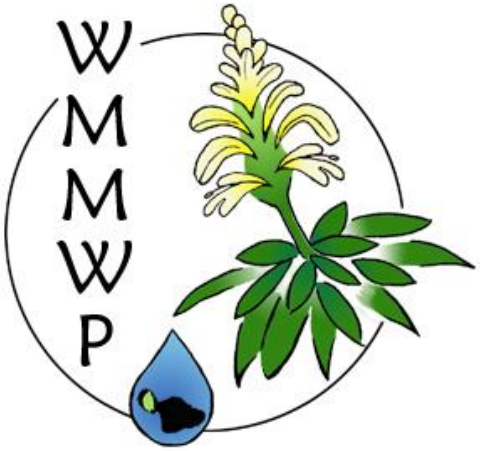
West Maui Mountains Watershed Partnership



Joint Government Water Conference
"Groundwater Protection Strategies"
August 7th, 2018

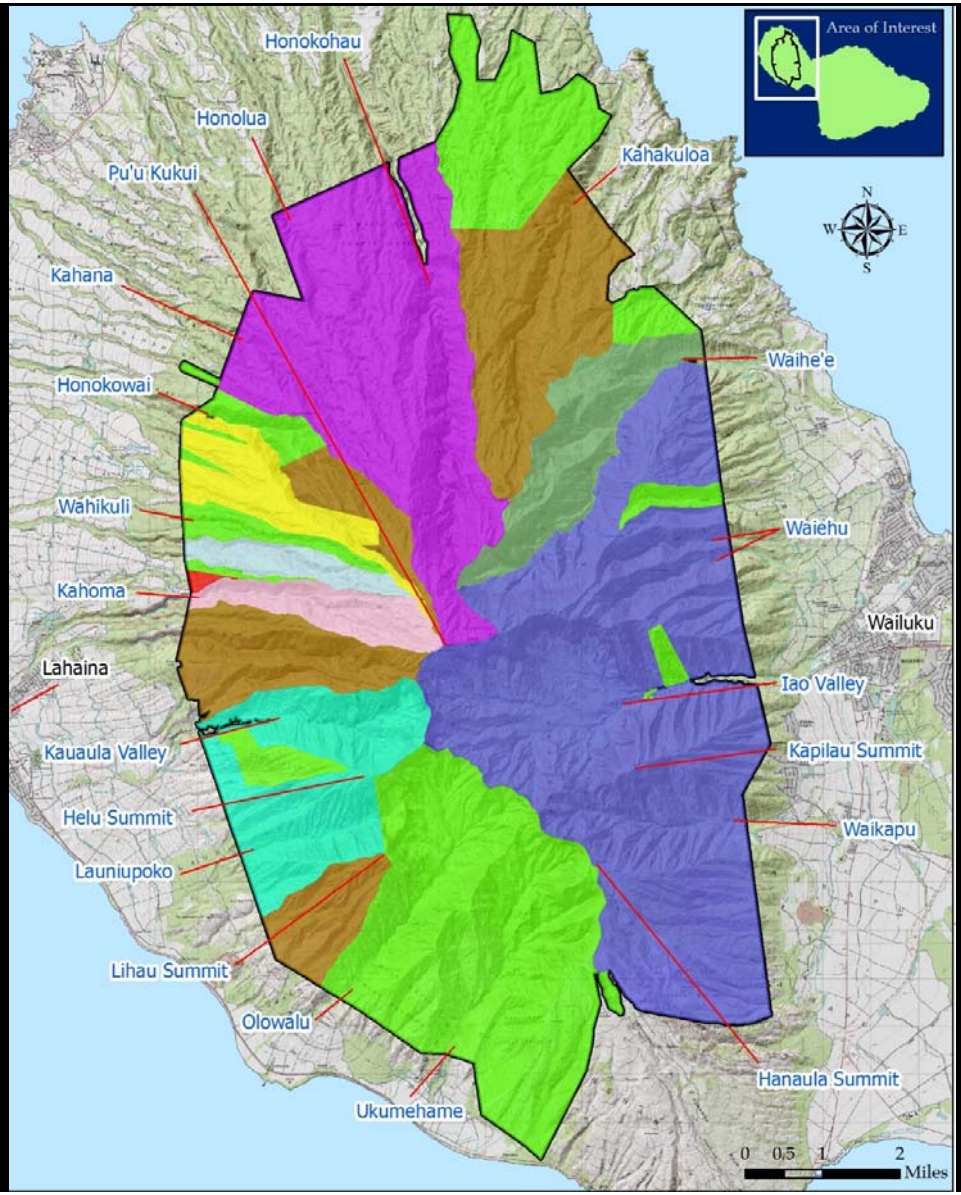
WMMWP Overview

- *Formed in1998*
- *47, 322 acres*
- *20,630 public acres @ 44%*
- *26,692 private acres @ 56%*
- *14 Partners*

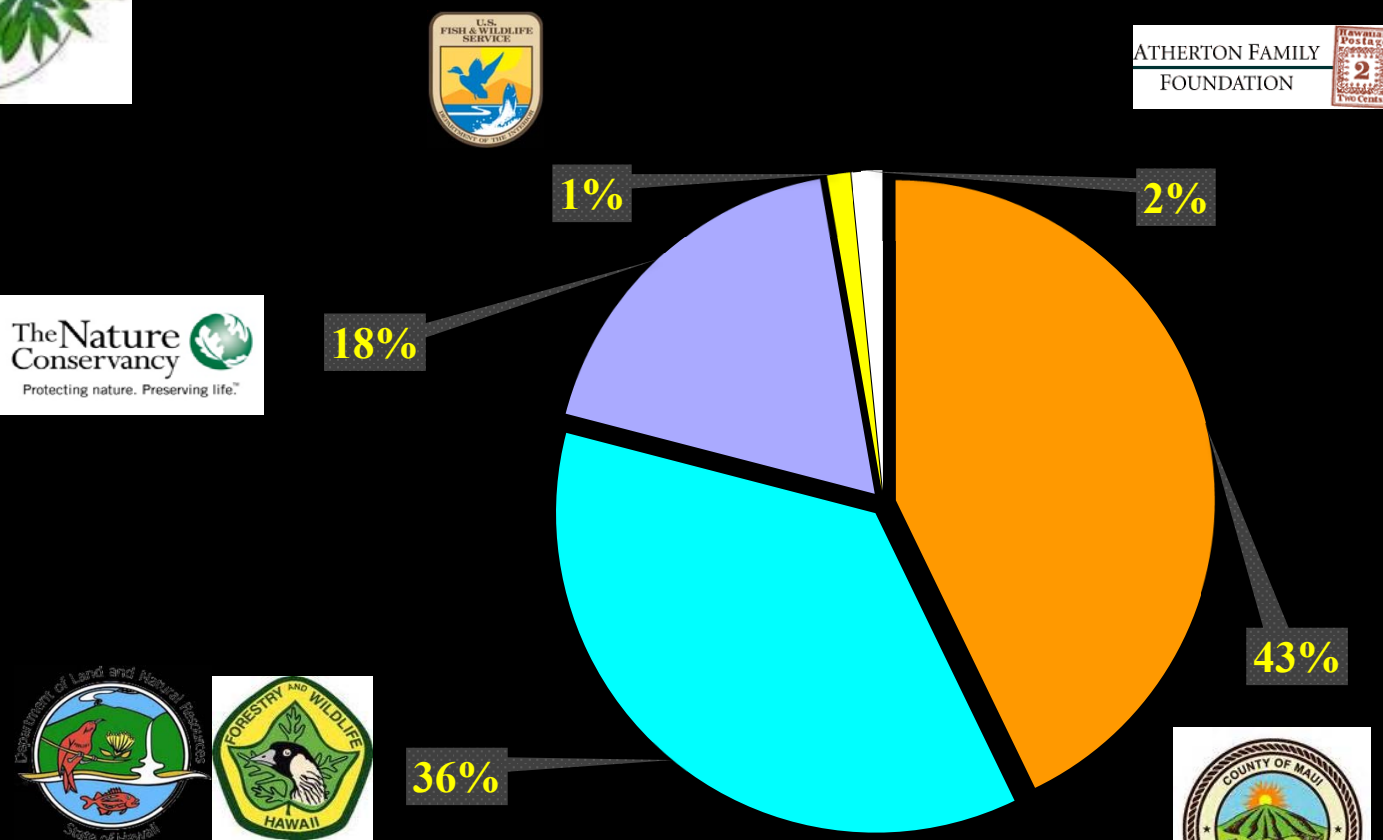
- Dept. of Water Supply (Maui County)
- General Finance Group, Inc.
- Kaanapali Land Mgmt. Corp./The Nature Conservancy
- Kahoma Land Company, LLC
- Kamehameha Schools
- Makila Land Company, LLC
- Maui Land & Pineapple Co., Inc.
- State of Hawaii - Natural Area Reserves
- State of Hawaii - Forest Reserves
- Wailuku Water Company, LLC

