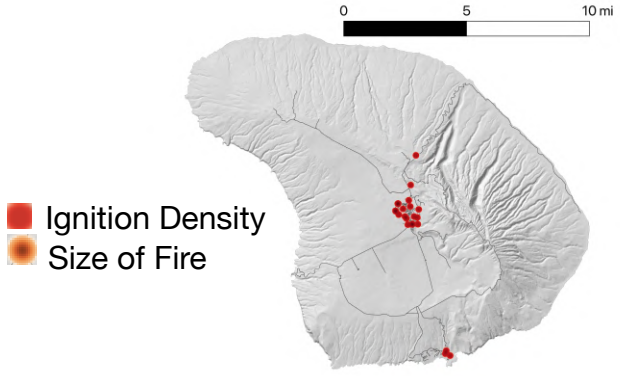
As a follow-up, HWMO conducted a brief online survey targeted at anyone managing vegetation. Selected results from the **87 survey respondents** are presented throughout the reports.

Wildfire Hazard Across Lānaʻi

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

Wildfires do not recognize fences or ownership boundaries.

Ignitions	+	Fuel (Hazardous Vegetation)	=	Widespread Impacts



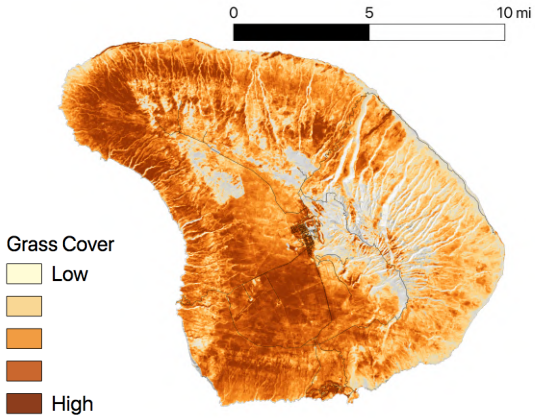
People Spark Fire

In Hawaiʻi, most **wildfires are caused by people.**

The majority are accidental, and are started by hot exhaust, sparks from equipment, open fires, cigarettes, fireworks, and more.

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

Source: HWMO 2002-2012 data



Fire Follows Fuel

Dry grass and other fine fuel is quick to ignite.

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

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

Source: UH Manoa 2018

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**

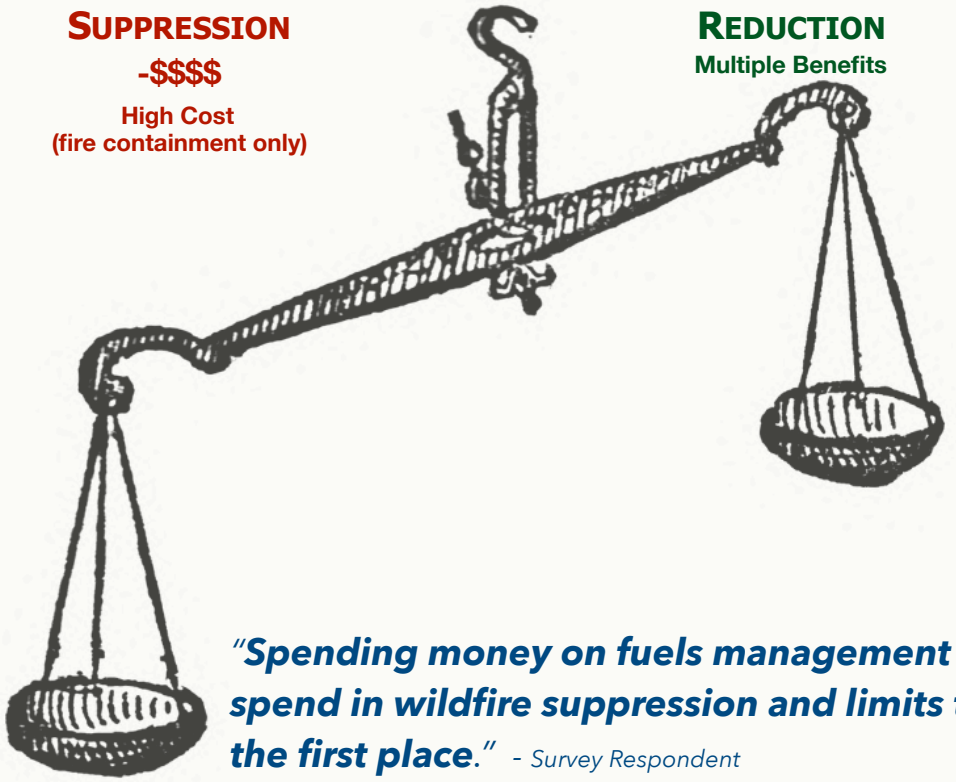
-$ **Damage to coastal resources** of community, and tourism and economic value

-$ **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 fires and recovering after wildfires have burned lands, homes, and infrastructure.

✓ Proactive activities that are more **cost-effective** than waiting until a firefighting response is required and urgent include:

- **Preventing ignitions** through public education
- **Reducing wildfire spread** potential through **vegetation management**
- Developing quick and easy **access for firefighting and evacuations**

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

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

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).

What's Already Happening on Lānaʻi?

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 Hawaiʻi 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.

