

1.3.4 Makaha

Ecosystem Restoration Management Plan

MIP Year 7-11, Oct. 2010 – Sept. 2015

OIP Year 4-8, Oct. 2010 – Sept. 2015

MU: Makaha Subunits I and II

Overall MIP Management Goals:

- Form a stable, native-dominated matrix of plant communities which support stable populations of IP taxa.
- Control ungulate, rodent, arthropod, slug, snail, fire, and weed threats to support stable populations of IP taxa. Implement control methods in Subunits II and III by 2015.

Background Information

Location: Northern Waianae Mountains

Land Owner: Honolulu Board of Water Supply

Land Manager: Oahu Army Natural Resources Program (OANRP)

Acreage: Subunit I (MIP): 85 acres

Subunit II (MIP-proposed): ~30 acres

Kamaili (OIP-proposed): ~25 acres

Total fenced: 175 acres

Elevation Range: 1,600 – 2,740 ft.

Description: Makaha Valley is located on the leeward side of the northern Waianae Mountains. Precipitation from Mt. Kaala provides the headwater for an intermittent stream in the back of the valley that often flows during the winter months. The Subunit I (85-acre) fence is located on the southern side of the valley, facing north. The lowest line of Subunit I is approximately 200ft. in elevation above the Makaha Stream. The bottom fence line crosses four gulches leading towards the eastern fence line. The fence then travels up a moderately sloped ridge to the crest line west of the Kumaipo saddle. The top line continues west on Kamaileunu Ridge and crosses the to the north side of the “no name” or Cable Puu. The fence line then continues down the steep narrow ridge of the makai line. There are several portions of the fence that use cliffs and steep gulch slopes strategically. The lower habitat is dominated by strawberry guava and coffee, but becomes more diverse at higher elevations, with a mix of native and non-native components. Near the top of the enclosure, the terrain gets very steep with some vertical cliff areas which host a variety of rare native plants.

The proposed Subunit II fence (~30 acres) has not been completed yet but a line has been scoped and is slated to be completed in 2011. This fence was originally proposed to be 65 acres but was scaled down to about 30 acres. Ground surveys revealed that most of the lower half of the proposed fence was monotypic strawberry guava and coffee stands with little native components for restoration work. Beginning at the top easternmost corner of Subunit I, this fence line goes toward Kaala along Kumaipo Saddle to a point below Three Poles. The fence then will head down, toward the Makaha Valley stream, for about 100 meters and then turn back toward the Subunit I fence. The fence line will maintain a line

100 meters below Kumaipo Saddle back to the Subunit I fence. The vegetation is predominantly non-native except for a small native band that this new fence line encompasses.

The Kamaili fence (~25 acre) has not been completed yet but a line has been scoped and is slated to be completed in 2011. This fence will be built around wild populations of *Abutilon sandwicensis* and *Flueggea neowawraea*.

Native Vegetation Types

Waianae Vegetation Types
<u>Mesic mixed forest</u>
Canopy includes: <i>Acacia koa</i> , <i>Metrosideros polymorpha</i> , <i>Nestigis sandwicensis</i> , <i>Diospyros</i> spp., <i>Pouteria sandwicensis</i> , <i>Charpentiera</i> spp., <i>Pisonia</i> spp., <i>Psychotria</i> spp., <i>Antidesma platyphyllum</i> , <i>Bobea</i> spp. and <i>Santalum freycinetianum</i> .
Understory includes: <i>Alyxia stellata</i> , <i>Bidens torta</i> , <i>Coprosma</i> spp., and <i>Microlepia strigosa</i>
NOTE: For MU monitoring purposes vegetation type is assigned based on theoretical pre-disturbance vegetation. Alien species are not noted.
NOTE: For MU monitoring purposes, vegetation types were subdivided using topography (gulch, mid-slope, ridge). Topography influences vegetation composition to a degree. Combining vegetation type and topography is useful for guiding management in certain instances.