Associate Partners

US Fish and Wildlife Service
Tri-Isle RC&D

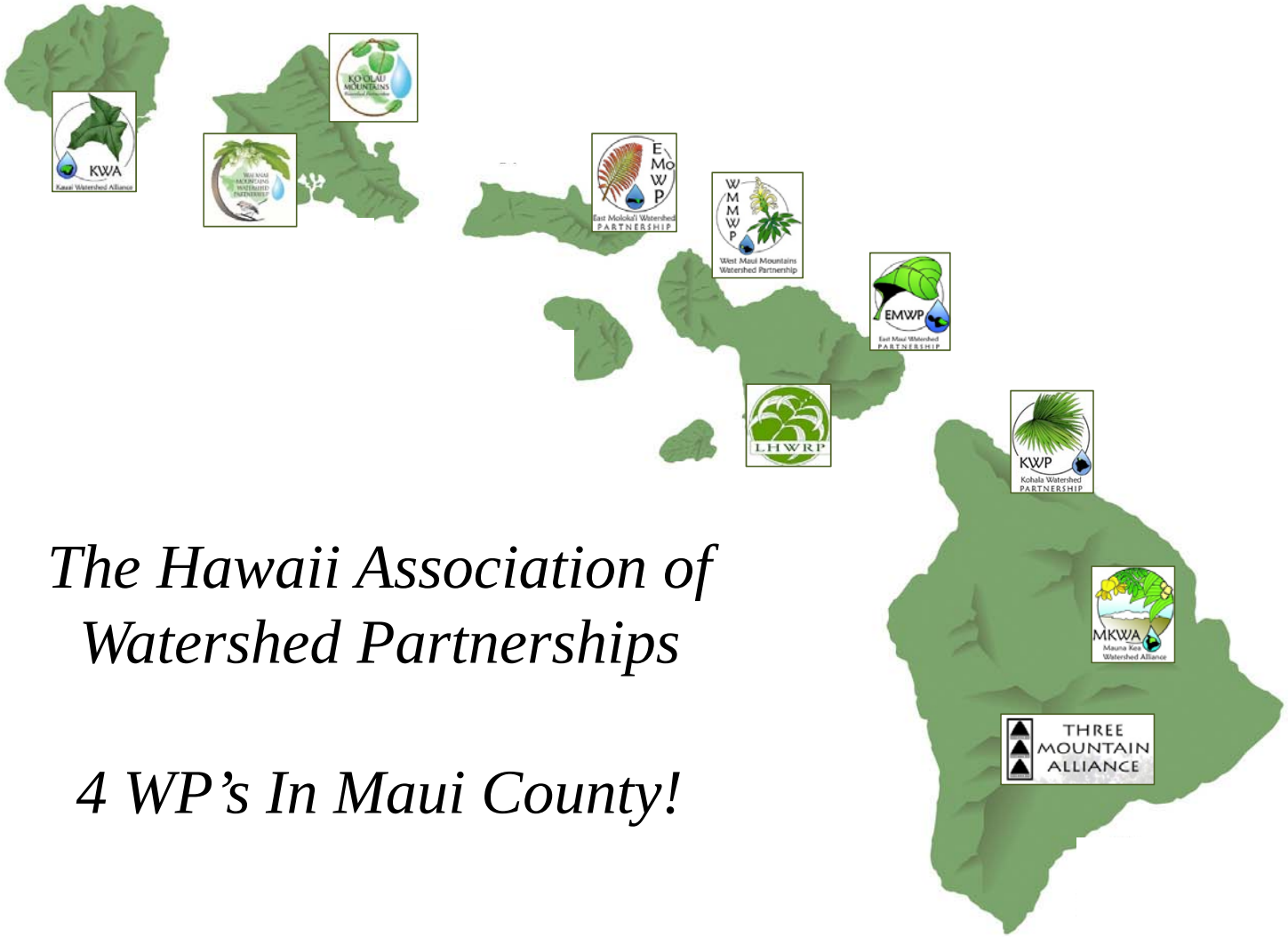


% of WMMWP Business in FY 18 ~ $ 956,000



FY19 Additions


KAHIAU

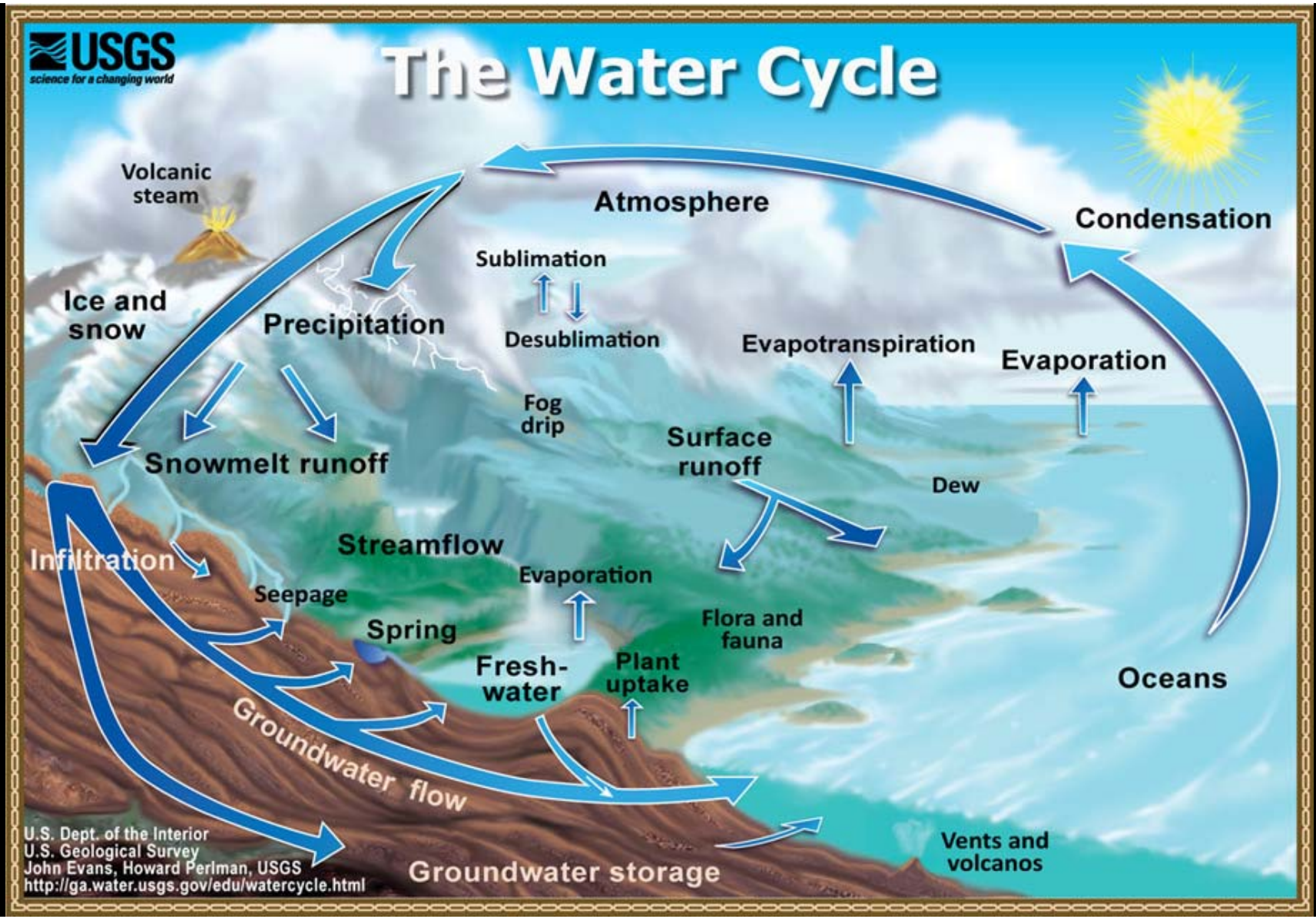


The Hawaii Association of Watershed Partnerships

4 WP's In Maui County!

Legislative Outreach

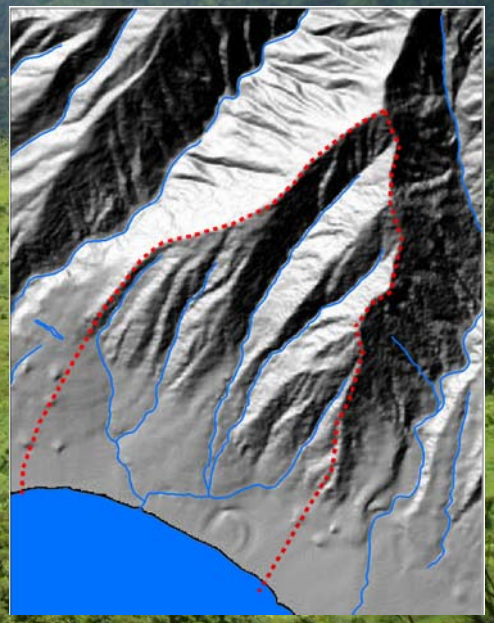
Field Crew

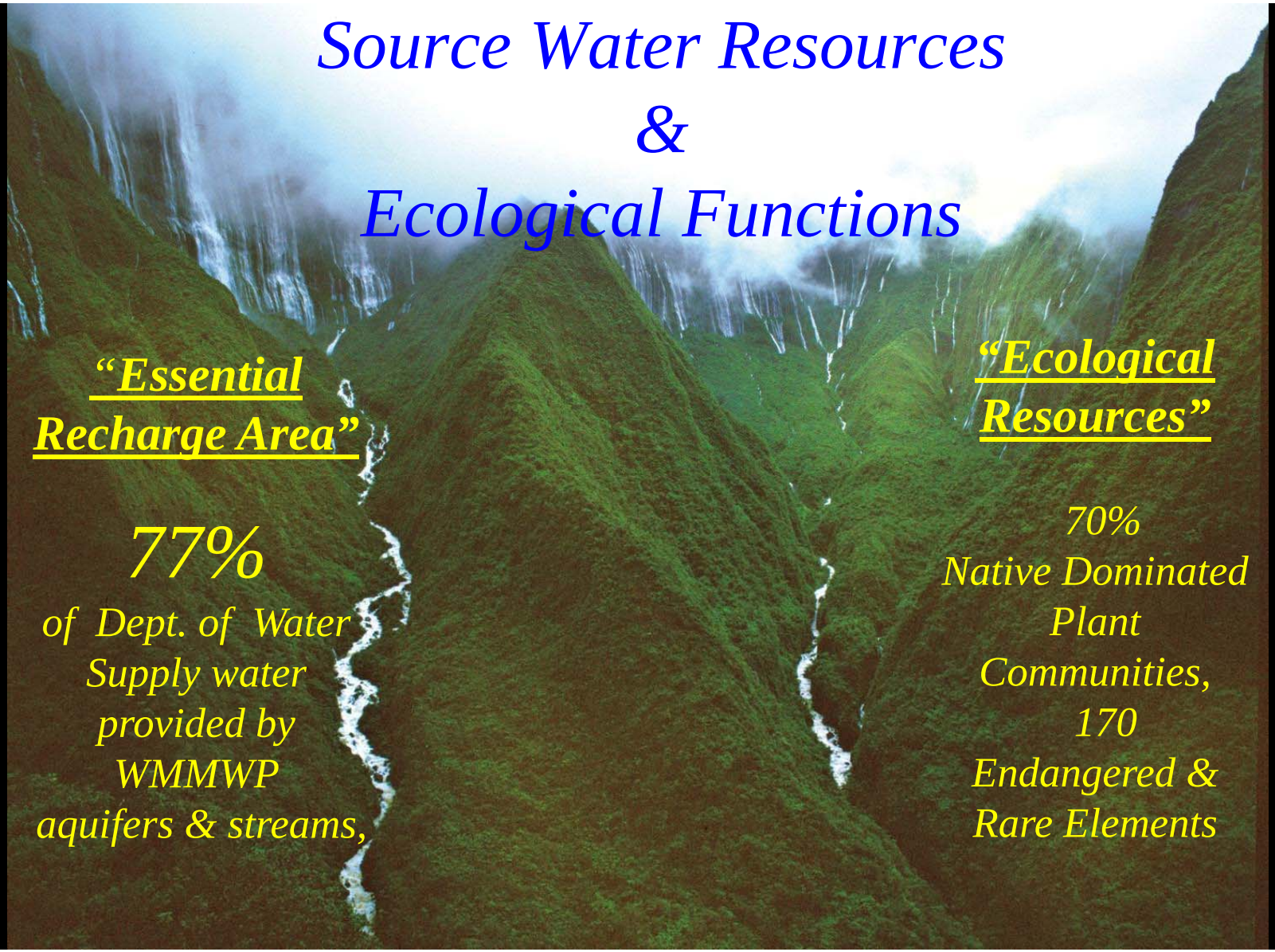

USGS
science for a changing world
The Water Cycle
Volcanic steam
Atmosphere
Condensation
Sublimation
Ice and snow
Precipitation
Desublimation
Evapotranspiration
Evaporation
Fog drip
Surface runoff
Snowmelt runoff
Dew
Streamflow
Infiltration
Evaporation
Seepage
Flora and fauna
Spring
Fresh-water
Plant uptake
Oceans
Groundwater flow
Vents and volcanos
Groundwater storage
U.S. Dept. of the Interior
U.S. Geological Survey
John Evans, Howard Perlman, USGS
http://ga.water.usgs.gov/edu/watercycle.html

WHAT IS A WATERSHED?

John Wesley Powell (Geographer/Scientist):

"that area of land, a bounded hydrologic system, within which all living things are inextricably linked by their common water course and where, as humans settled, simple logic demanded that they become part of a community."





Source Water Resources & Ecological Functions

"Essential Recharge Area"

77%

of Dept. of Water Supply water provided by WMMWP aquifers & streams,

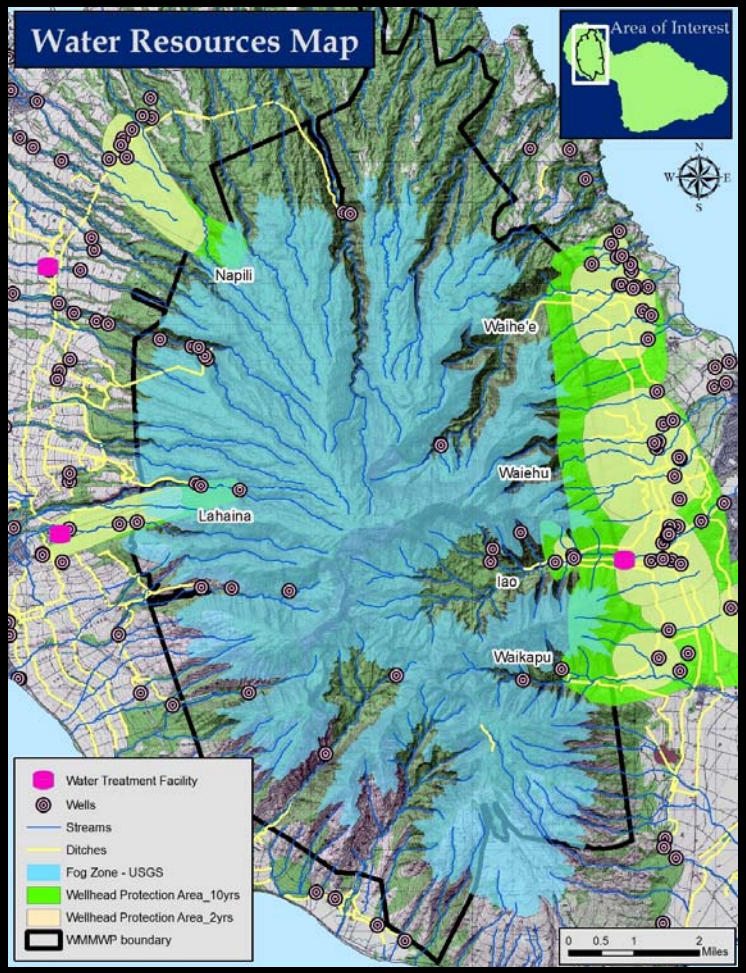
"Ecological Resources"

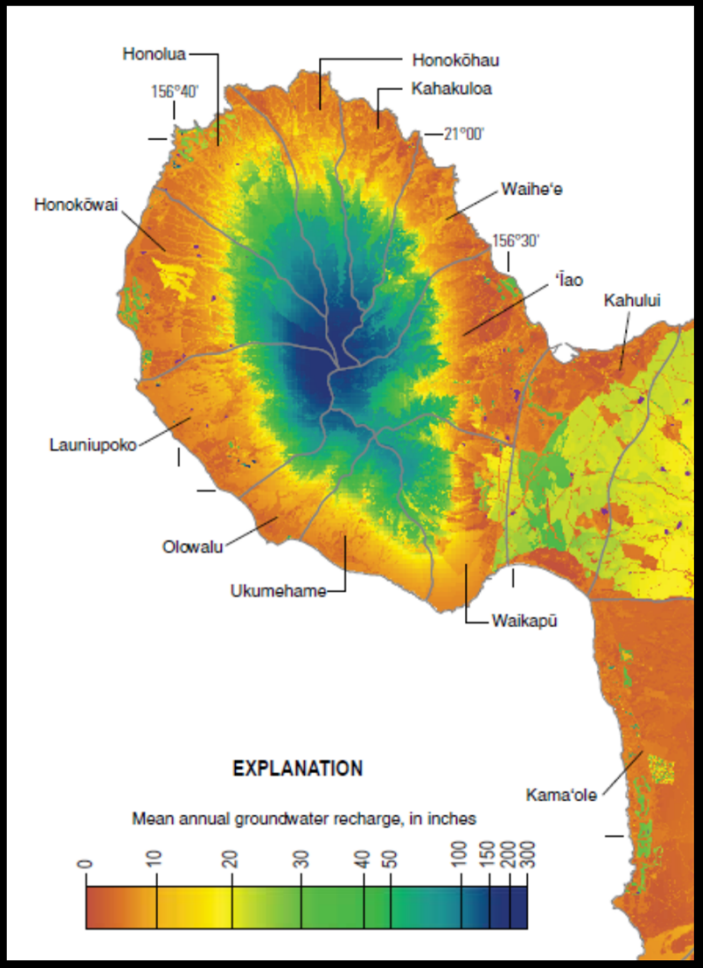
70% Native Dominated Plant Communities, 170 Endangered & Rare Elements


A Native Hawaiian forest can collect up to 30% MORE water just by fog and cloud drip ALONE!

Water collects and flows . . .

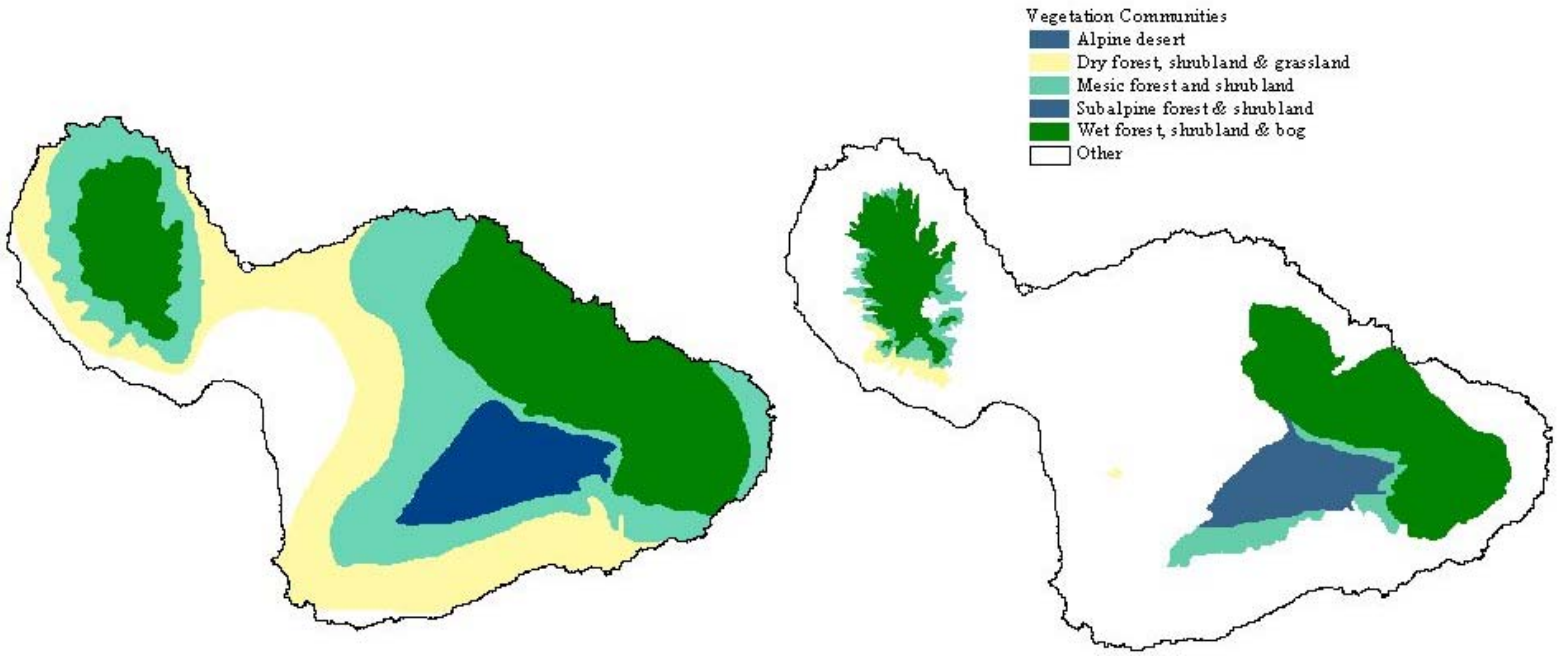
Priority Water Recharge Area





Average annual recharge from 1978-2007, USGS- Johnson et al.

Maui Vegetation Communities Before and After Human Habitation



BEFORE the arrival of the Polynesians about 400 A.D., pristine vegetation communities and ecosystems prevailed.

Today, AFTER 1500 years of human activity the native forests have been reduced dramatically.

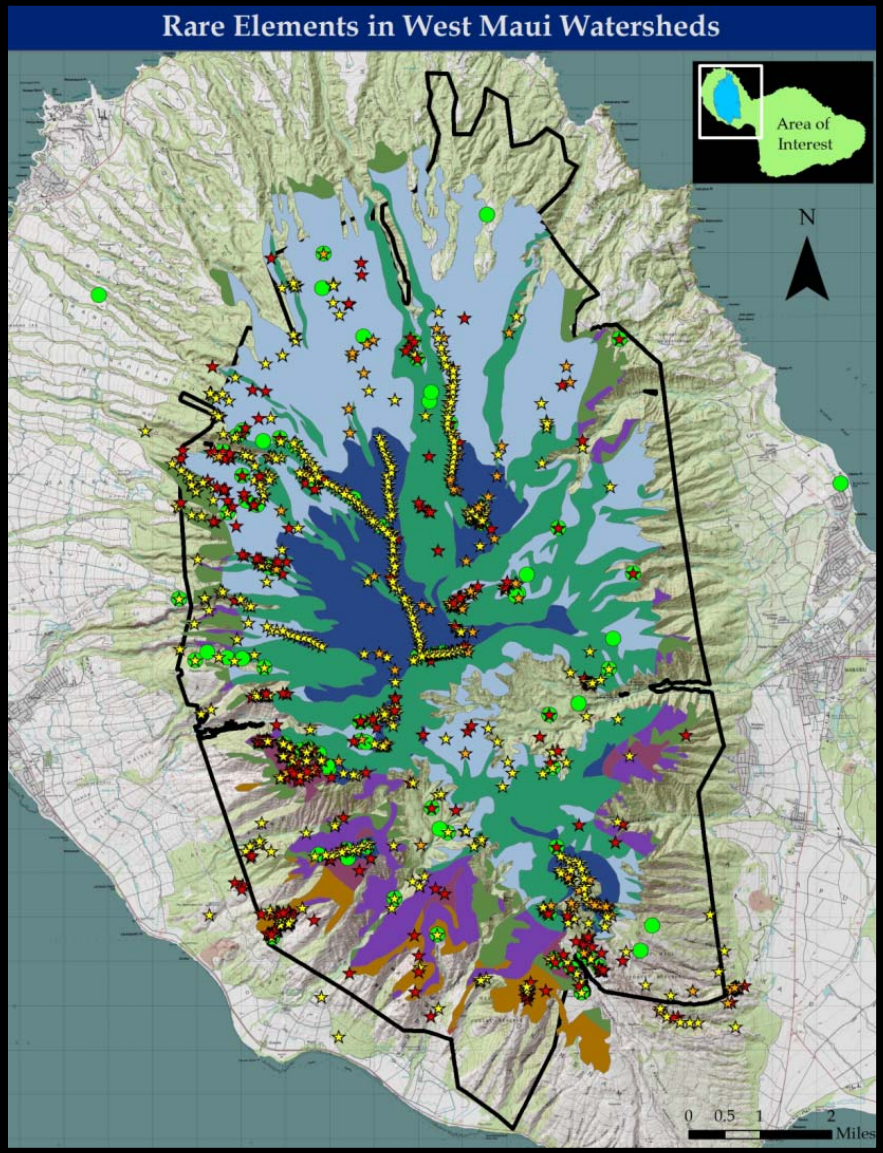
30 0 30 Kilometers

N
W E
S

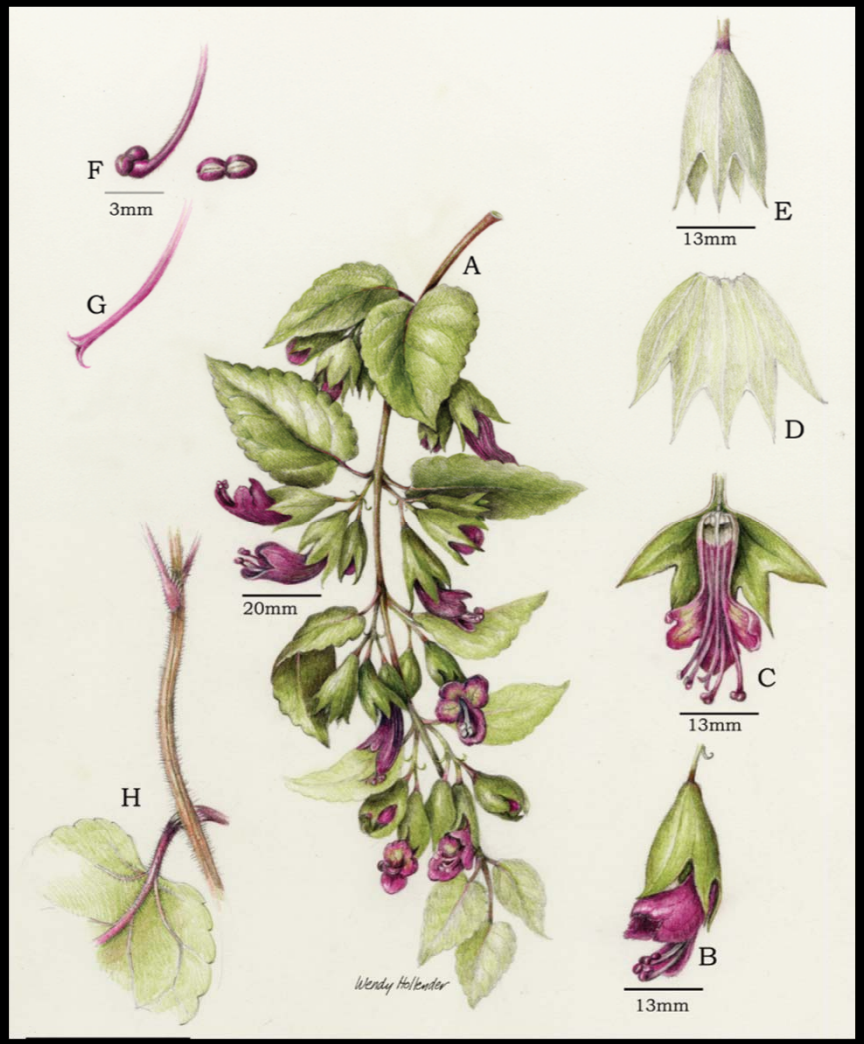
Robyn L. Myers
Graduate Group in Ecology
UC Davis, 1997