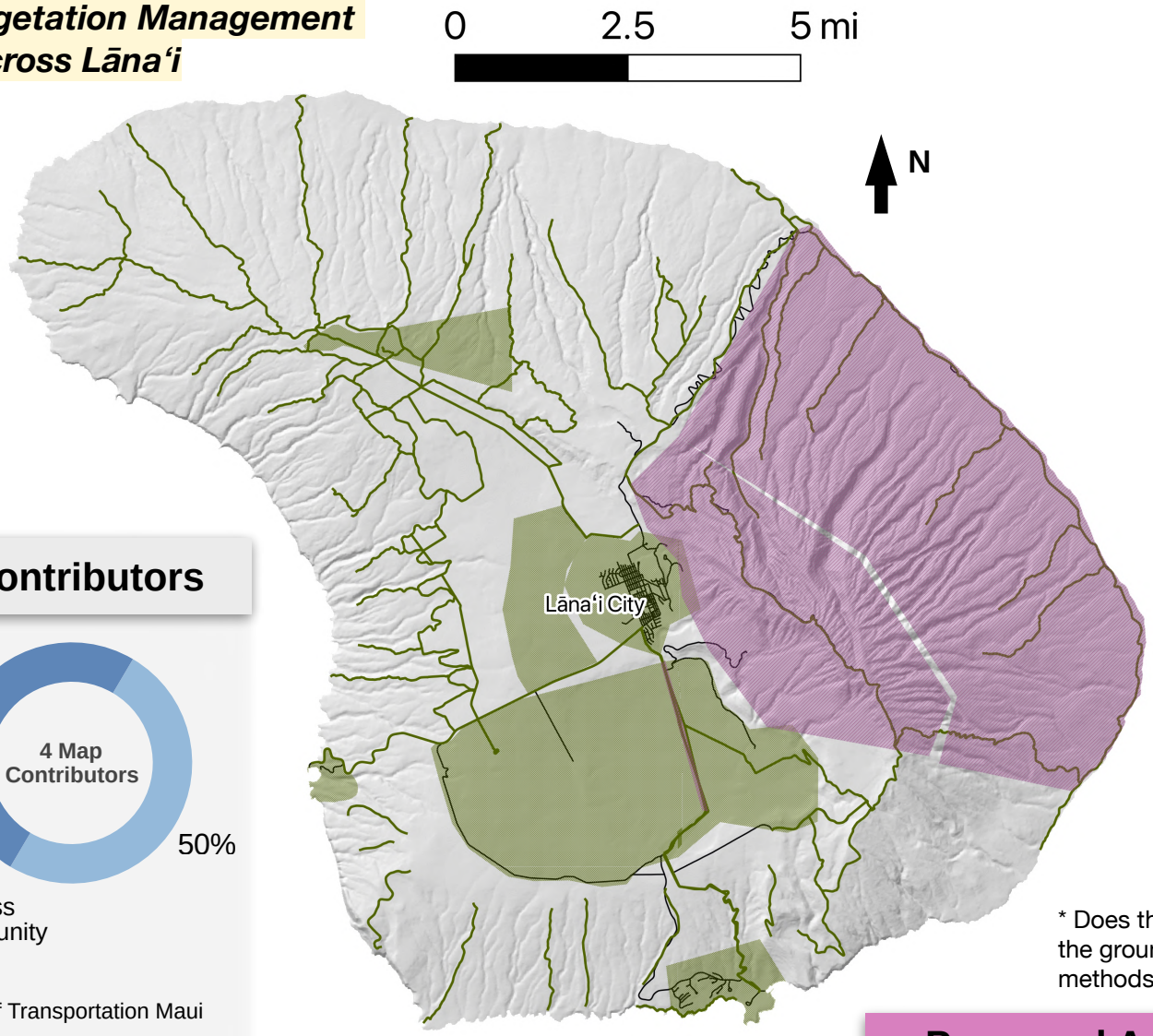
In addition to mapping areas of vegetation management, land stewards identified reasons for managing vegetation, which methods were used, and how frequently they managed areas.

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: Lānaʻi 2018-19 Snapshot

Current Vegetation Management and Proposed Vegetation Management Across Lānaʻi



Mapping Contributors

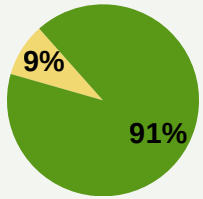
- Agency
- For-Profit Business
- Non-Profit/Community

Mahalo to:

1. State Department of Transportation Maui District
2. DLNR Division of Forestry and Wildlife - Maui Nui
3. Maui Electric
4. Pūlama Lānaʻi

Current Vegetation Management

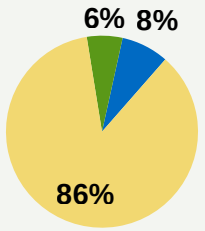
~13,000 Acres



Wildfire Hazard Mitigation Strategies

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

~ 180 Miles



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

Proposed Additional Vegetation Management

~23,000 Acres

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.