Primary Vegetation Types at Makaha

Mesic Gulch



Mesic Mid-Slope



Mesic Ridge



MIP/OIP Rare Resources

Organism Type	Species	Pop. Ref. Code	Population Unit	Management Designation	Wild/ Reintroduction/ Future Reintro
Plant	<i>Abutilon sandwicense</i>	MAK-B MAK-D MAK-E	Makaha Makai Makaha Makai Makaha Mauka	MFS MFS GSC	Wild
Plant	<i>Alectryon macrococcus</i> var. <i>macrococcus</i>	MAK-A MAK-B MAK-D MAK-E	Makaha	MFS	Wild
Plant	<i>Cenchrus agrimonioides</i> var. <i>agrimonioides</i>	MAK-A MAK-B†	Makaha	MFS	Reintroduction
Plant	<i>Chamaesyce herbstii</i>	MAK-A	Makaha	MFS	Reintroduction
Plant	<i>Cyanea grimesiana</i> subsp. <i>obatae</i>	MAK-A MAK-B†	Makaha	MFS	Wild Future Reintro
Plant	<i>Cyanea longiflora</i>	MAK-A MAK-B†	Makaha	MFS	Wild Future Reintro
Plant	<i>Cyanea superba</i> subsp. <i>superba</i>	MAK-A	Makaha	MFS	Reintroduction
Plant	<i>Dubautia herbstobatae</i>	MAK-A MAK-B MAK-C MAK-D	Kamaileunu Makaha Makaha/Ohikilolo Makaha/Ohikilolo	GSC MFS GSC GSC	Wild

Organism Type	Species	Pop. Ref. Code	Population Unit	Management Designation	Wild/ Reintroduction/ Future Reintro
Plant	<i>Flueggea neowawraea</i>	MAK-A MAK-B MAK-C MAK-D MAK-E MAK-G MAK-G MAK-I	Makaha	MFS	Wild Wild Wild Wild Wild Reintroduction Reintroduction Reintroduction
Plant	<i>Hesperomannia arbuscula</i>	MAK-A MAK-B†	Makaha Makaha	MFS	Wild
Plant	<i>Melanthera tenuifolia</i>	MAK-A MAK-B MAK-C MAK-D MAK-E MAK-F MAK-G MAK-H	Kamaileunu and Waianae Kai	MFS	Wild
Plant	<i>Neraudia angulata</i>	MAK-A MAK-B MAK-C	Makaha	GSC	Wild
Plant	<i>Nototrichium humile</i>	MAK-A MAK-B MAK-D MAK-E	Makaha	GSC	Wild
Plant	<i>Phyllostegia kaalaensis</i>	MAK-A	Makaha	MFS	Reintroduction
Plant	<i>Schiedea nuttallii</i>	MAK-A MAK-B†	Makaha	MFS	Reintroduction Future Reintro
Plant	<i>Schiedea obovata</i>	MAK-A† MAK-B†	Makaha	MFS	Future Reintro
Plant	<i>Viola chamissoniana</i> subsp. <i>chamissoniana</i>	MAK-A MAK-B MAK-C MAK-D MAK-F MAK-G	Kamaileunu Makaha Kamaileunu Makaha/Ohikilolo Makaha Makaha	GSC MFS GSC GSC MFS MFS	Wild
Snail	<i>Achatinella mustelina</i>	MAK-A, MAK-B, MAK-C, MAK-D, MAK-E	Makaha	MFS	Wild
Bird	<i>Chasiempis ibidis</i>		Makaha	GSC	Wild

MFS= Manage for Stability

*= Population Dead

GSC= Genetic Storage Collection †=Reintroduction not yet done

Other Rare Taxa at Makaha MU

Organism Type	Species	Status
Plant	<i>Cyanea membranacea</i>	Rare
Plant	<i>Diellia falcata</i>	Endangered
Plant	<i>Gouania meyenii</i>	Endangered
Plant	<i>Isodendrion laurifolium</i>	Endangered
Plant	<i>Joinvillea ascendens</i> var. <i>ascendens</i>	Candidate
Plant	<i>Labordia kaalae</i>	Rare
Plant	<i>Lobelia niihauensis</i>	Endangered
Plant	<i>Melicope makahae</i>	Candidate
Plant	<i>Platydesma cornuta</i> var. <i>decurrens</i>	Endangered
Plant	<i>Pteralyxia macrocarpa</i>	Candidate
Plant	<i>Schiedea hookeri</i>	Endangered
Plant	<i>Strongylodon ruber</i>	Rare
Plant	<i>Sicyos lanceoloidea</i>	Endangered
Plant	<i>Tetraplasandra kawaiensis</i>	Rare
Snail	<i>Amastra spirozona</i>	Rare