“Ecological Resources”

70%
Native Dominated Plant Communities
170
Endangered & Rare Elements
50%
Plant Critical Habitat:



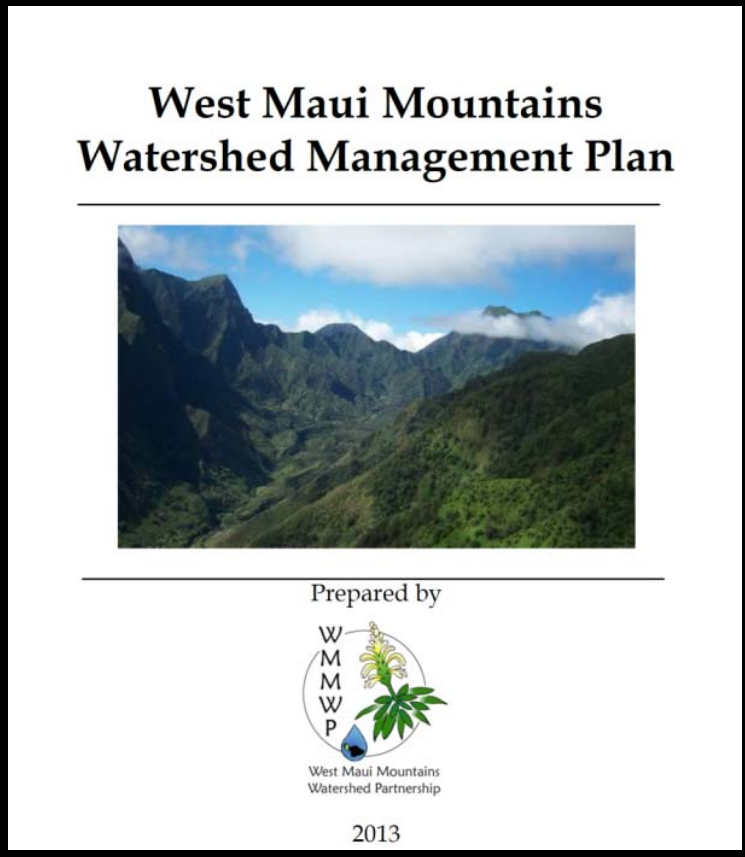
Stenogyne kauaulaensis



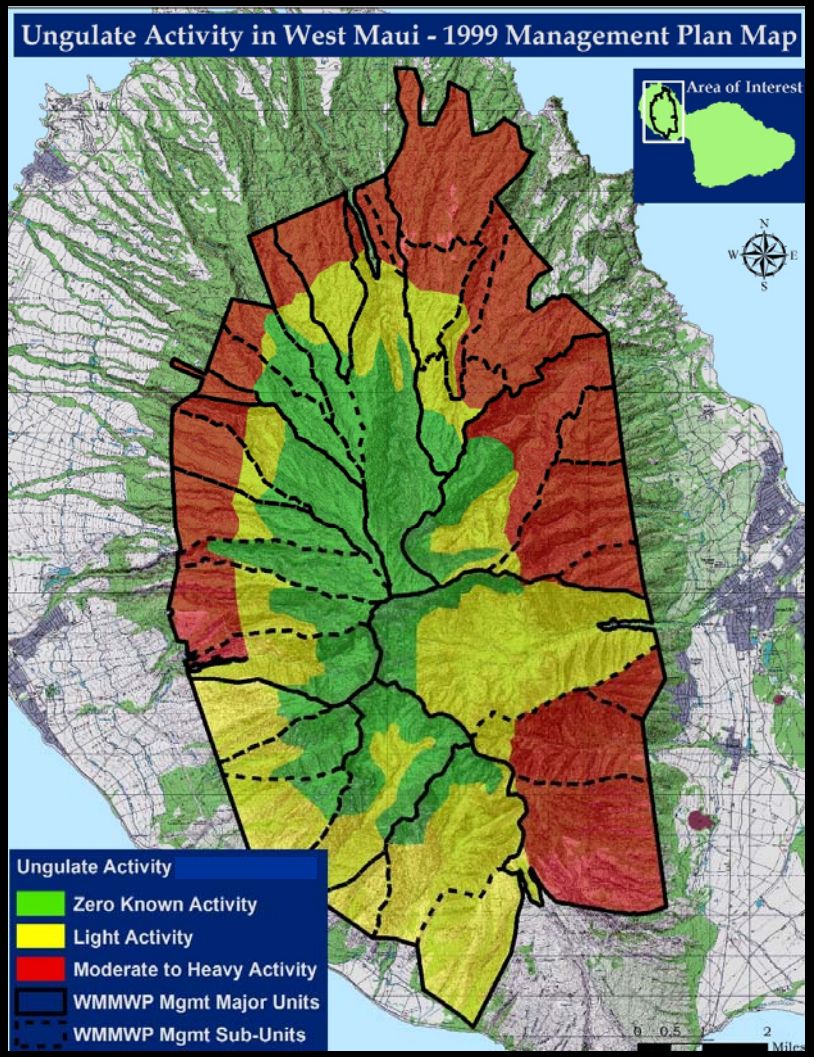

© WMMWP

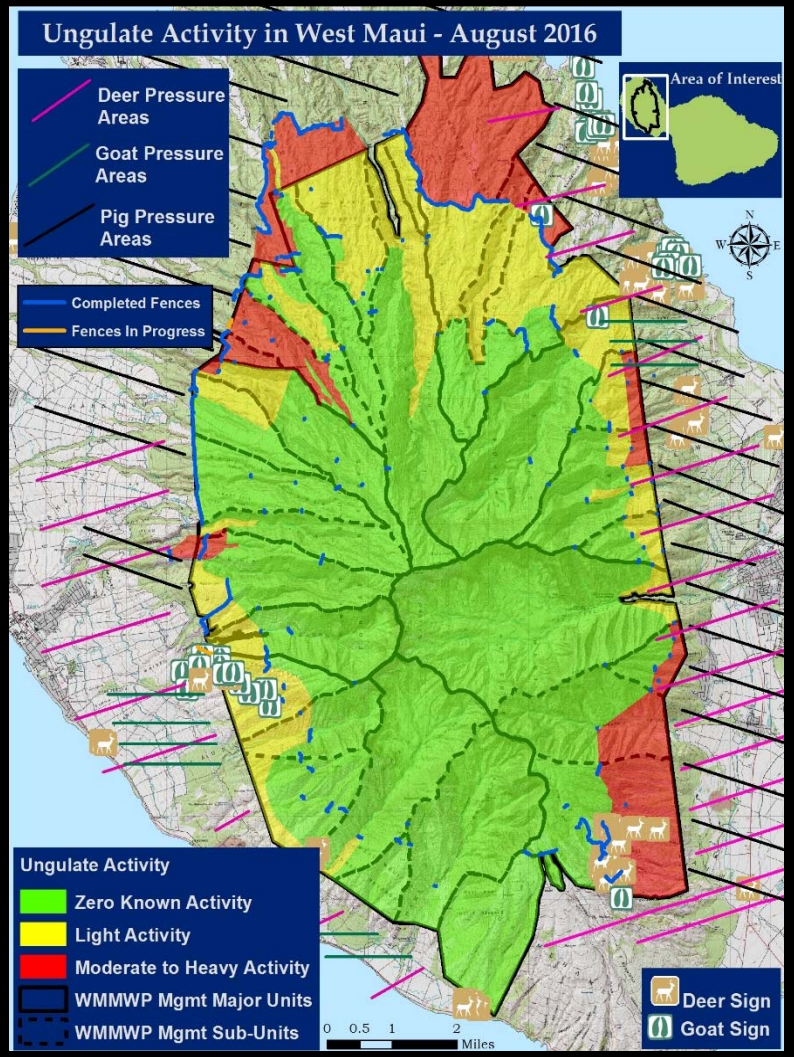
WMMWP Programs

1. *Invasive animal management*
2. *Invasive plant control*
3. *Human activities management*
4. *Wildfire management*
5. *Water and watershed monitoring*
6. *Protection of rare species & habitat*
7. *Public education and awareness*
8. *Watershed management coordination*



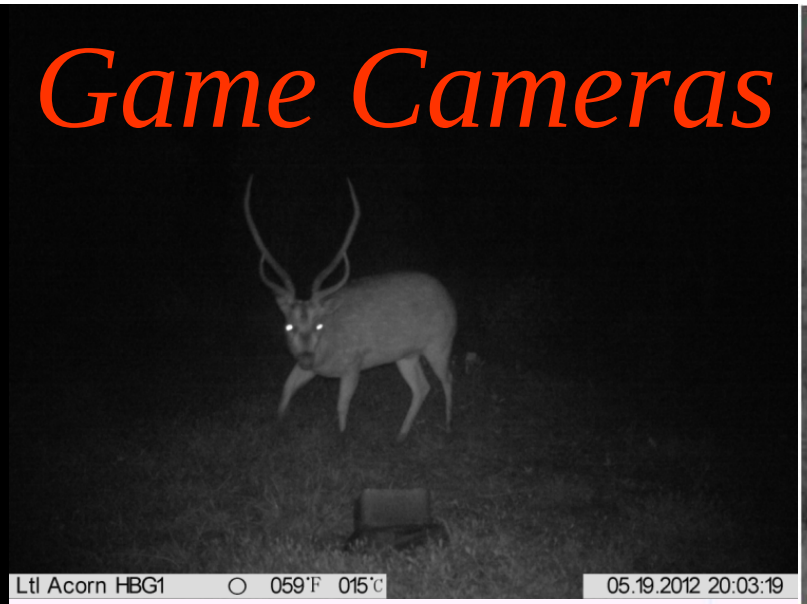
Feral Ungulates

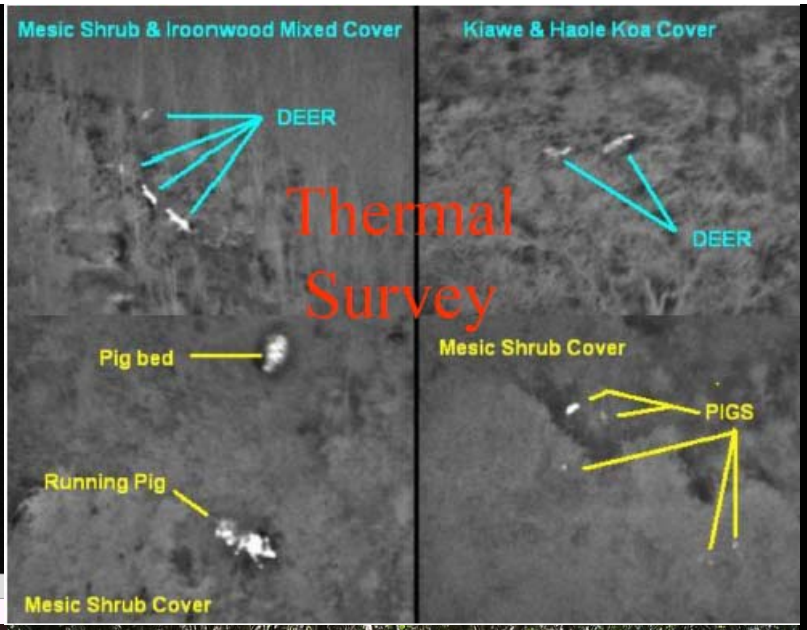




Heavy Activity *Little to Moderate* *Ungulate Free*

Game Cameras





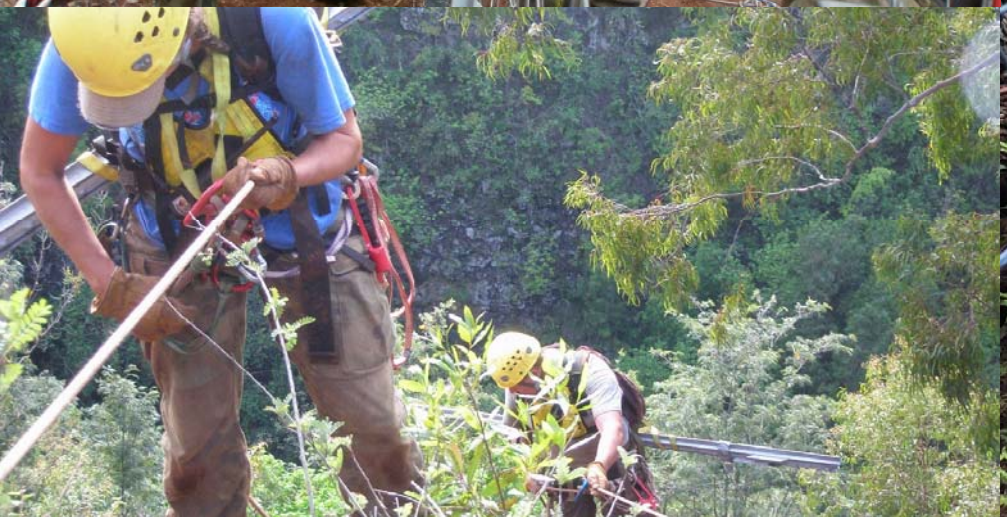
Pig Disturbance in Bogs & Streams

Sediment Transport to Streams & Ocean

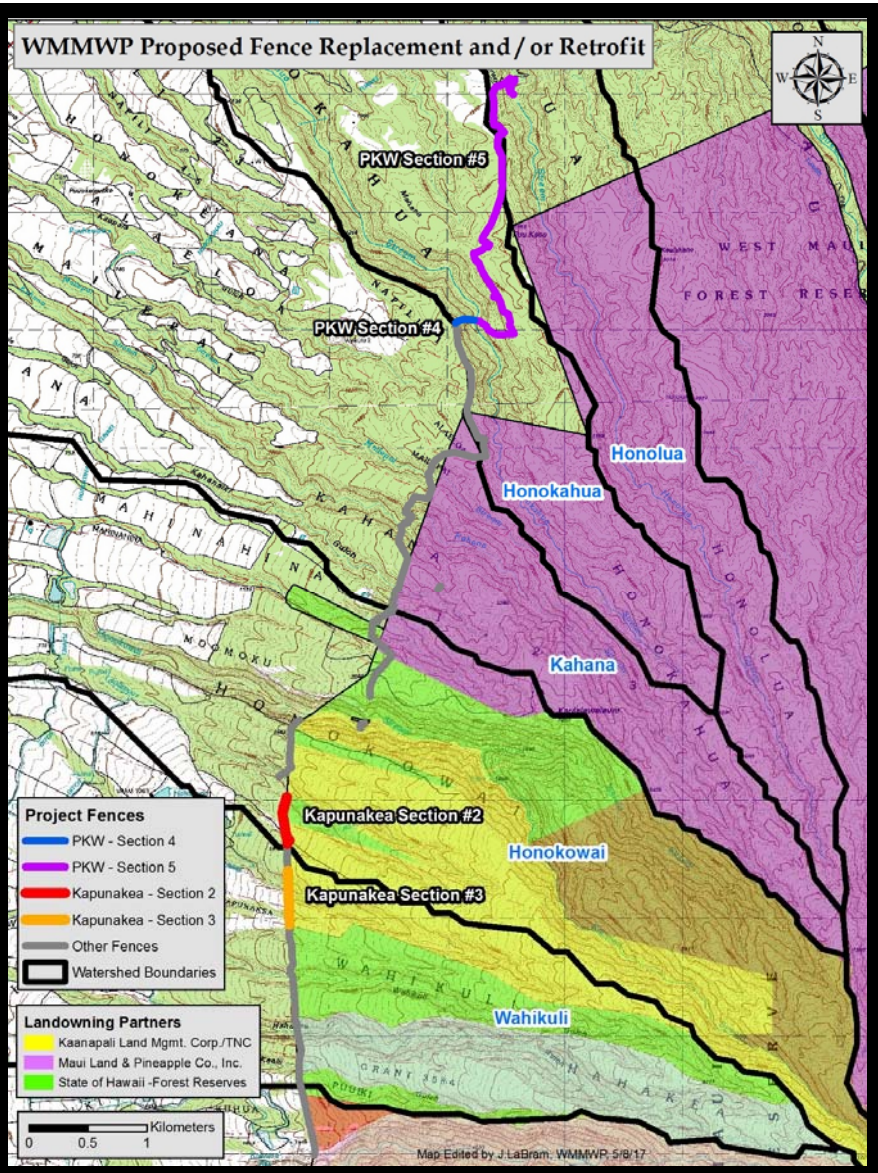
Photo Credits: Save Honolua Coalition

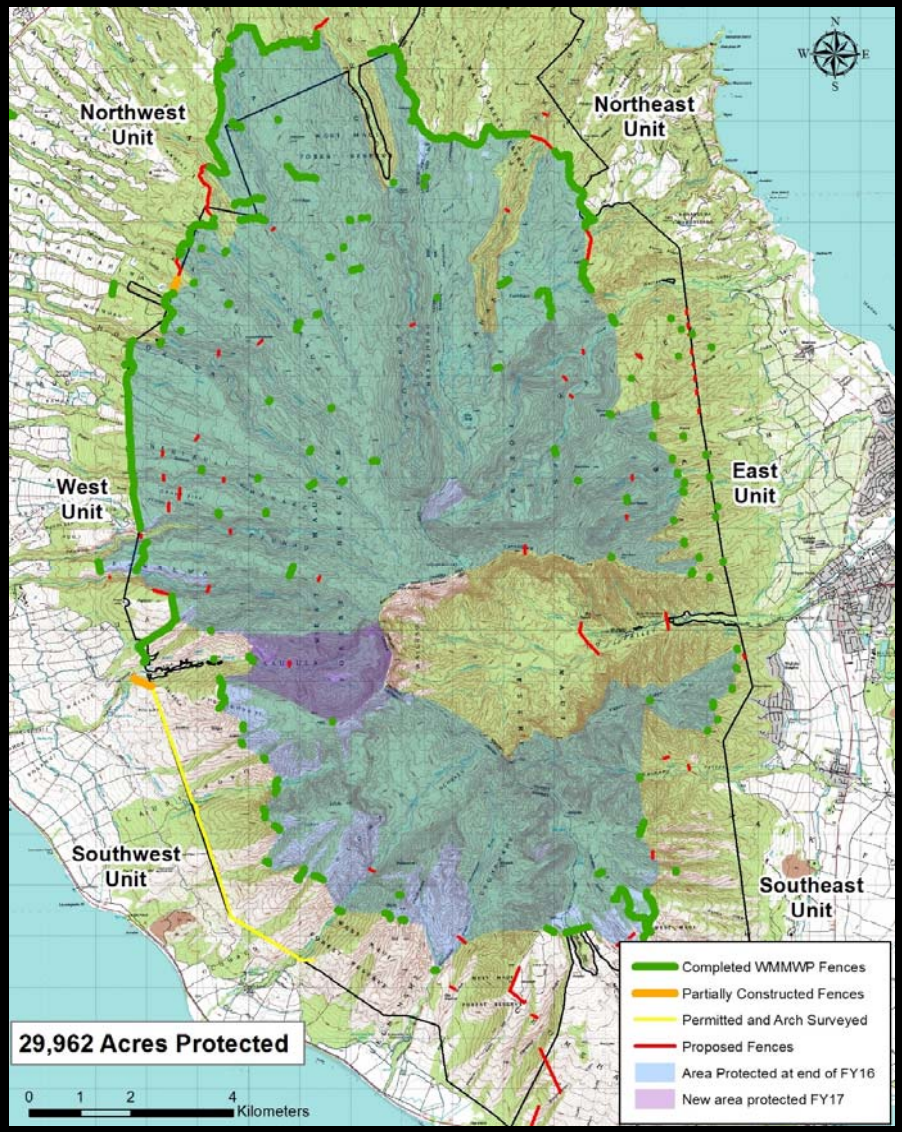
Solution:
Fencing clearly helps minimize the problem.