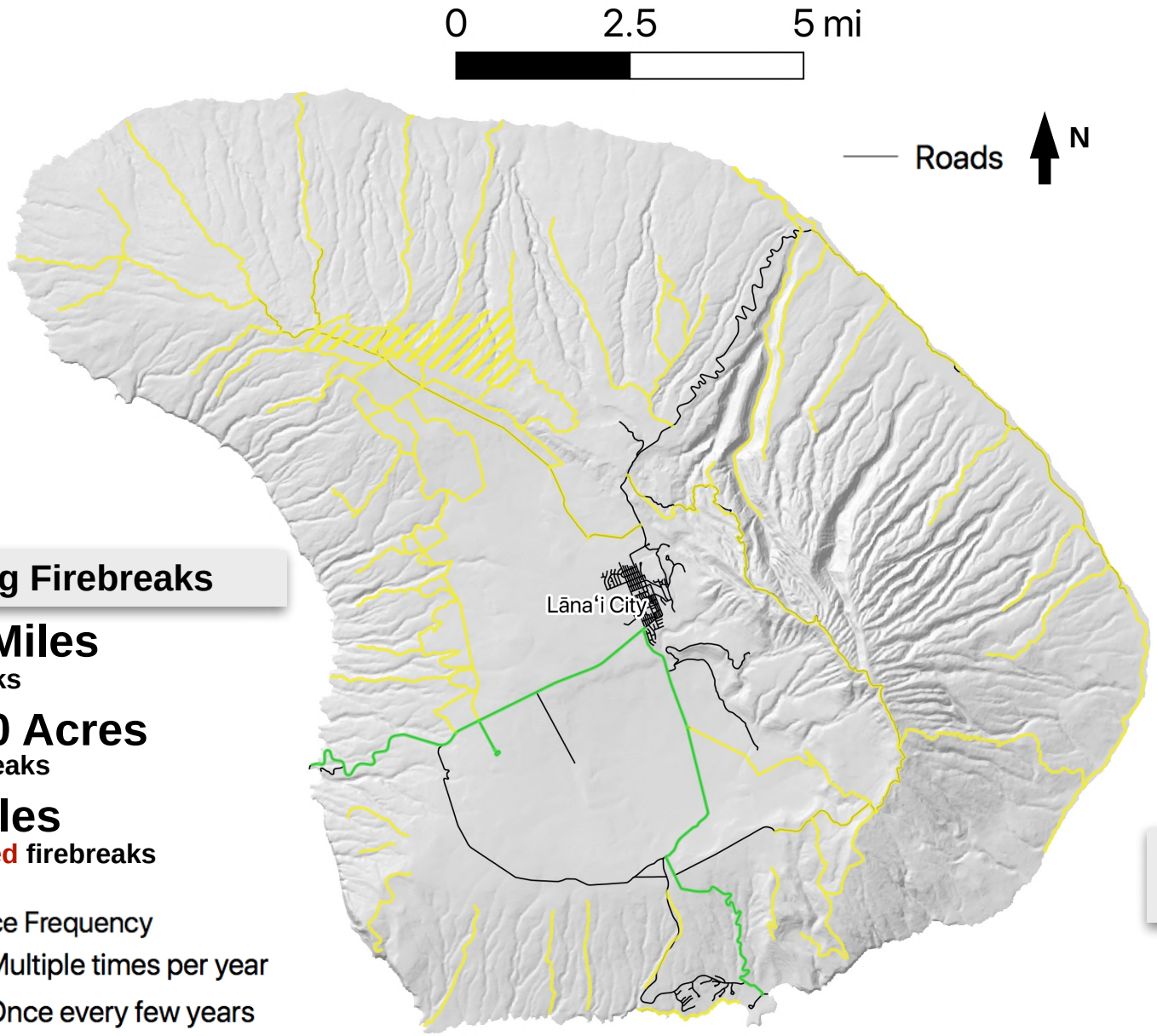
The **greatest protection** occurs **when firebreaks are enhanced** with reduced flammability or quantity of fuel on either side and adequate access to water.

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

Enhanced firebreak east of Manele Road on Lānaʻi. Photo Credit: Mike Donoho

Wildfire Hazard Mitigation Strategies: **FIREBREAKS**

Snapshot 2018-19: Current Firebreaks on Lānaʻi



Existing Firebreaks

~ 150 Miles
of firebreaks

~ 1,200 Acres
with firebreaks

~15 Miles
of enhanced firebreaks

Maintenance Frequency

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

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

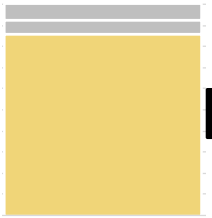
In addition to **access,** they can passively **slow the spread of wildfire by breaking continuity of fuel** across the landscape.

Proposed Firebreaks

None Proposed

Wildfire Hazard Mitigation Strategies: **FIREBREAKS**

Lānaʻi Snapshot 2018-19: Miles of Existing Firebreaks



150 Miles
Mapped

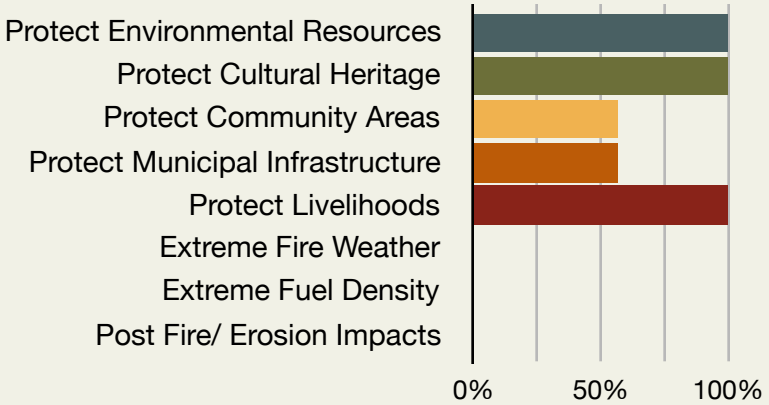
Roughly 150 miles of firebreaks were mapped by Lānaʻi land stewards.