Stream Curtain



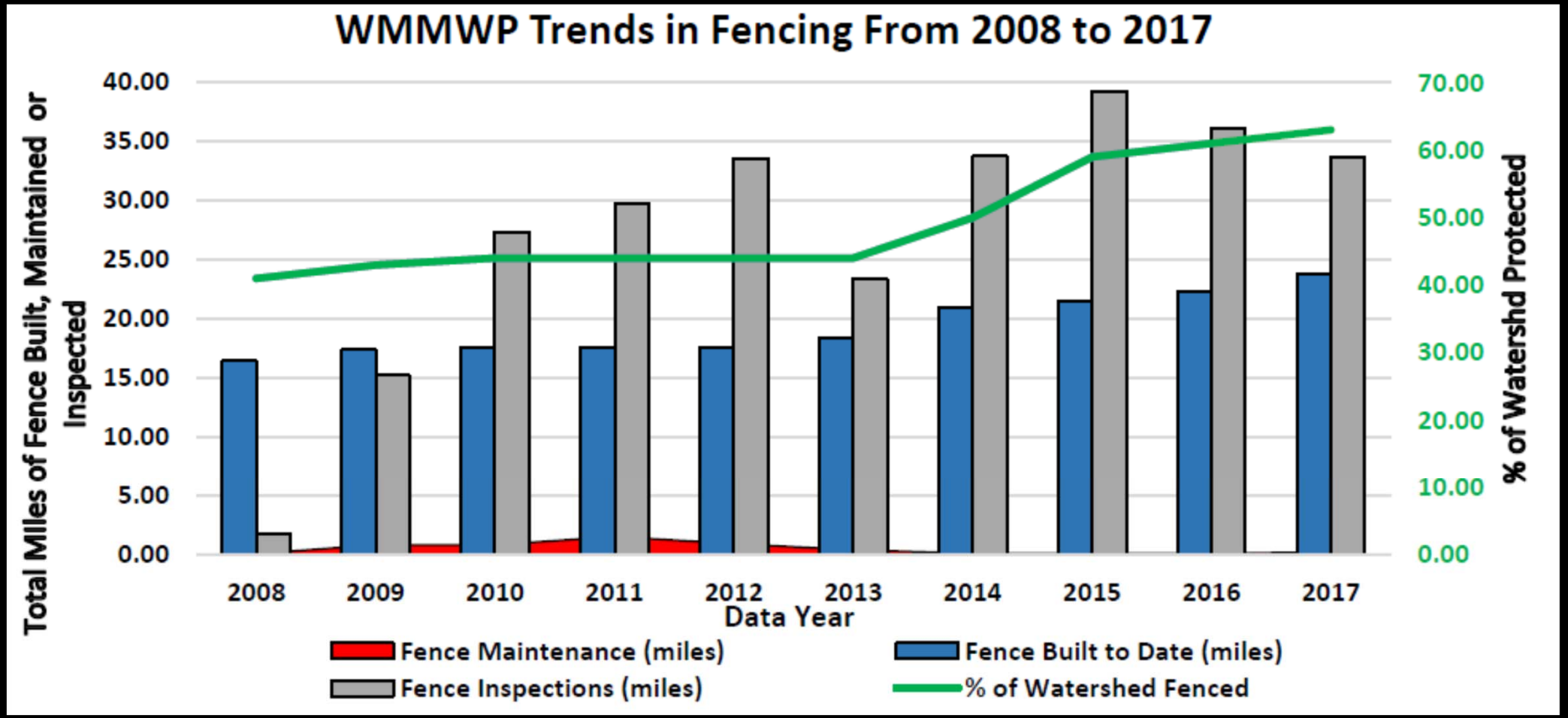
DOH funding 3 miles of Fences

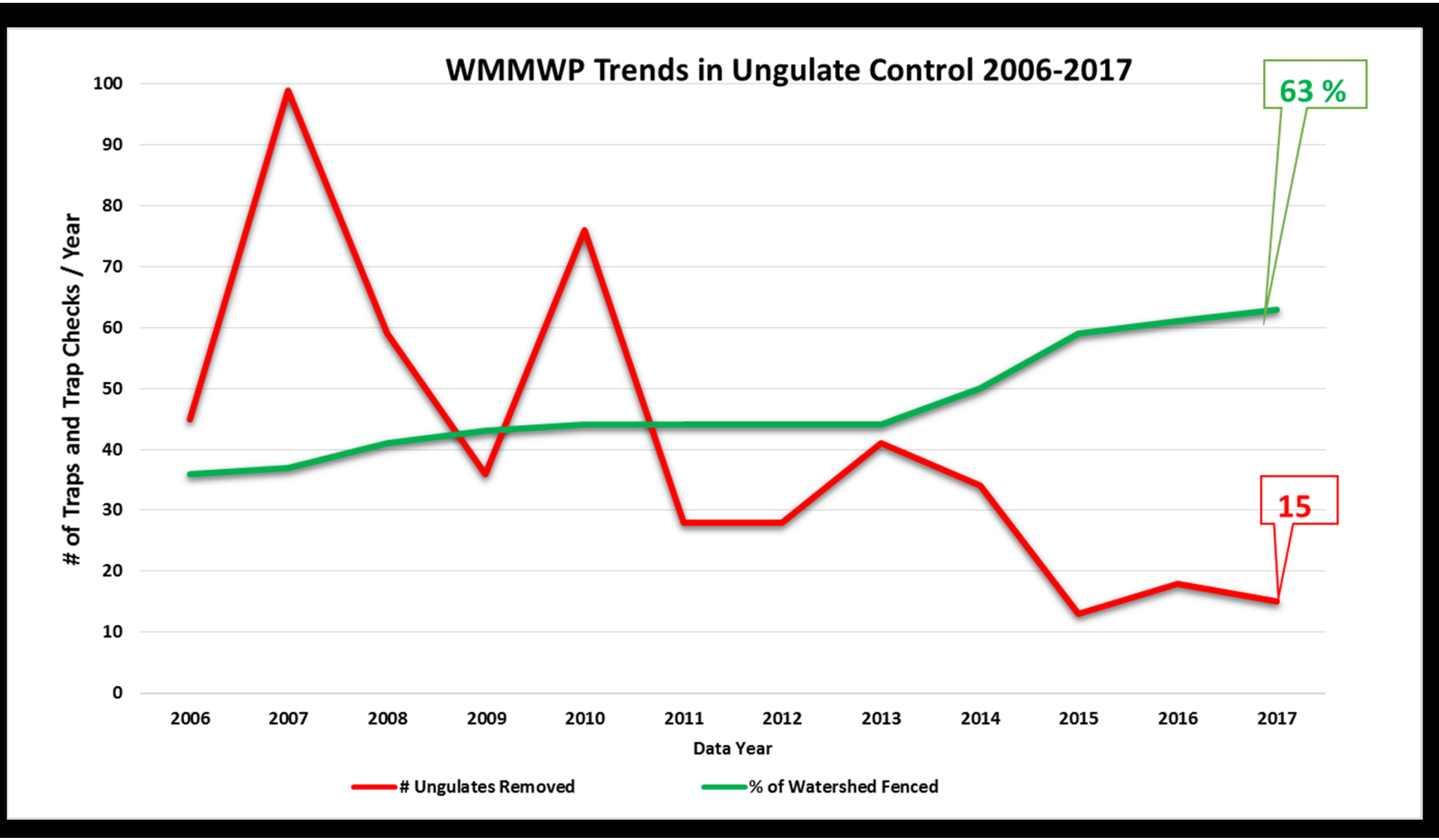


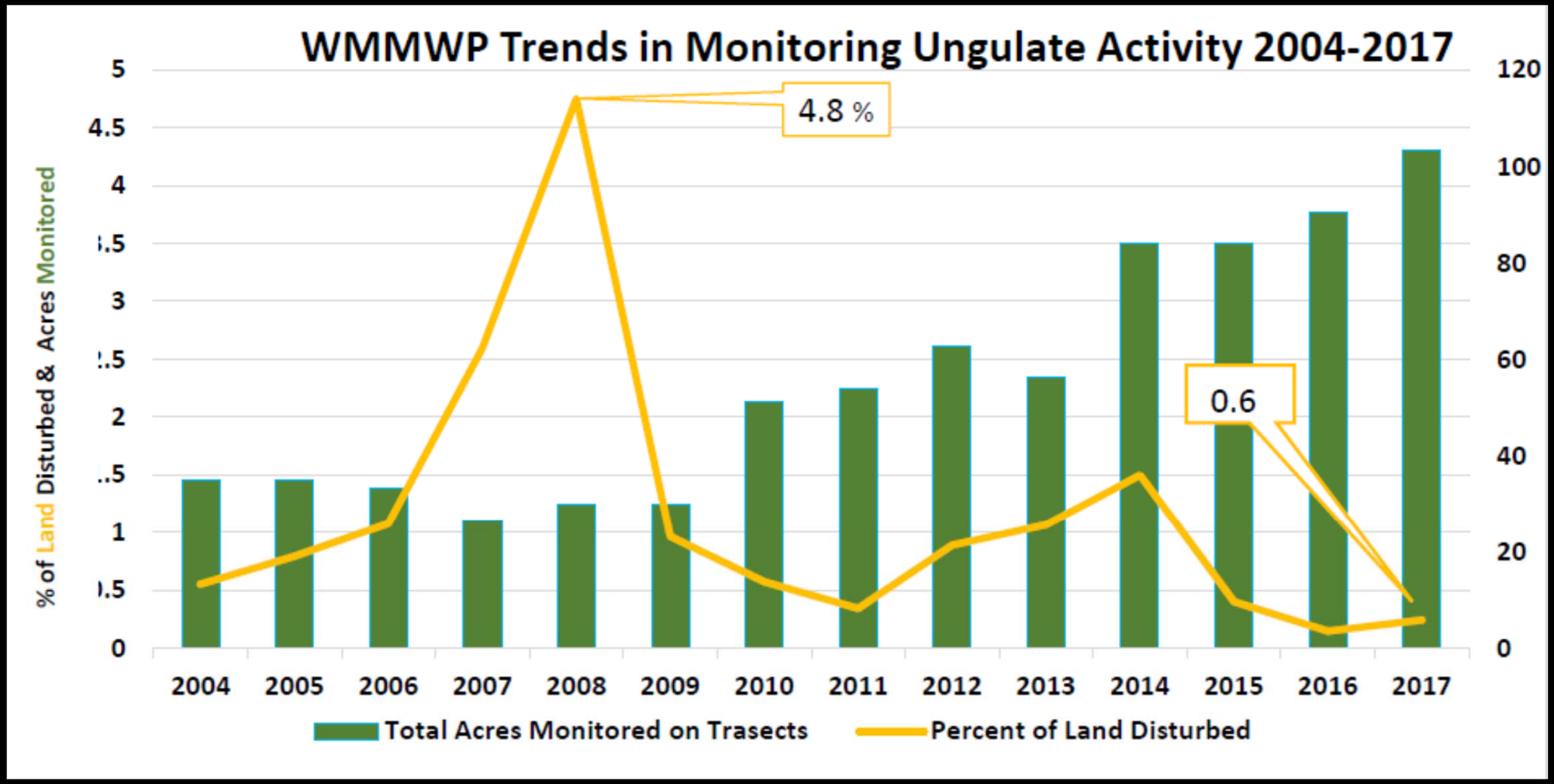


Fencing Accomplishments

- *22 miles to date*
- *29,962 acres fenced*
- *63.3% of WMMWP protected*

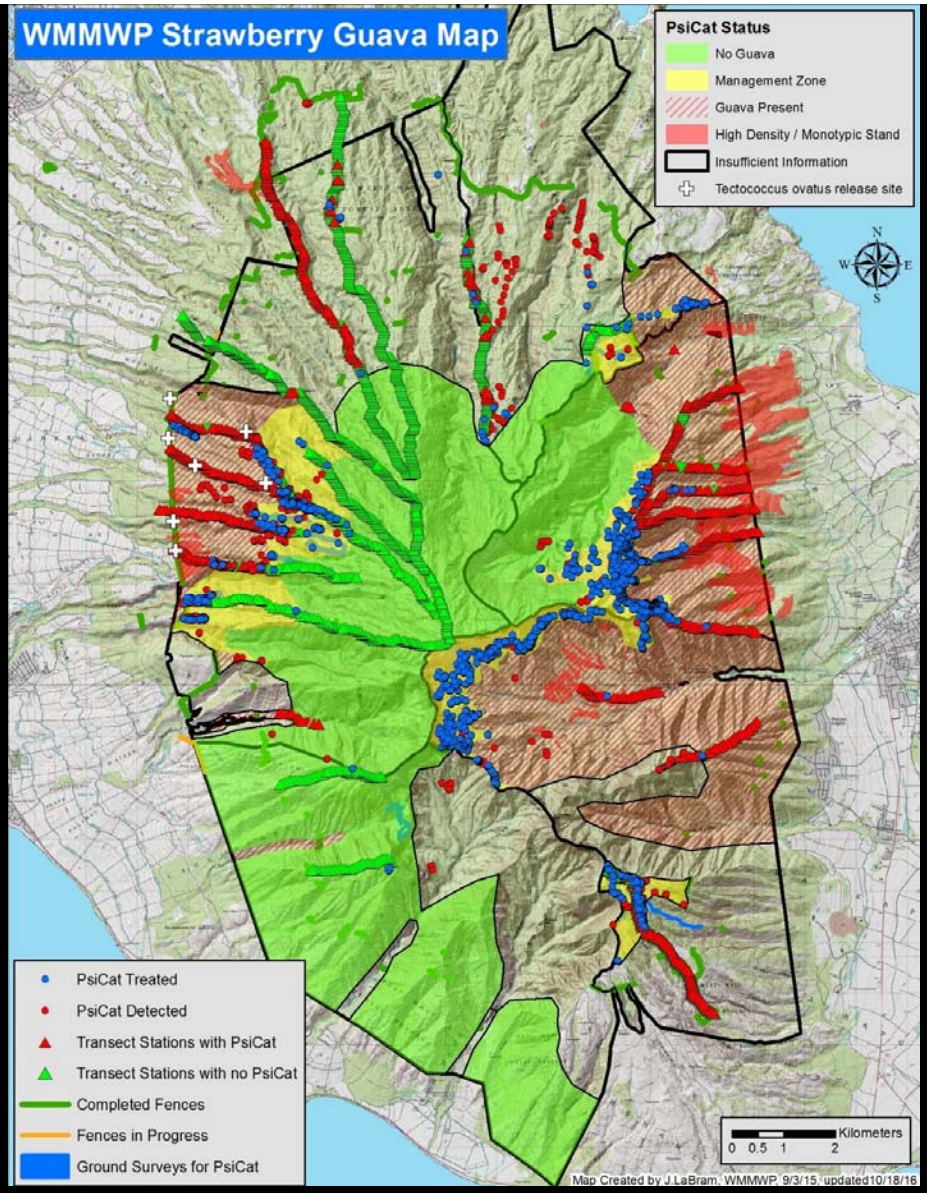

WMMWP Trends in Fencing From 2008 to 2017
Total Miles of Fence Built, Maintained or Inspected
% of Watershd Protected
40.00
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
Data Year
Fence Maintenance (miles)
Fence Built to Date (miles)
Fence Inspections (miles)
% of Watershed Fenced