Maintenance Frequency of Existing Firebreaks

All miles of firebreak mapped are *maintained once every few years*.

Self-reported maintenance frequency by mapping contributors.

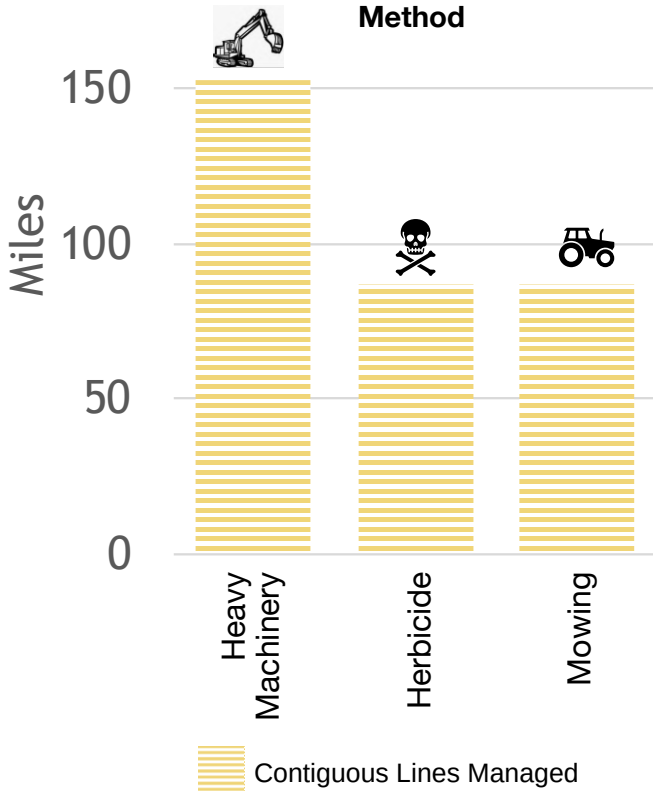
Reasons Why Firebreaks Are Established and Maintained on Lānaʻi



These firebreaks are maintained for numerous reasons including to *protect environmental resources, cultural heritage,* and *livelihoods*.

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

How Are Lānaʻi Land Stewards Creating and Maintaining Firebreaks?



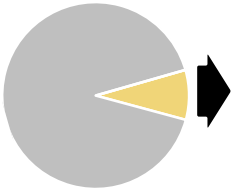
In some instances multiple methods are used to manage the same area.

The most common methods used are *heavy machinery, herbicide*, and *mowing*.

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

Wildfire Hazard Mitigation Strategies: **FIREBREAKS**

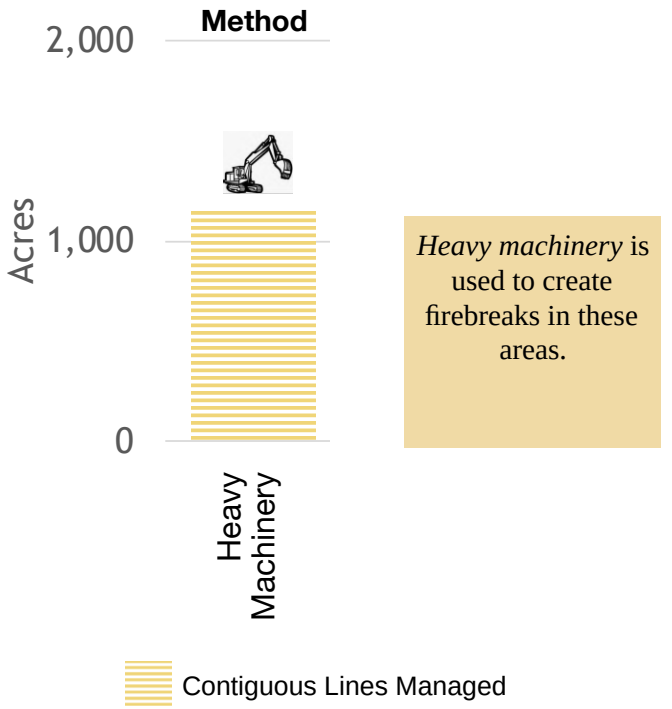
Lānaʻi Snapshot 2018-19: Acres With Existing Firebreaks



1,200 Acres Mapped

Some mapping participants identified general areas where there are firebreak, roughly 1,200 acres on Lānaʻi.

How Are Lānaʻi Land Stewards Creating and Maintaining Firebreaks?



Heavy machinery is used to create firebreaks in these areas.

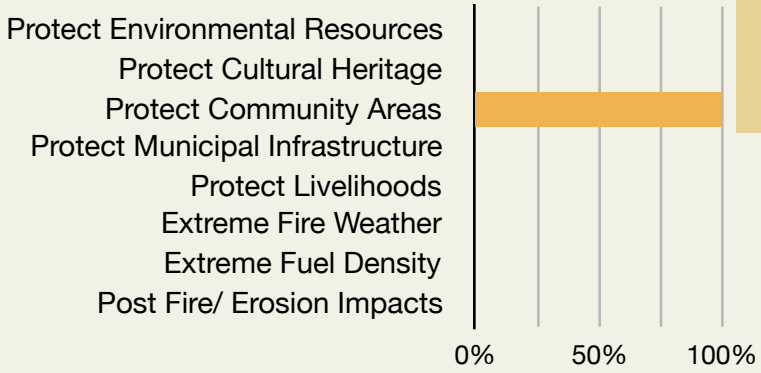
Maintenance Frequency of Existing Firebreaks

Maintained Every Few Years 100%

Firebreaks in these areas are *maintained once every few years.*

Self-reported maintenance frequency by mapping contributors.

Reasons Why Firebreaks Are Established and Maintained on Lānaʻi



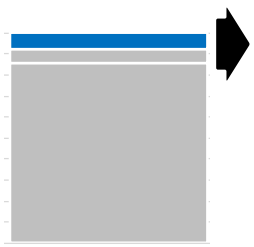
These areas are maintained to *protect community areas.*

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

Firebreaks on Lānaʻi. Photo Credit: Mike Donoho

Wildfire Hazard Mitigation Strategies: **Enhanced FIREBREAKS**

Lānaʻi Snapshot 2018-19: Miles of Enhanced Firebreaks

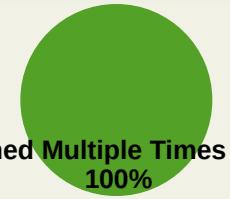


15 Miles Mapped

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

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

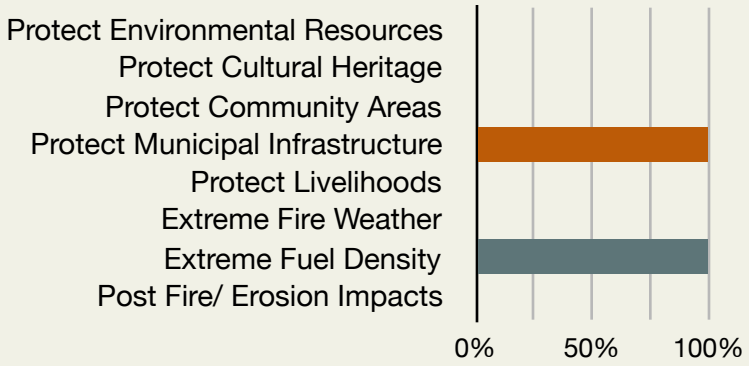
Maintenance Frequency of Enhanced Firebreaks



Self-reported maintenance frequency by mapping contributors.

All miles mapped of enhanced firebreaks are *maintained multiple times per year.*

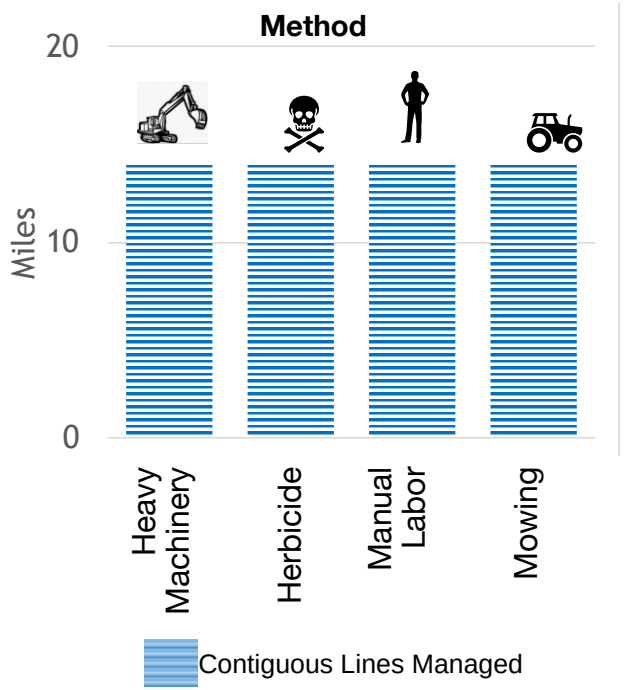
Reasons Why Enhanced Firebreaks Are Established and Maintained on Lānaʻi



These enhanced firebreaks are maintained to *protect municipal infrastructure* due to *extreme fuel density*.

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

How Are Lānaʻi Land Stewards Creating and Maintaining Enhanced Firebreaks?



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

Enhanced firebreaks are managed using a combination of methods including *heavy machinery, herbicide, manual labor,* and *mowing*.