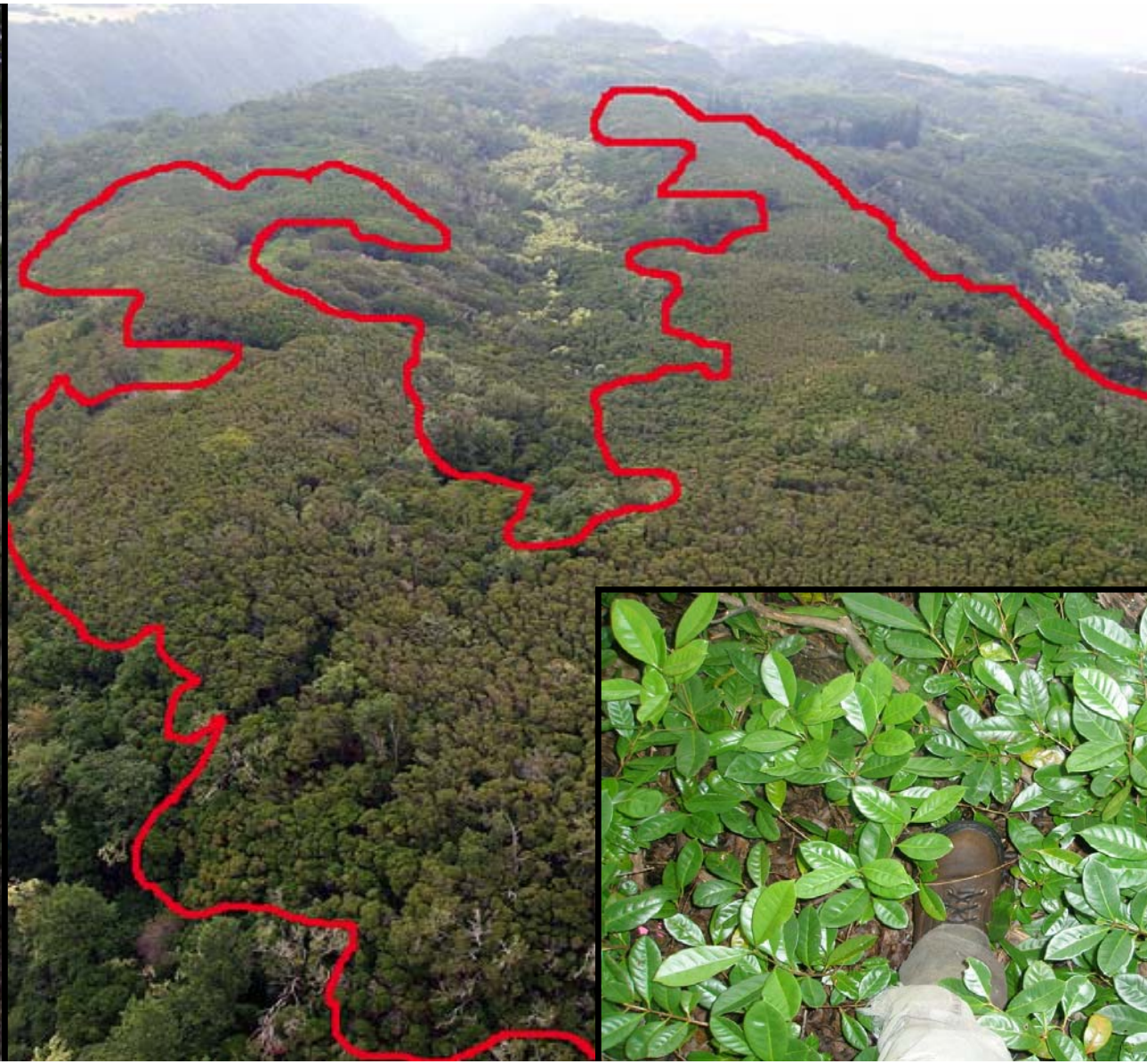

WMMWP Trends in Ungulate Control 2006-2017
63 %
15
# of Traps and Trap Checks / Year
100
90
80
70
60
50
40
30
20
10
0
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
Data Year
Ungulates Removed
% of Watershed Fenced


WMMWP Trends in Monitoring Ungulate Activity 2004-2017
% of Land Disturbed & Acres Monitored
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
120
100
80
60
40
20
0
4.8 %
0.6
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
Total Acres Monitored on Trasects
Percent of Land Disturbed

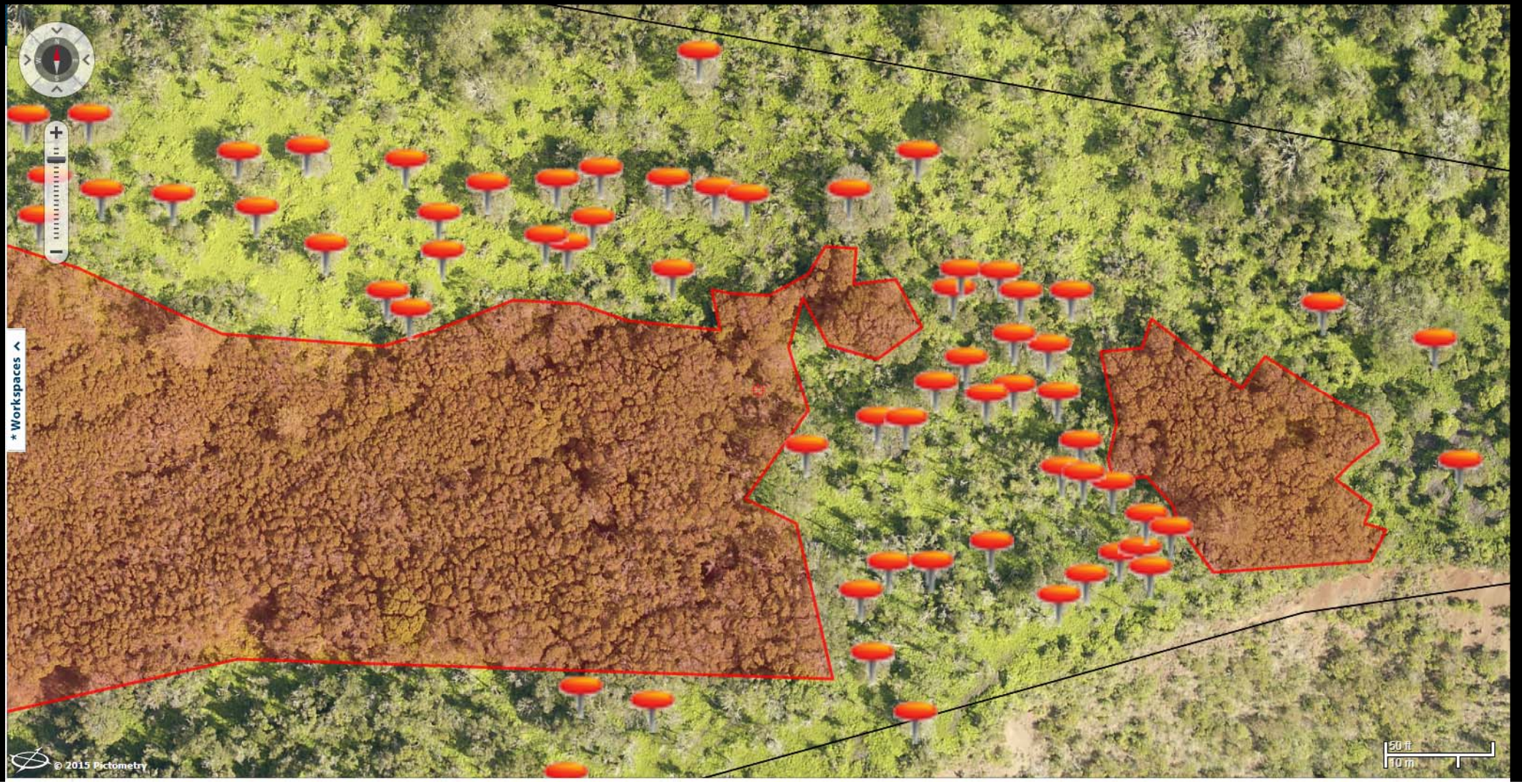
Strawberry Guava

- *Water Hog*
- *4,076 acres managed*
  - *Ground control*
  - *Aerial via HBT*
  - *Biological control*
  - *Public Involvement*





Pictometry Mapping




©WMMWP

HBT - Aerial Control

Ground Control

Biological Control = Tectococcus ovatus

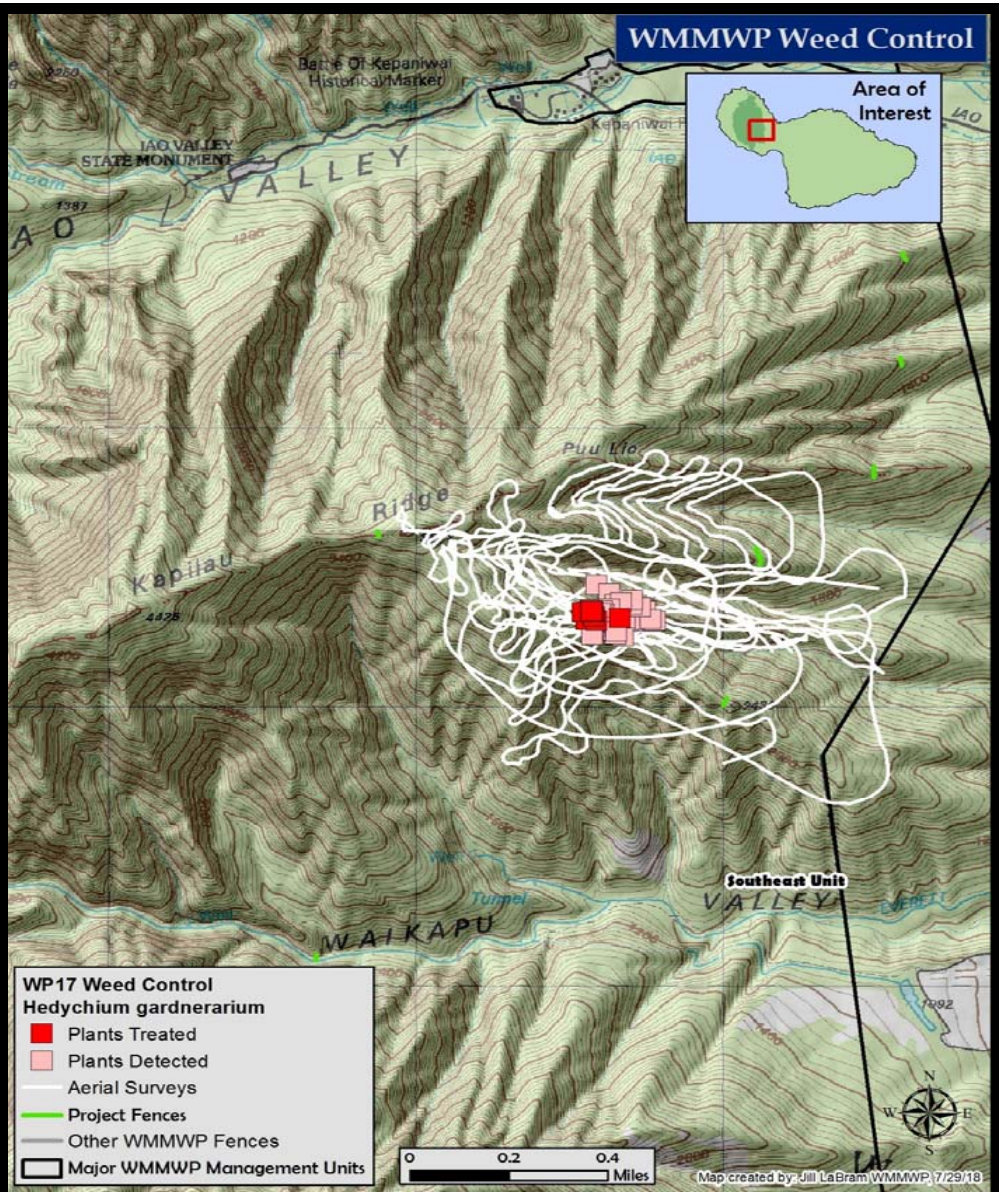
Spread of Tectococcus ovatus

Toilet Brush Ginger

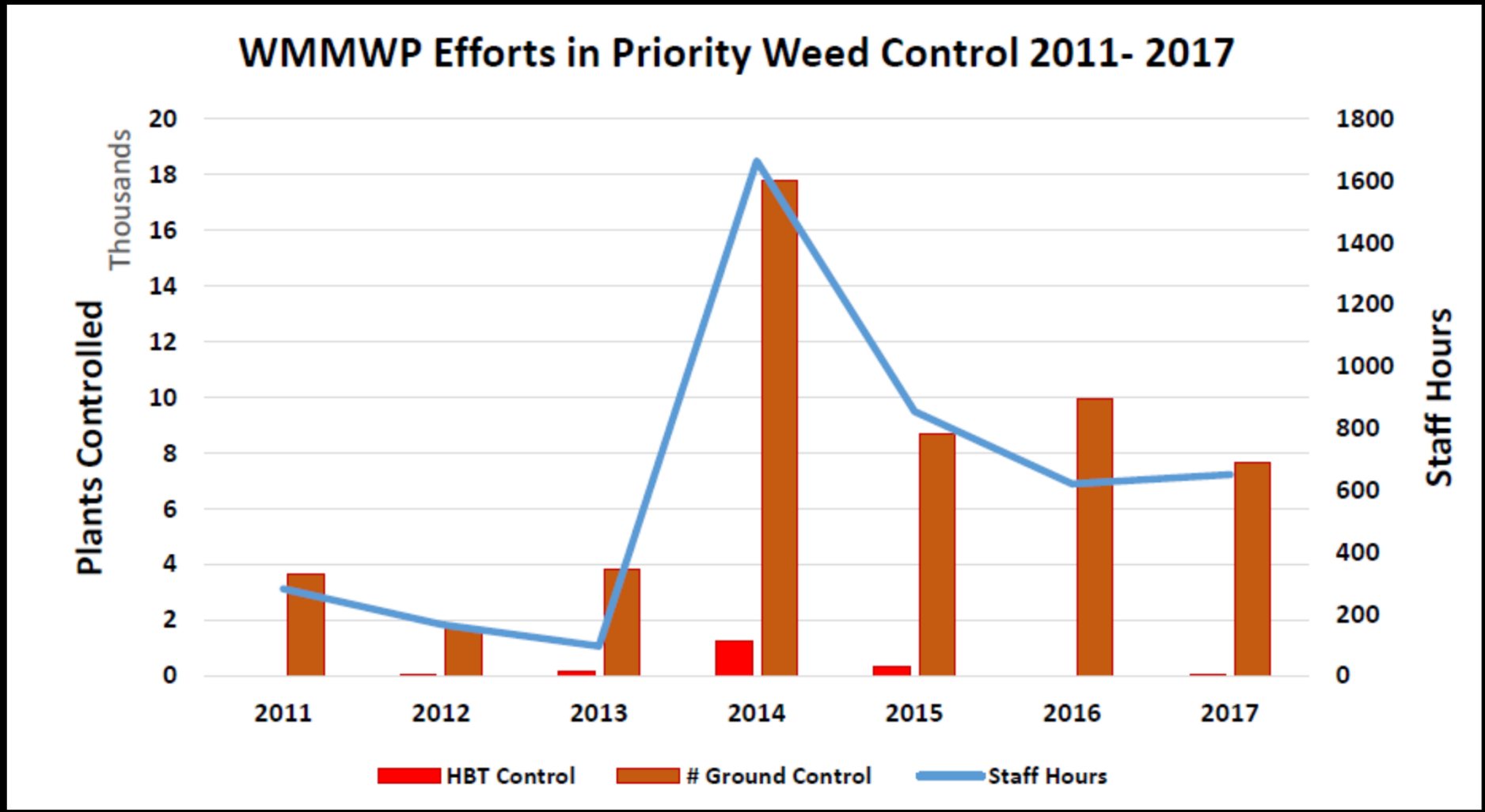
Hedychium gardnerianum

Toilet brush Ginger

Hedychium gardnerianum



Weed Control Effort = 10 trees / hr.



RAPID ʻŌHIʻA DEATH

WHAT YOU CAN DO TO HELP PREVENT THE SPREAD

Artwork by Laurie Swaige

5 THINGS YOU CAN DO

1 DON'T MOVE ʻŌHIʻA

Do not move ʻōhiʻa wood, firewood or posts, especially from an area known to have ROD. If you don't know where the wood is from, don't move it.

2 DON'T TRANSPORT ʻŌHIʻA INTER-ISLAND

Comply with the new quarantine rule to help prevent ROD from spreading. Don't move ʻōhiʻa plants, wood, or other ʻōhiʻa plant parts interisland without a permit.

3 CLEAN YOUR TOOLS

Use only these proven cleaning methods—other methods have been tested and they don't kill the fungus. Tools used for cutting ʻōhiʻa trees (especially infected ones) should be cleaned with 70% rubbing alcohol or 10% bleach (if using bleach be sure to oil afterwards to prevent corrosion).