Enhanced firebreak east of Manele Road on Lānaʻi. Enhanced firebreaks are those with reduced flammability or quantity of fuel on either side. Photo Credit: Mike Donoho

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.**

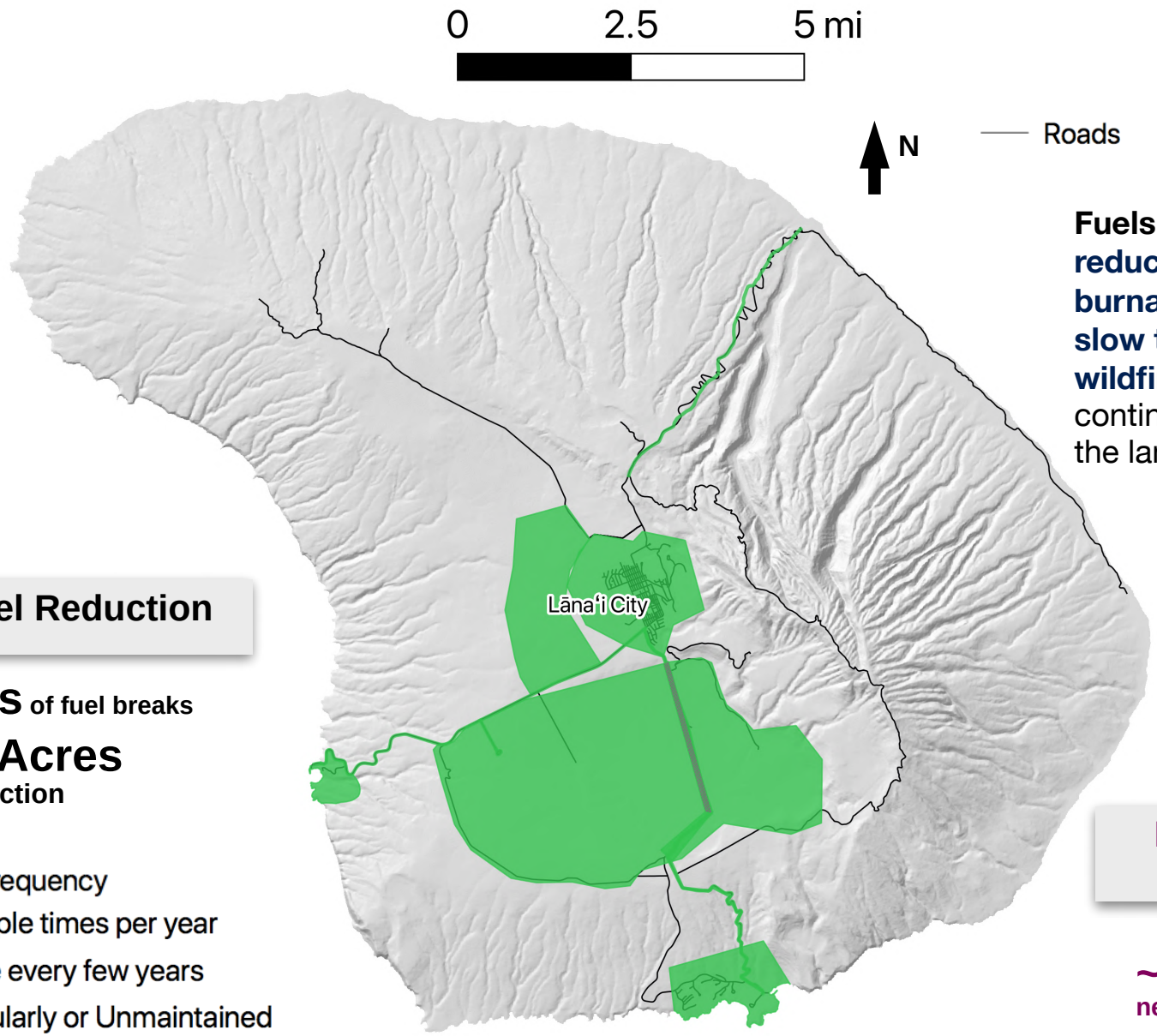
Linear fuel reduction, or fuel breaks, slow the spread of wildfire and are beneficial along roadsides and other areas with frequent ignitions.

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.**

Mowed fuels reduction on Lāna‘i. Photo Credit: Mike Donoho

Wildfire Hazard Mitigation Strategies: **FUELS REDUCTION**

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



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

Existing Fuel Reduction

~ 10 Miles of fuel breaks

~ 12,500 Acres
with fuels reduction

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

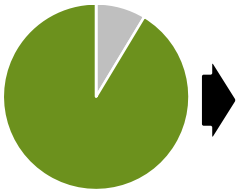
Proposed Fuel Reduction

~ 115 Acres in need of fuels reduction

Proposed Fuels Reduction

Wildfire Hazard Mitigation Strategies: **FUELS REDUCTION**

Lānaʻi Snapshot 2018-19: Acres of Active Fuels Reduction



12,500 Acres Mapped

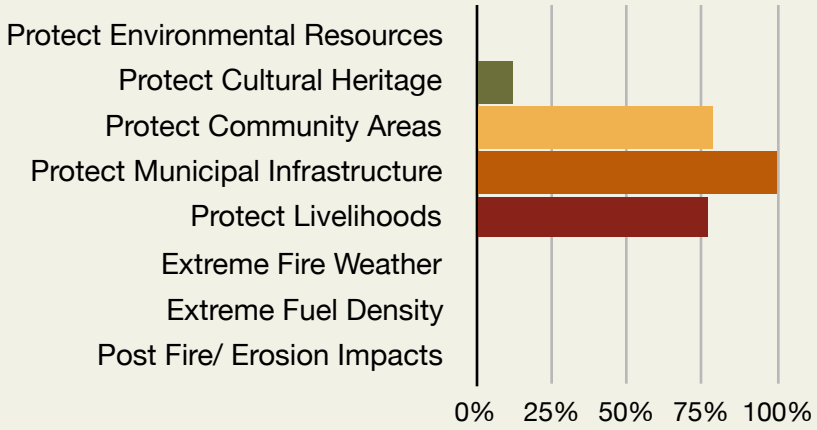
On Lānaʻi, roughly 12,500 acres of fuels reduction were mapped.

Maintenance Frequency of Fuel Reduction

These areas are *maintained multiple times per year.*

Self-reported maintenance frequency by mapping contributors.

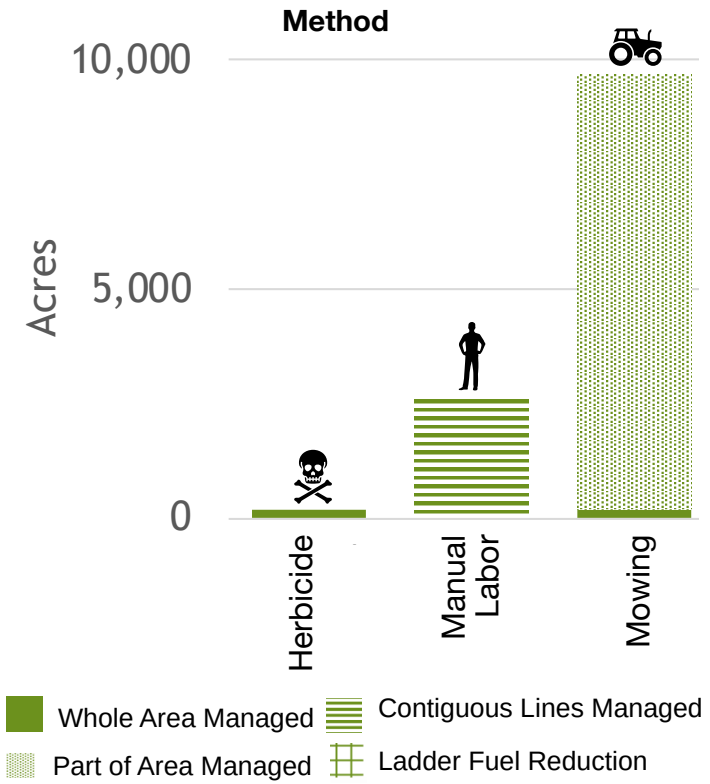
Reasons for Acres of Fuel Reduction on Lānaʻi



These areas are managed to *protect municipal infrastructure, community areas,* and *livelihoods.*

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

How Are Lānaʻi Land Stewards Reducing Fuel?



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

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

Wildfire Hazard Mitigation Strategies: **FUELS REDUCTION**

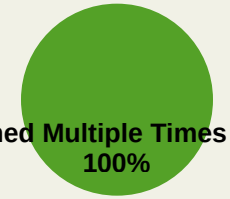
Lānaʻi Snapshot 2018-19: Miles of Active Fuels Reduction

10 Miles

Mapped

Land stewards on Lānaʻi mapped roughly 10 miles of fuel breaks, or linear fuels reduction.

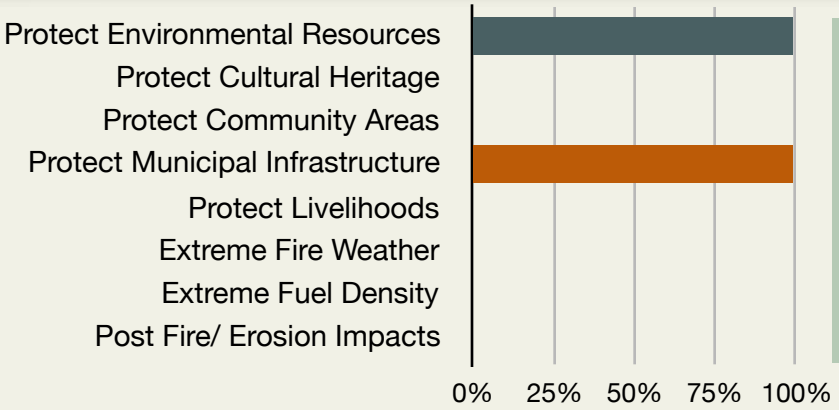
Maintenance Frequency of Fuel Breaks



These areas are *maintained multiple times per year*.

Self-reported maintenance frequency by mapping contributors.

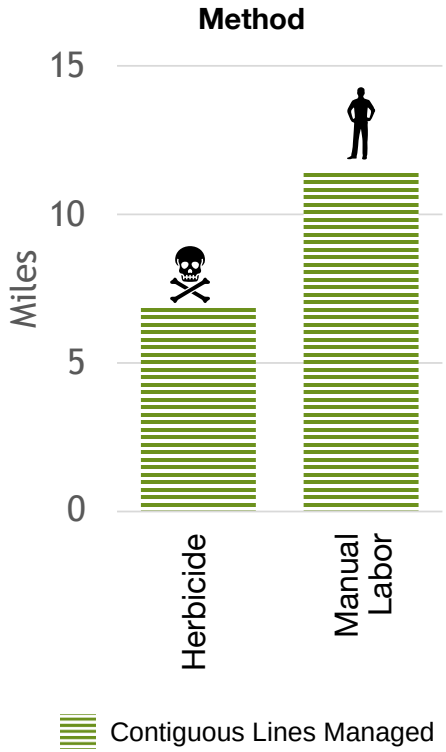
Reasons for Fuel Breaks on Lānaʻi



Reasons reported for managing these areas include *protecting environmental resources* and *municipal infrastructure*.