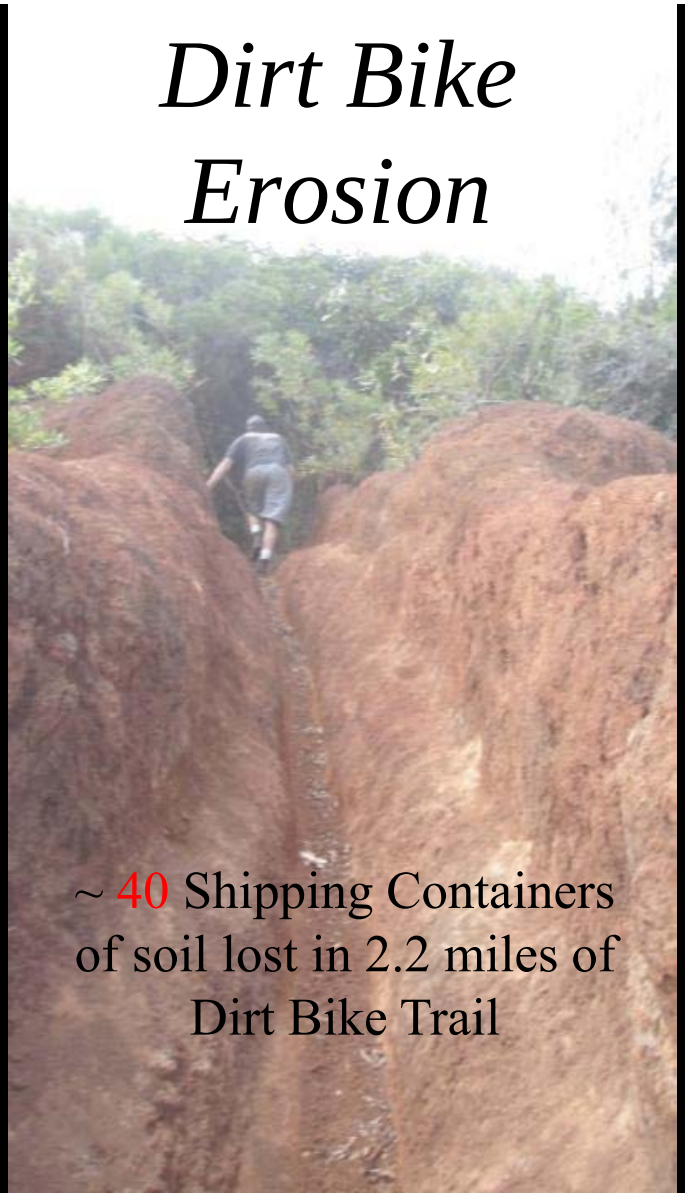
4 CLEAN YOUR GEAR

Clean your shoes, and clothing. Decontaminate shoes by dipping the soles in 10% bleach or 70% rubbing alcohol to kill the ROD fungus. Other gear can be sprayed with the same proven cleaning solutions. Wash clothing in hot water and detergent.

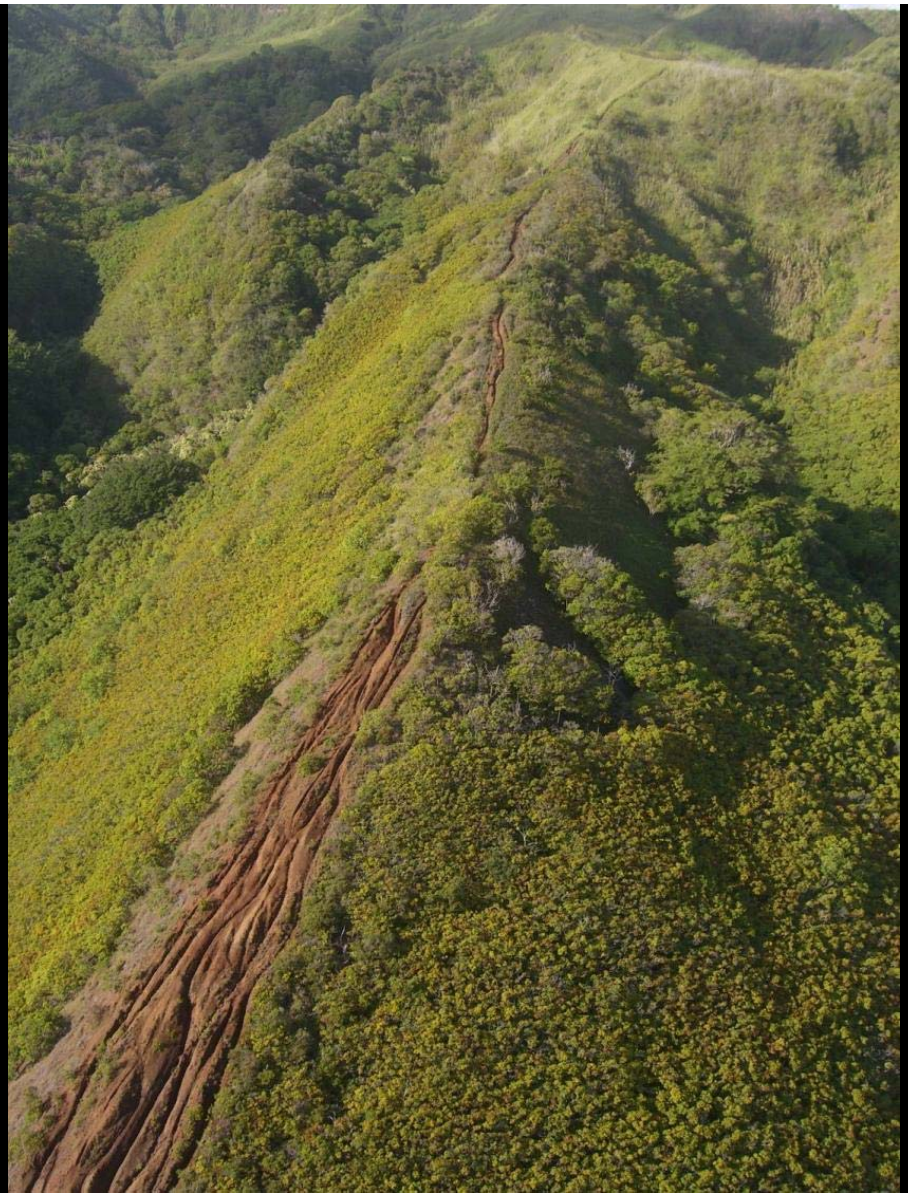
5 WASH YOUR VEHICLE

Wash the tires and undercarriage of your vehicles with detergent especially after traveling from an area with ROD and/or if you have traveled off-road.

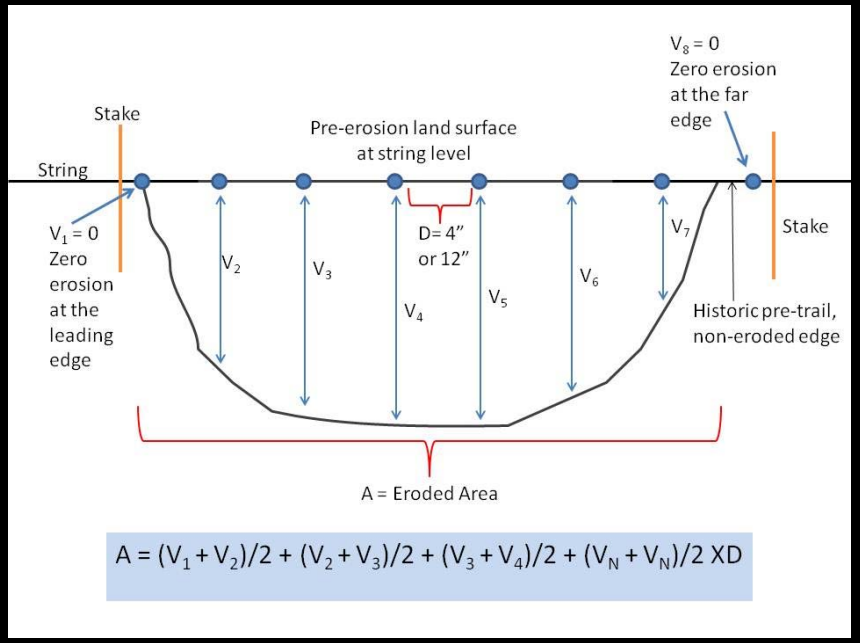
Dirt Bike Erosion



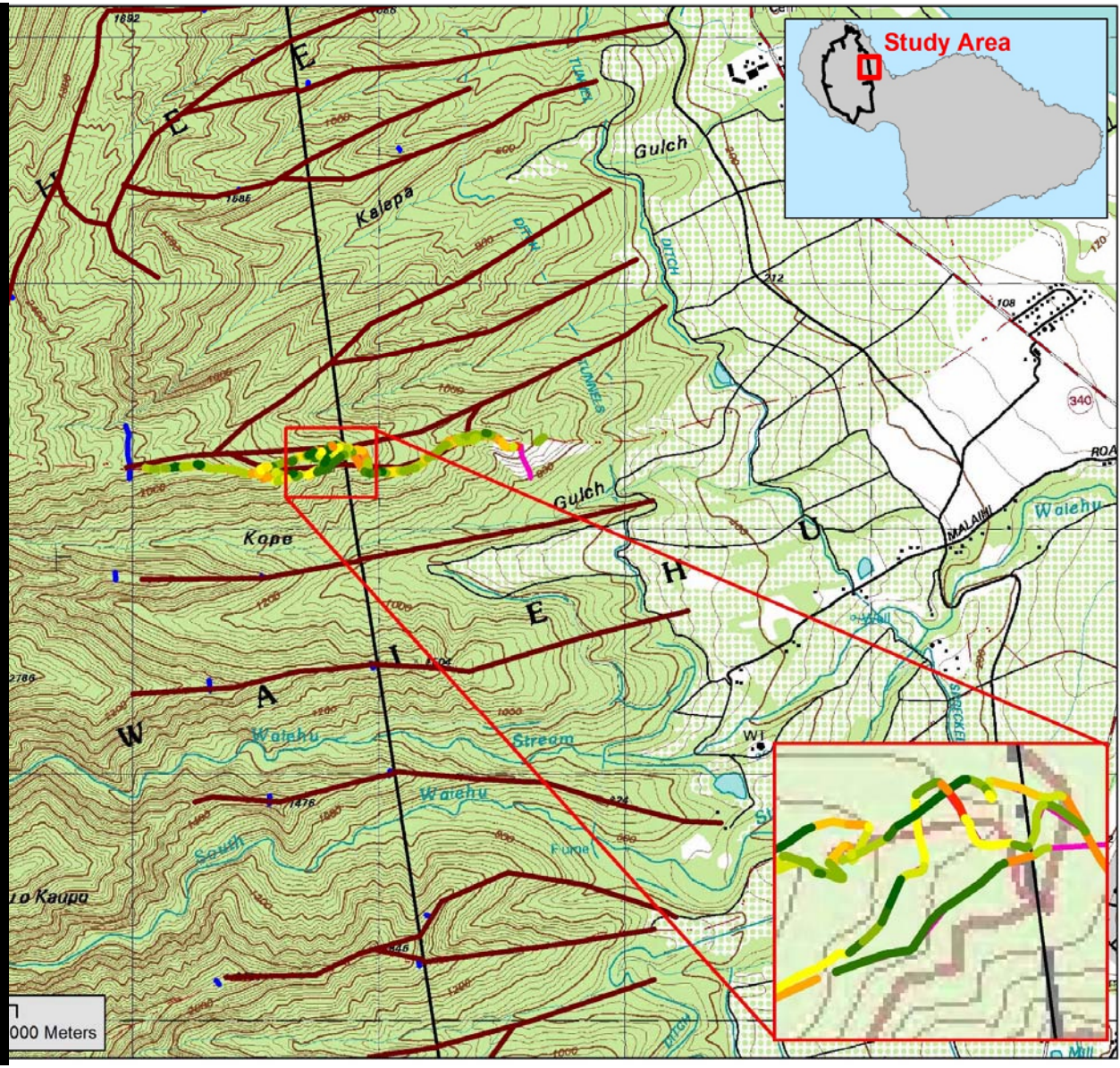
~ 40 Shipping Containers of soil lost in 2.2 miles of Dirt Bike Trail



Dirt Bike Erosion



5.8 million cubic feet of soil per mile



Dirt Bike Barriers

‘It’s not a pretty picture’

Out-of-control brush fire burns 2,000 acres, closes highway

June 9, 2010

The Maui News

U.S. Drought Monitor

Hawaii

September 28, 2010

Valid 7 a.m. EST

Drought Conditions (Percent Area)

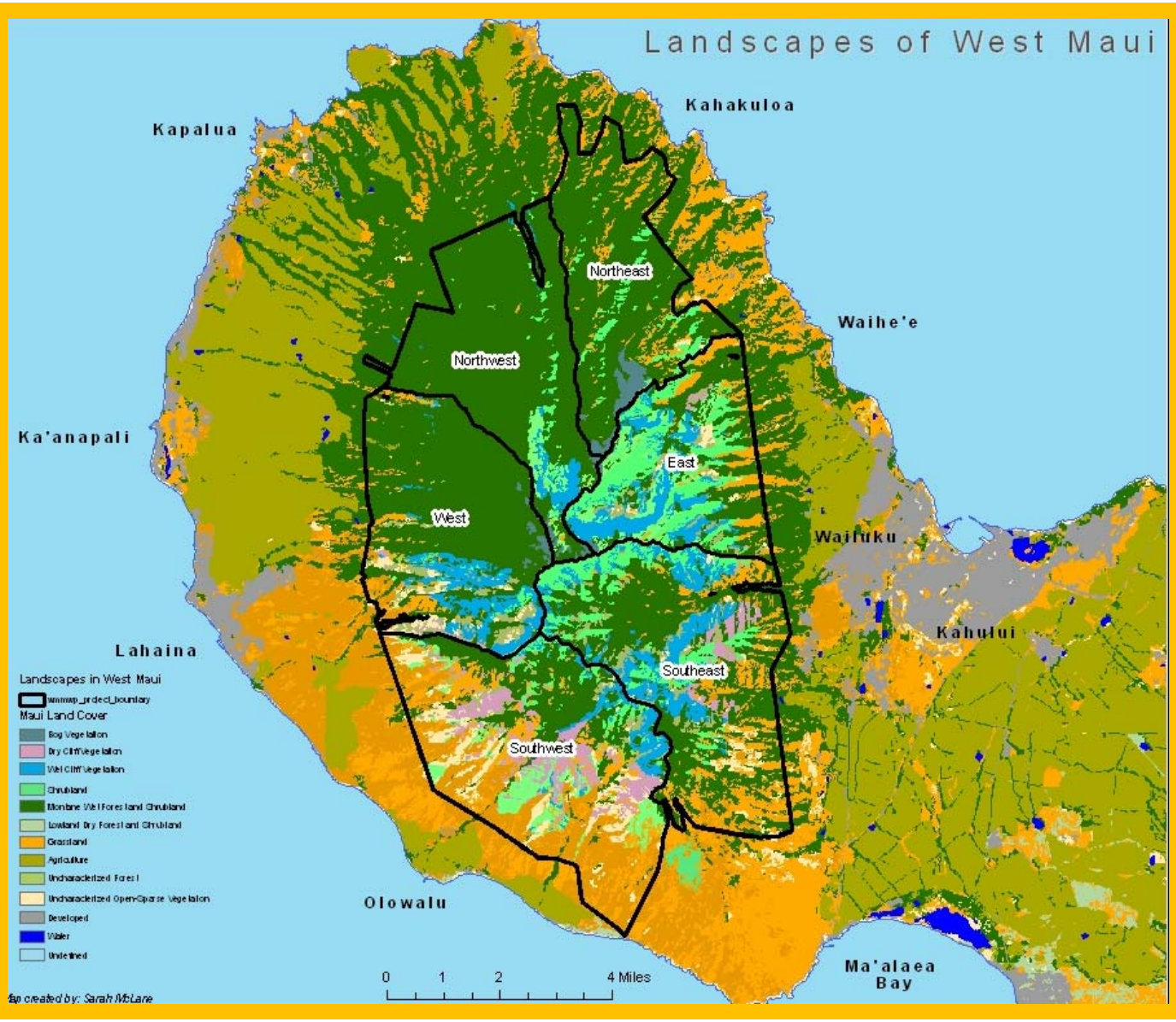
	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	2.2	97.8	73.9	46.8	31.5	5.1
Last Week (09/21/2010 map)	2.2	97.8	73.9	46.8	31.0	5.1
3 Months Ago (07/06/2010 map)	0.4	99.6	72.8	44.4	30.6	5.1
Start of Calendar Year (01/05/2010 map)	31.1	68.9	53.8	36.9	6.4	0.0
Start of Water Year (10/06/2009 map)	18.8	81.2	51.4	32.8	6.7	0.0
One Year Ago (09/29/2009 map)	18.8	81.2	51.4	32.8	6.7	0.0

Intensity:

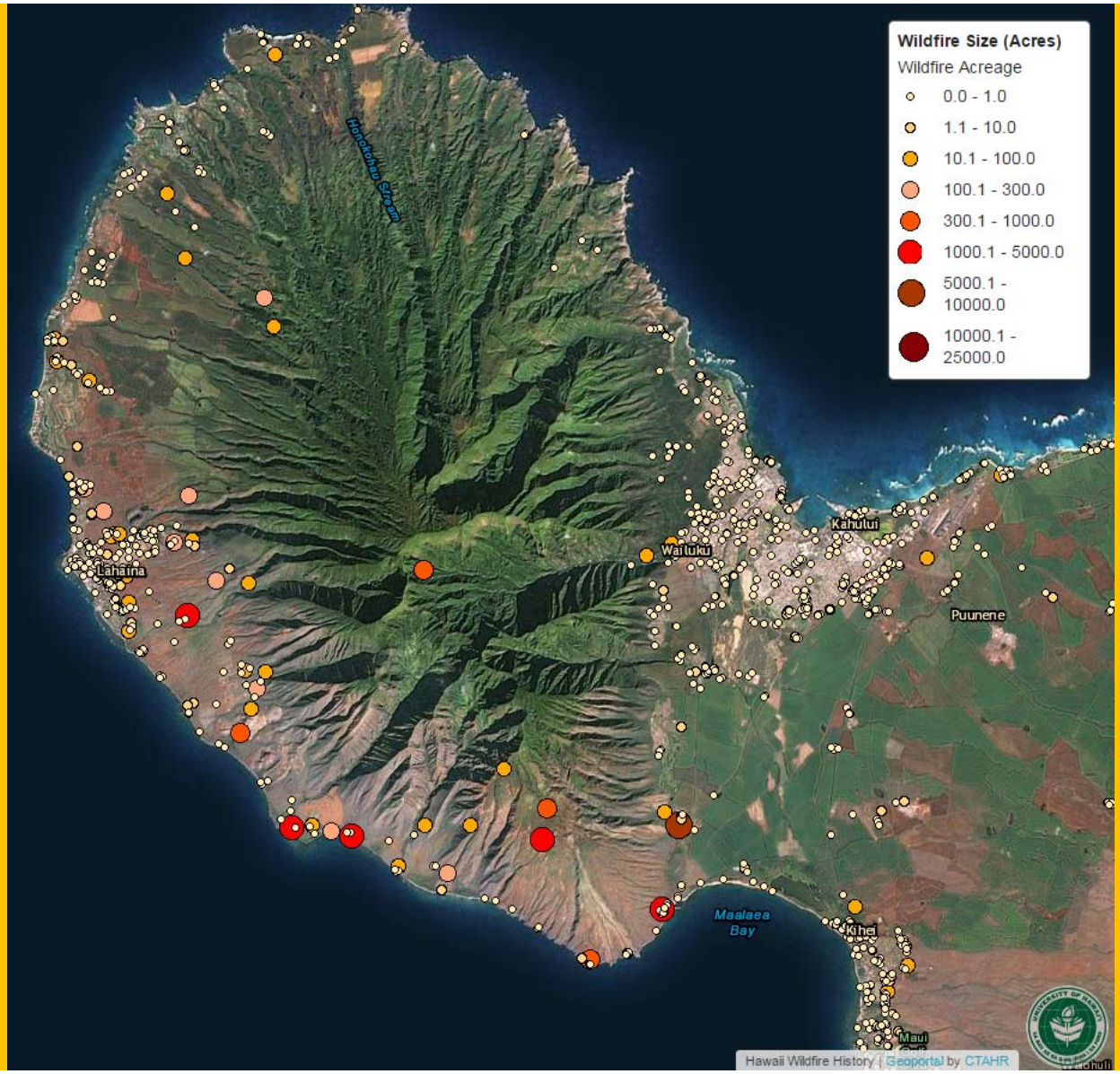
- D0 Abnormally Dry
- D1 Drought - Moderate
- D2 Drought - Severe
- D3 Drought - Extreme
- D4 Drought - Exceptional