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

How Are Lānaʻi Land Stewards Reducing Fuel?



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

The most common method reported for linear fuel reduction on Lānaʻi is *manual labor* and *herbicide*.

Fuels Conversion: Make It Less Burnable!

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

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

Actively Managed Landscapes
Lower Fire Risk
(e.g. active agriculture, targeted invasive species removal, maintained homes and community areas)

The Takeaway:

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

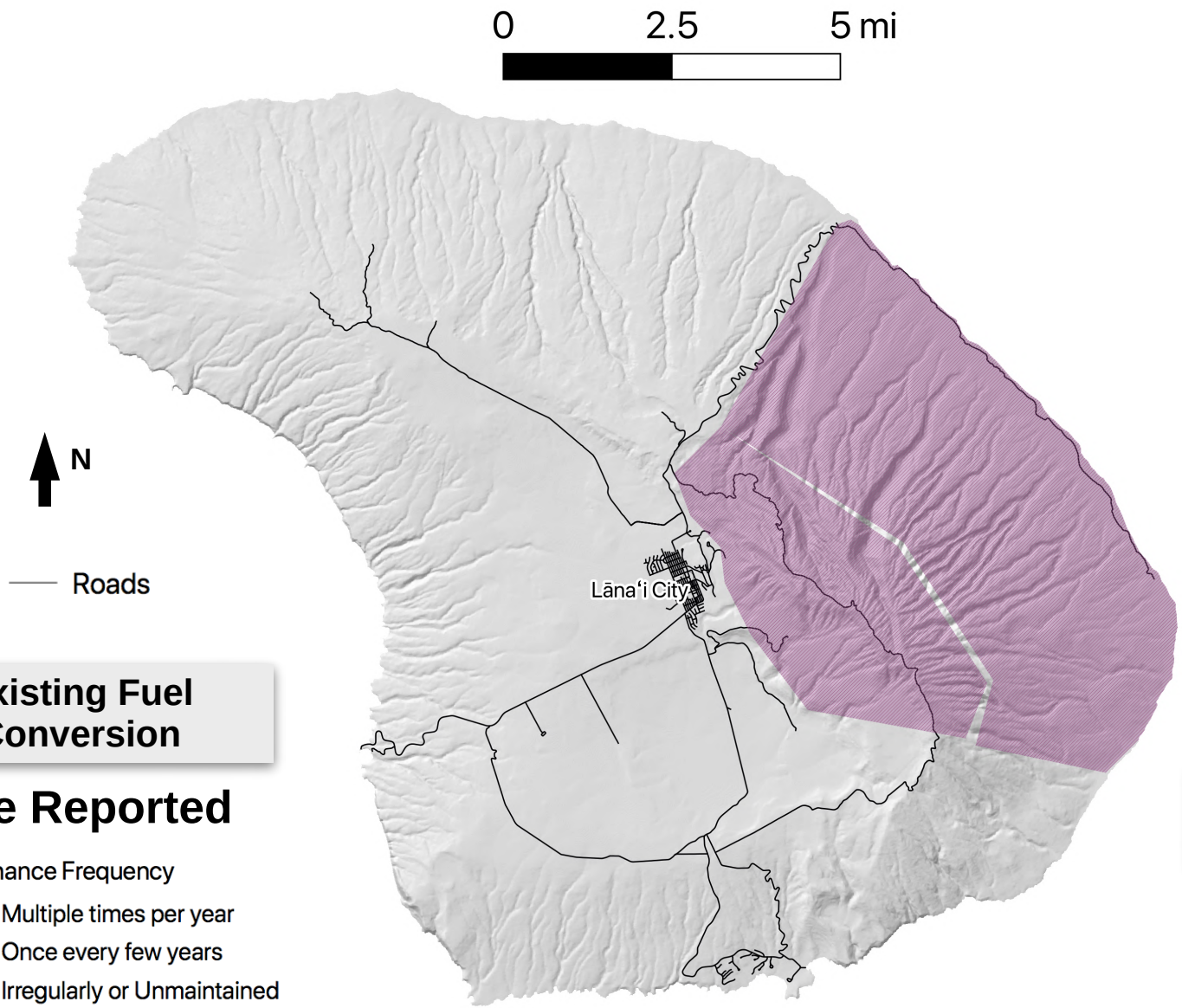
Many land management activities result in converting fuel whether it be agricultural lands, development of community and recreational areas, or removal of invasive species.

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

Including fire-thinking in development is important because these activities are already converting fuel. Photo Credit: HWMO

Wildfire Hazard Mitigation Strategies: **FUELS CONVERSION**

Snapshot 2018-19: Current & Proposed Fuels Conversion on Lānaʻi



Existing Fuel Conversion

None Reported

Maintenance Frequency

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

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

~ 23,000 Acres

Proposed Fuels Conversion

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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HAWAII WILDFIRE MANAGEMENT ORGANIZATION