USDA National Drought Mitigation Center

Climate
Defines
&
Changes
Vegetation



Fire Frequency & Size Could Increase



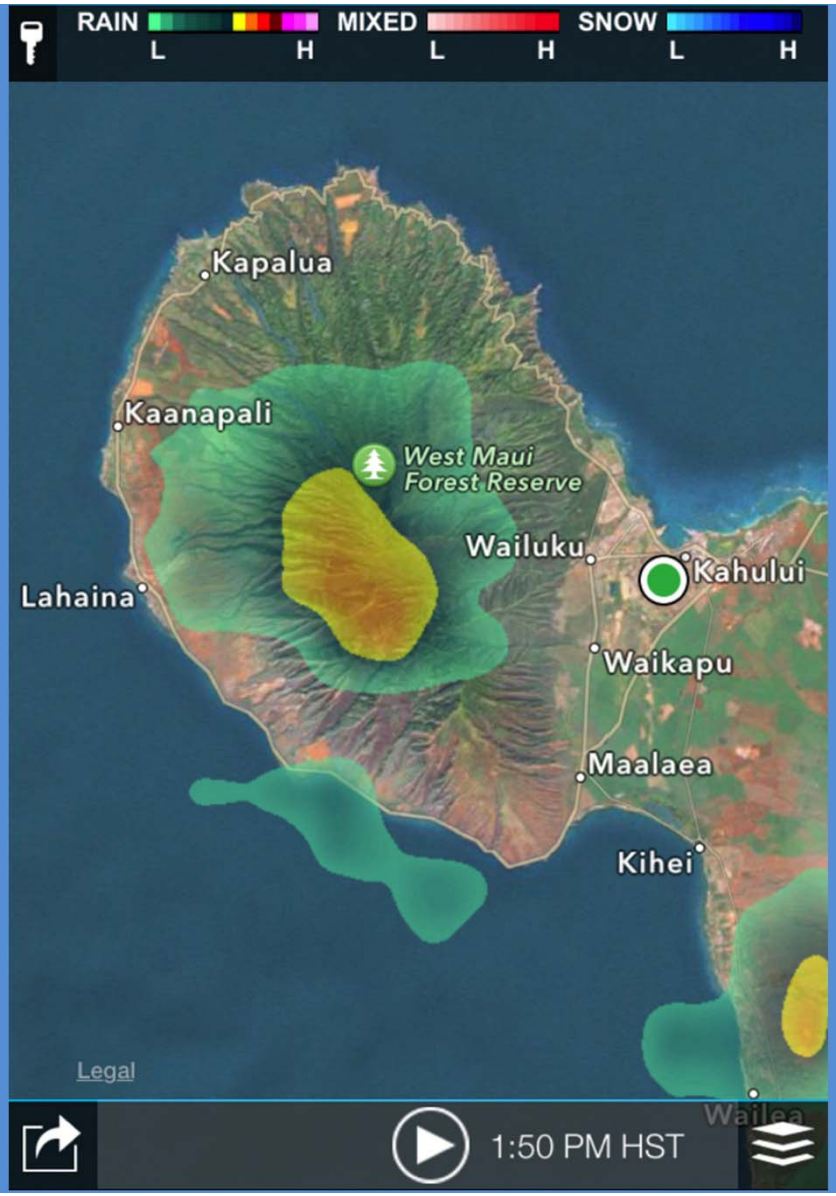
Fire Begets Fire

Photo Credit:
TNC Molokai

Pu'u Kukui
5788'

Helu Fire
3600'

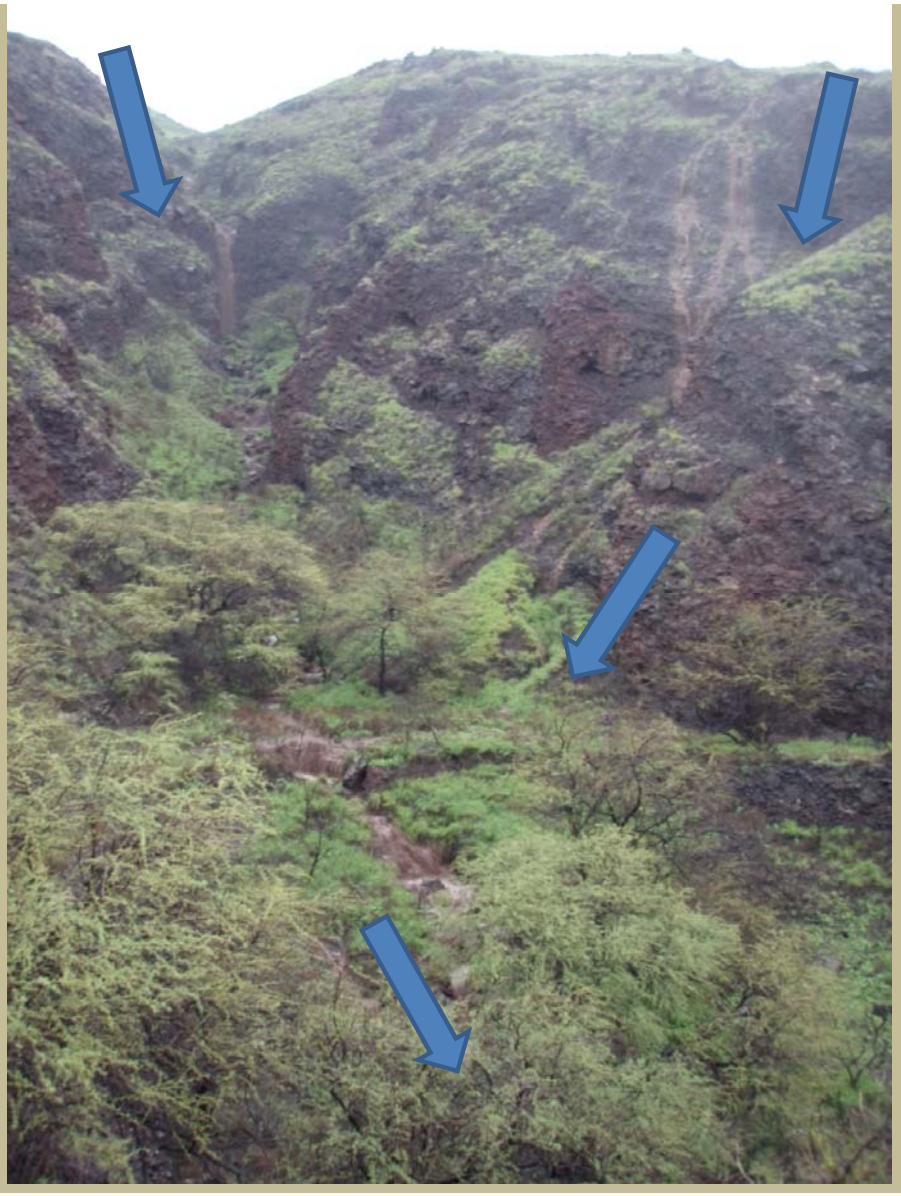
Burns organic soil & leaves only ash


RAIN
L
H
MIXED
L
H
SNOW
L
H
Kapalua
Kaanapali
West Maui
Forest Reserve
Wailuku
Kahului
Lahaina
Waikapu
Maalaea
Kihei
Legal
1:50 PM HST

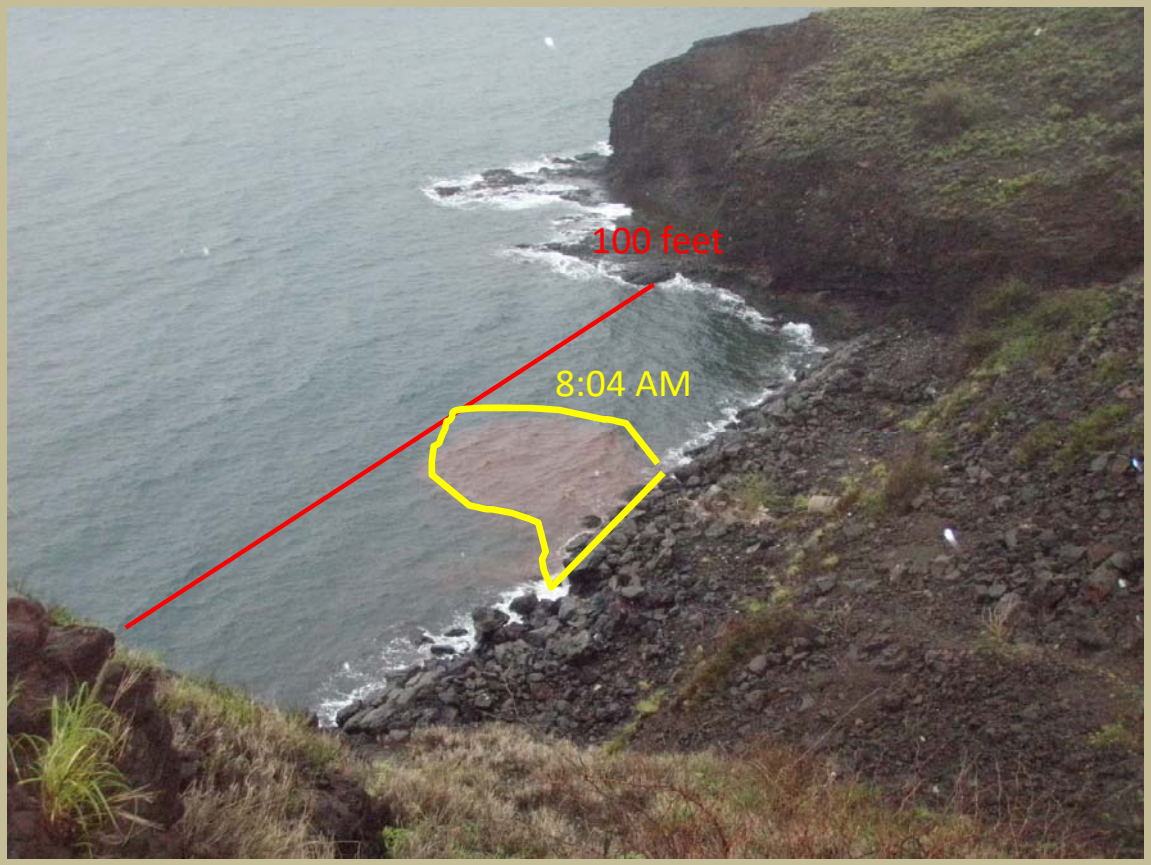
Gullies Start to Form


Honoapiilani Hwy
Time Lapse Location
Maalaea
Maalaea, HI
30
380
Hauoli St. Culvert
310
N Kihei Rd
Maalaea Harbor
Kaheawa Access Rd. Culvert
© 2012 Google
Image © 2012 GeoEye
Image © 2012 DigitalGlobe
Data USGS
Goog
2011
2000
20°47'57.47" N 156°31'34.26" W elev 1022 ft

Fire zone causing major sediment loss



8:02 AM
January 11,2011
Makahuna Gulch

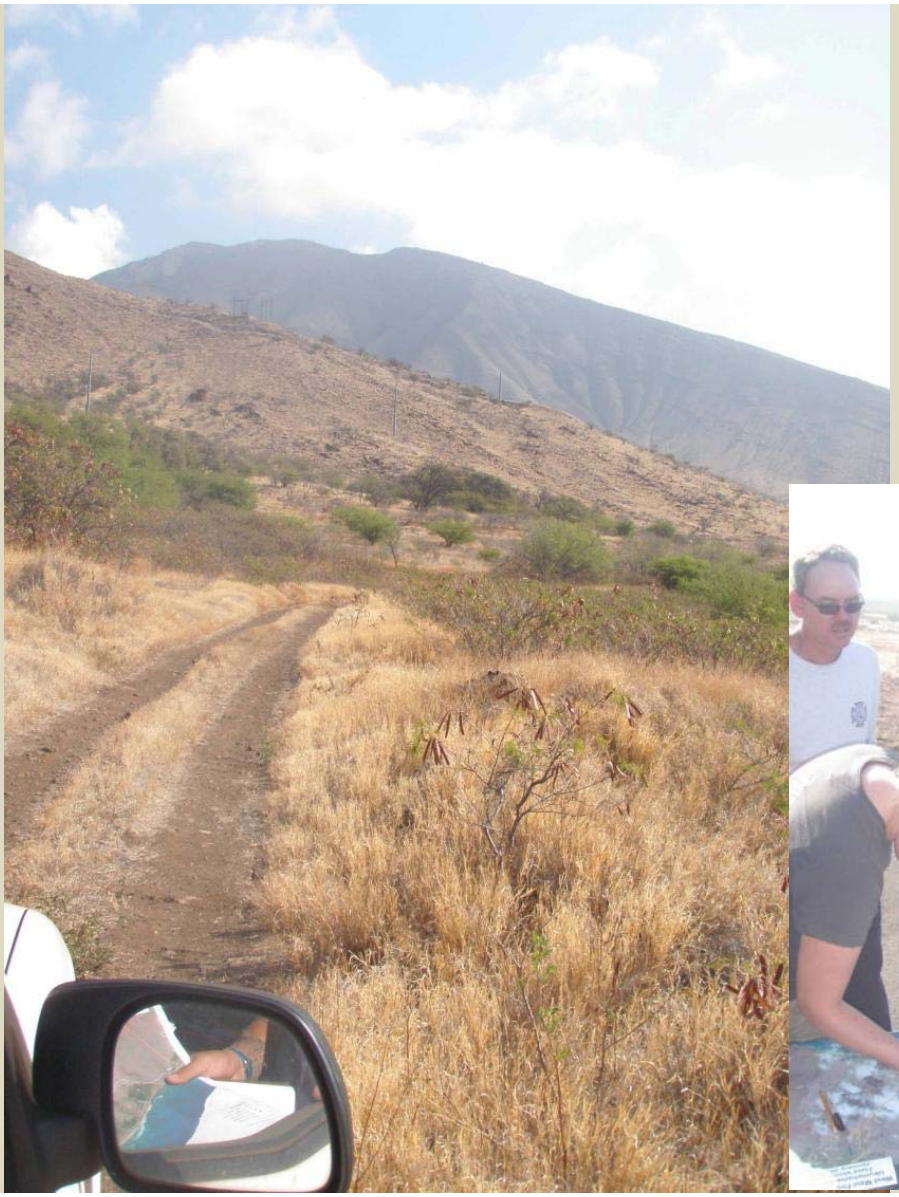


8:44 AM January 11, 2011 Makahuna Gulch

Ma’alaea Harbor

Hauoli Street Culvert

Ma’alaea Harbor

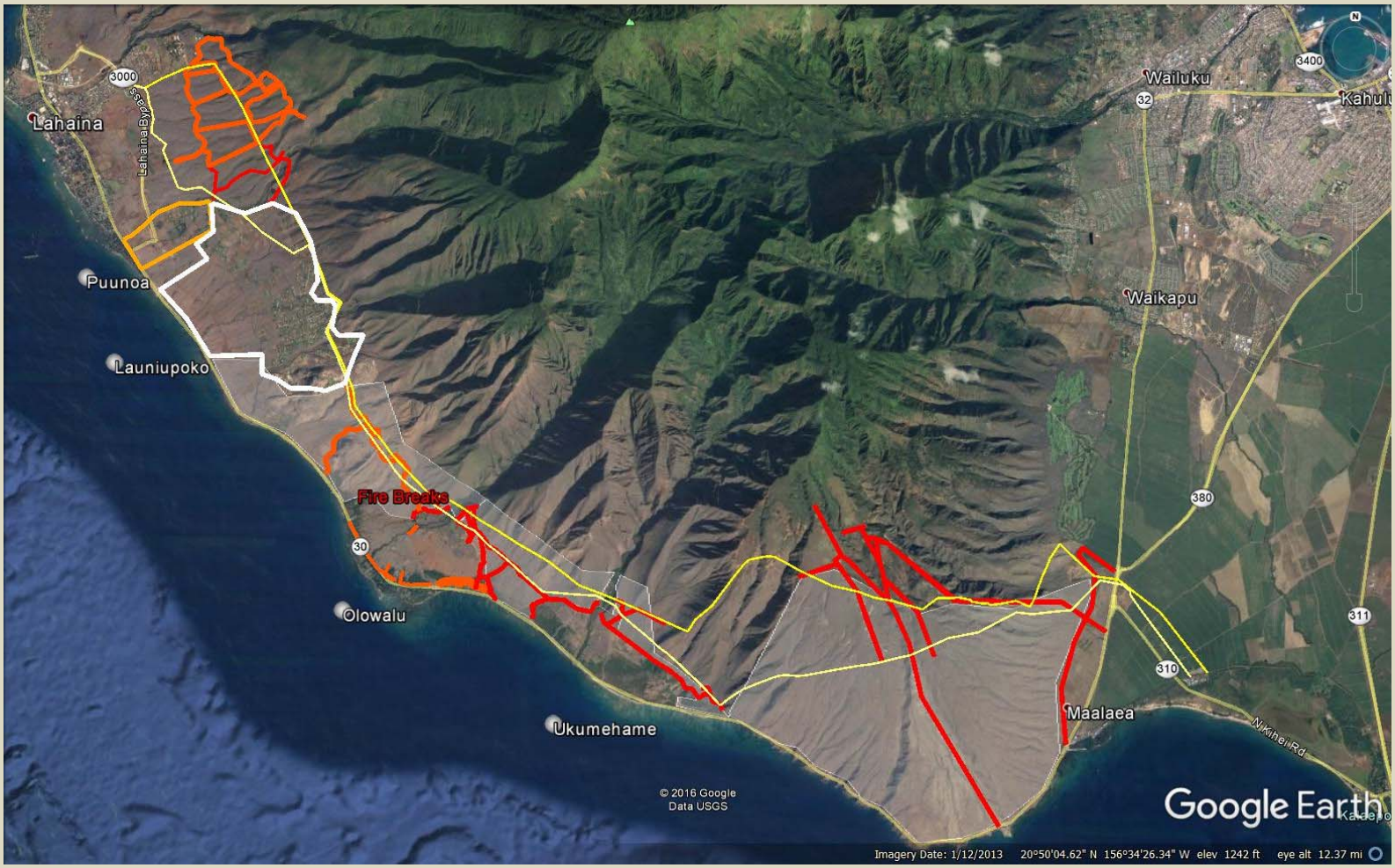


West Maui Fire Task Force

Maui Fire Department
Maui Police Department
WMMWP
Local Landowners / Home Owners Associations
DLNR/DOFAW
County of Maui

- Infrastructure Mapping
- Planning- CWPP
- Communication
- Fuel Reduction
- Enhanced Access

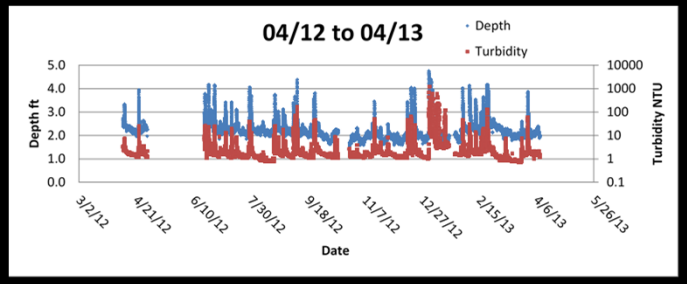
Southwestern Fire Planning

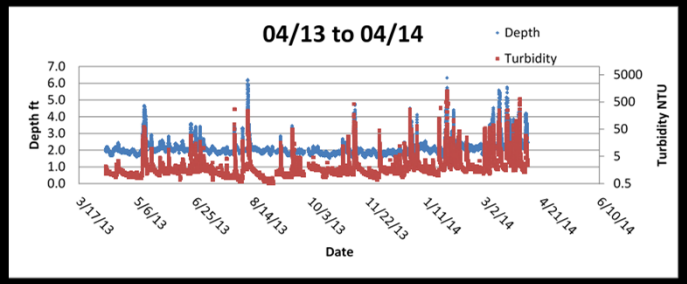


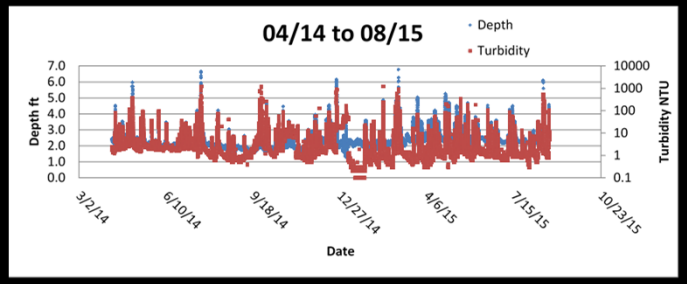
hawaiiwildfire.org

Turbidity:

- *Low Flow Average 2.55 (NTUs)*
- *Storm Average of 22.45 (NTUs)*







Automated Storm & Base Flow Sampling: -

Storm samplers are attached to the stream wall to sample during high storm events. Base flows are taken monthly at low flow periods.

EPSCoR Analytical Laboratory
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Year 1

Baseline: Averages Pre-4/9/13

N =		NO2+NO3	TN	TOC	TP	TSS
13	BaseFlow	0.013	0.144	4.736	0.014	11.012
13	Storm	0.098	1.068	24.670	0.220	101.701

Year 2

Post Fence Averages Post-4/9/13

N =		NO2+NO3	TN	TOC	TP	TSS
10	BaseFlow	0.012	0.110	4.518	ND<0.015	8.513
4	Storm	0.029	0.376	5.285	0.786	523.750

Erosion Bridges:

10 erosion bridges were randomly placed to record background sediment loss.

Average Erosion =

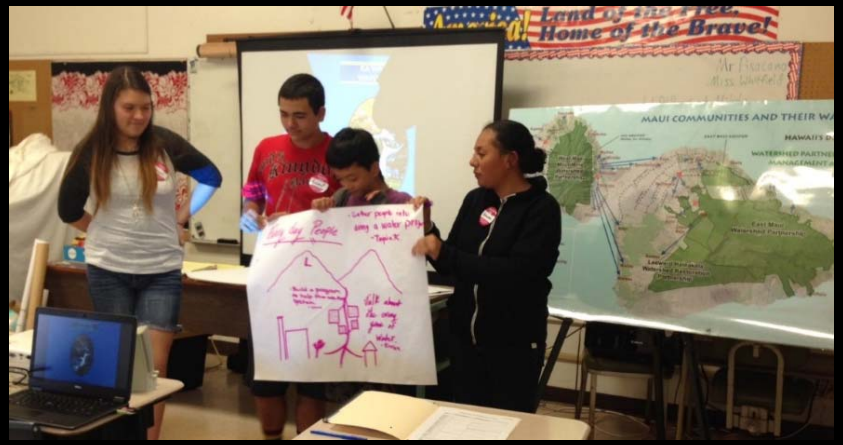
6mm or .237 inches

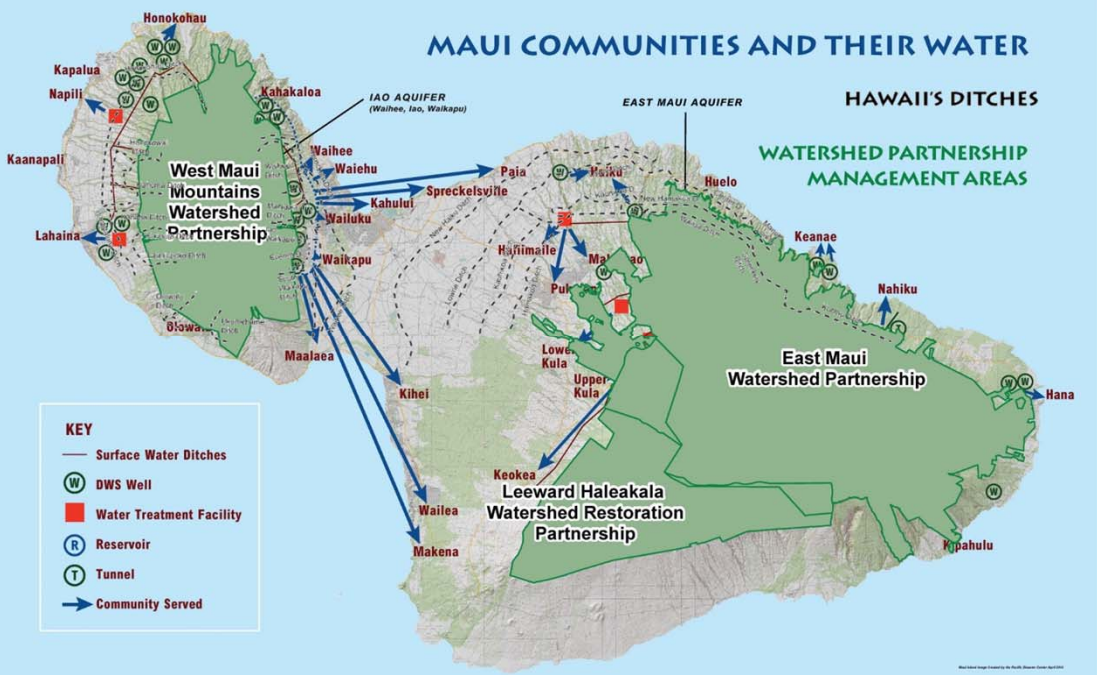
Honolua Erosion Table for Ten Stations: Change from 2012 to 2013

Location	Slope	Pins 1-20																			total
PSU (Site#)	%	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	(mm)
1	10	-9	-7	4	-5	5	19	2	-14	-3	-9	-7	-16	-8	-5	-9	-2	-5	0	-10	18	**-97**
2	30	-3	-1	11	-6	-7	-13	15	-6	-1	-7	-6	2	3	-1	3	4	-10	-4	-18	-4	**-49**
3	42	-5	-3	-2	1	-7	-1	14	4	-3	1	1	2	7	0	2	4	0	1	-2	0	**14**
4	10	-15	-3	-11	-17	-13	-9	-8	-8	-7	-4	-2	-4	-6	-1	-16	6	-18	-22	-1	-9	**-168**
5	12	6	4	9	20	22	24	9	4	14	5	11	14	6	16	15	15	-3	29	9	25	**254**
6	20	-5	3	0	-4	-16	0	1	-27	-4	-15	-8	-6	-16	-11	-3	-10	-10	-9	-4	-24	**-168**
7	49	3	-1	1	5	4	0	2	-2	-5	-12	-12	-3	-4	-3	-1	2	8	12	10	19	**23**
8	23	0	-1	-6	-4	-2	0	-8	-11	-9	-11	-5	-9	-5	-4	-6	1	-4	-5	-18	14	**-93**
9	38	-55	-57	-53	-54	-38	-46	-47	-51	-47	-54	-62	-58	-46	-36	-25	-25	-30	-34	-26	-21	**-865**
10	37	1	-1	3	-3	-4	-6	-6	-16	-2	1	1	-1	1	-2	0	1	-7	-2	-2	-7	**-51**

Public Education & Awareness

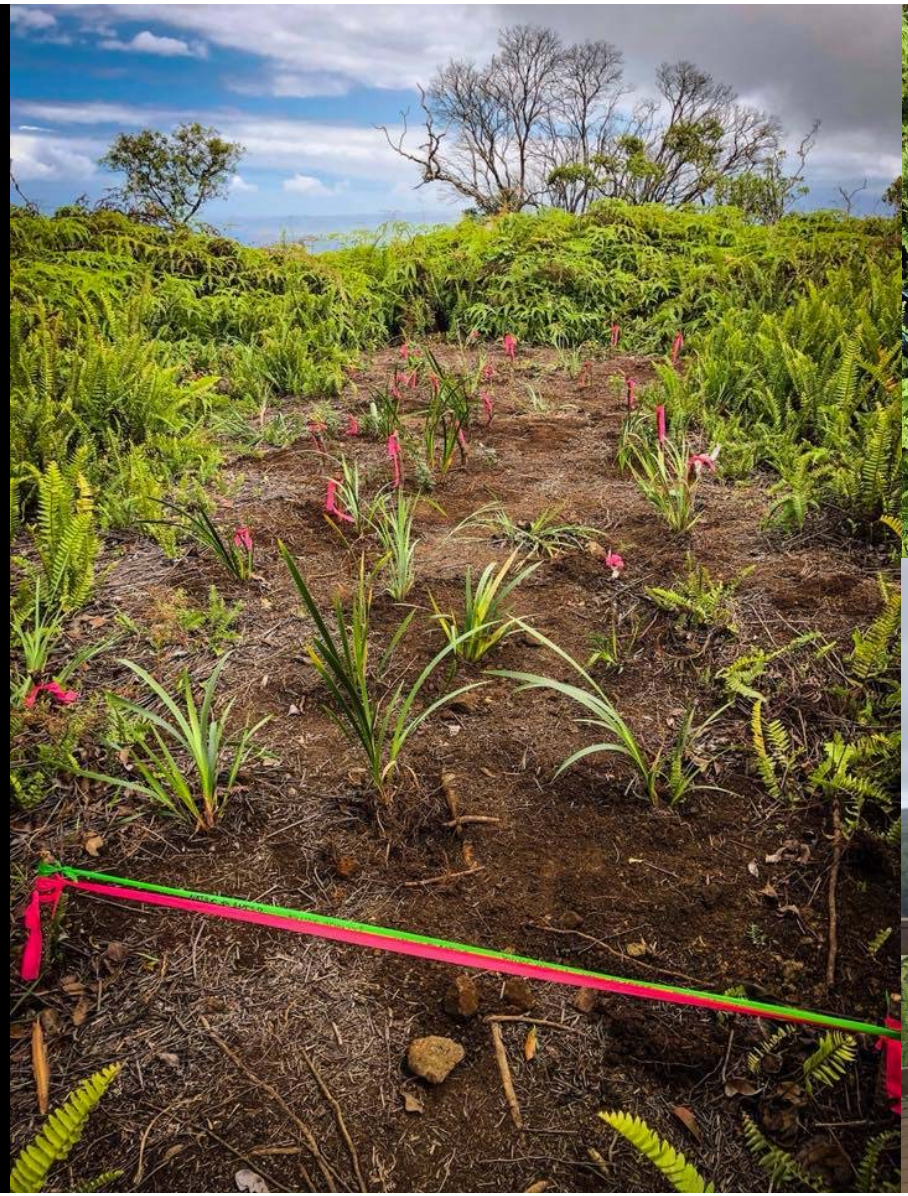
engage the community through outreach events

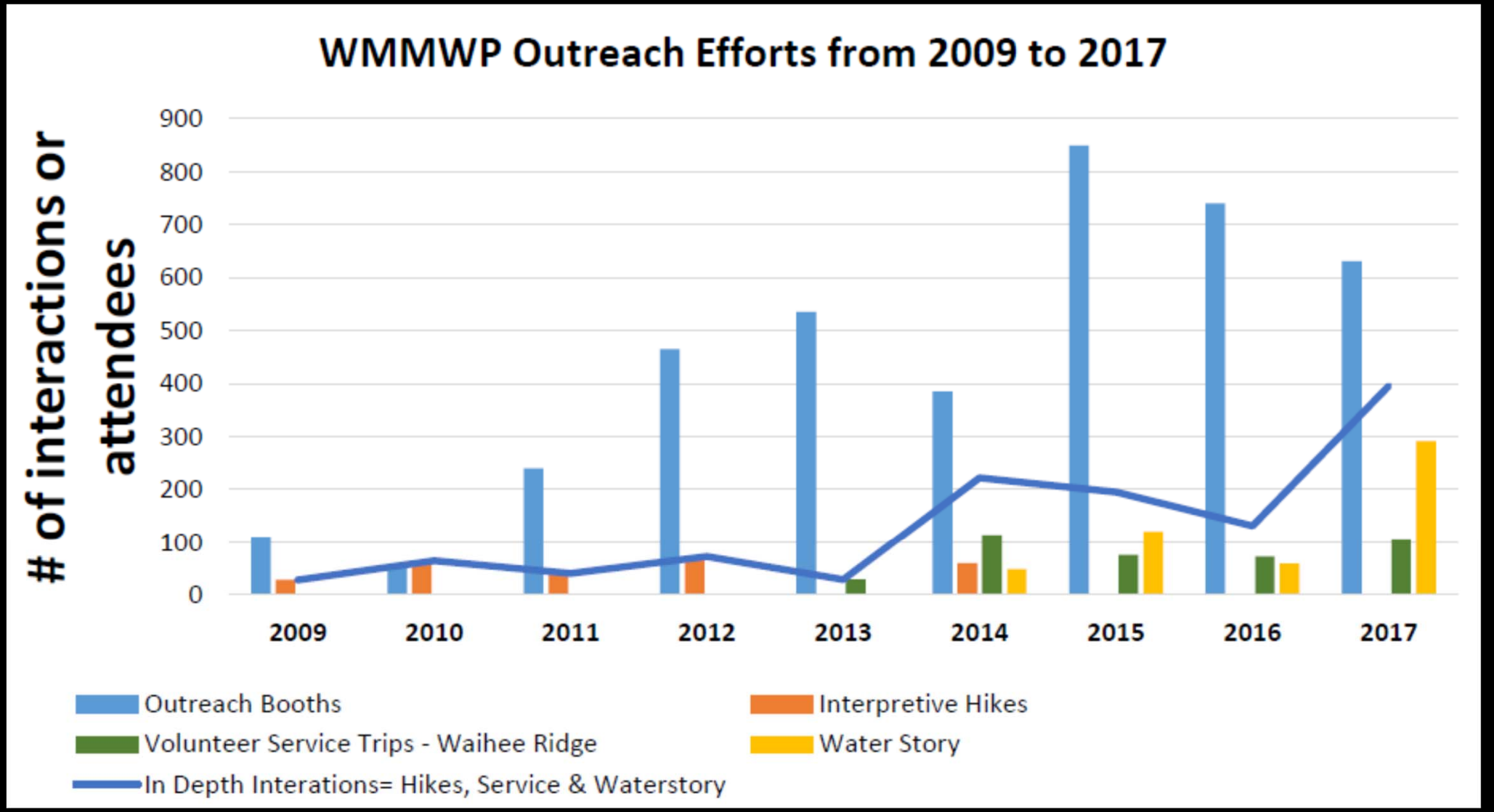




mauieconomic DEVELOPMENTBOARD

Volunteer Stewardship




WMMWP Outreach Efforts from 2009 to 2017
# of interactions or attendees
900
800
700
600
500
400
300
200
100
0
2009
2010
2011
2012
2013
2014
2015
2016
2017
Outreach Booths
Interpretive Hikes
Volunteer Service Trips - Waihee Ridge
Water Story
In Depth Interations= Hikes, Service & Waterstory

KUPU Hawaii AmeriCorps

www.kupuhawaii.org

Hawaii Youth Conservation Corps (HYCC)

www.kupuhawaii.org

Protect Our Watersheds !!!


Aloha
&
Mahalo!