Rare Resources of Makaha



Locations of Rare Resources at Makaha Subunit I

Map removed, available
upon request

Locations of Rare Resources at Makaha Subunit II

Map removed, available
upon request

MU Threats to MIP/OIP MFS Taxa

Threat	Taxa Affected	Localized Control Sufficient?	MU scale Control required?	Control Available?	Method
Pigs	All	No	Yes	Yes.	
Goats	All	No	Yes	Yes	
Rats	All	Yes	Unknown	Yes	
Predatory snails	<i>A. mustelina</i>	Yes	No	Limited to hand-removal and physical barriers. No control currently conducted.	
Slugs	<i>C. grimesiana</i> subsp. <i>obatae</i> , <i>C. longiflora</i> , <i>C. superba</i> subsp. <i>superba</i> , <i>S. nuttallii</i> , <i>S. obovata</i> , <i>P. kaalaensis</i>	Yes	No	Label expansion being sought for Sluggo. No control currently	
Ants	Unknown, possibly a threat to native snails, arthropods, plants and birds	Yes	No	No control programs currently	
Black Twig Borer (BTB)	<i>F. neowawraea</i> , <i>A. macrococcus</i> var. <i>macrococcus</i>	Yes	No	No proven methods currently available	
Weeds	All	Yes	Yes	Yes	
Fire	All	No	Yes	Yes	

Management History

Makaha has a diverse history of management dating back to the early Polynesian era. Over the years the landscape has gone through drastic changes in vegetation due to various land uses and practices.

- Early 1800's Makaha ahupuaa ruled by a Hawaiian chief named Kanepaiki
- 1850 High Chief Paki was awarded title to the ahupuaa of Makaha through the Mahele
- 1855 the Robinson firm purchased Makaha Valley for \$5000 in gold
- Late 1800's sugar plantation attempted and failed in Makaha Valley
- 1886 Landowner August Ahrens plants the first coffee trees in Makaha Valley as a 45-acre coffee plantation
- 1893 James Lowe also attempts to farm coffee in Makaha Valley
- 1987 Board of Water Supply gains control of water resources and management of Makaha Valley
- 1999: OANRP begins management in Makaha
- August 2005, Guava plots installed on camp ridge by NRS with UH Botany
- 2005 Subunit I fenceline scoped and EA approved
- September 2006 Subunit I fence construction begins
- September 2006, work trips initiated with Waianae high school students
- August 2007 Subunit I fence construction finished
- 2005-2009 Rat baiting for *Chasiempis ibidis* conducted
- August 2009 Subunit I declared pig free

- August-October 2009 Vegetation monitoring
- January 2010 Subunit II fenceline scoped
- March 2010 Kamaili fenceline scoped

Ungulate Control

Identified Ungulate Threats: Pigs

Threat Level: High

Primary Objectives:

- Maintain Subunit I fence as ungulate-free.
- Construct Subunit II fence and remove any pigs within fence.
- Construct Kamaili fence and remove any pigs within fence.

Strategy:

- Maintain Subunit I as pig-free by maintaining fence.
- Construct a fence in Subunit II and remove pigs from fence.
- Construct a fence in Kamaili and remove pigs from fence.
- Conduct outreach with community hunting groups for hunting actions in Makaha. Prioritize actions as (1) pig removal in fences and (2) hunting activities in priority areas to reduce pressure on fences.

Monitoring Objectives:

- Conduct fence checks and read transect quarterly. GPS and mark new fences at ten meter intervals so that the fence will be one large transect.
- Monitor for pig sign while conducting other management actions in the fence.
- Monitor integrity of all fences after extreme weather/wind events as soon as possible.

Management Responses:

- If any pig activity is detected within the fenced unit, implement hunting and/or trapping program.
- If more than ten percent activity is detected along transects outside fence, increase volunteer hunting effort.

Maintenance Issues:

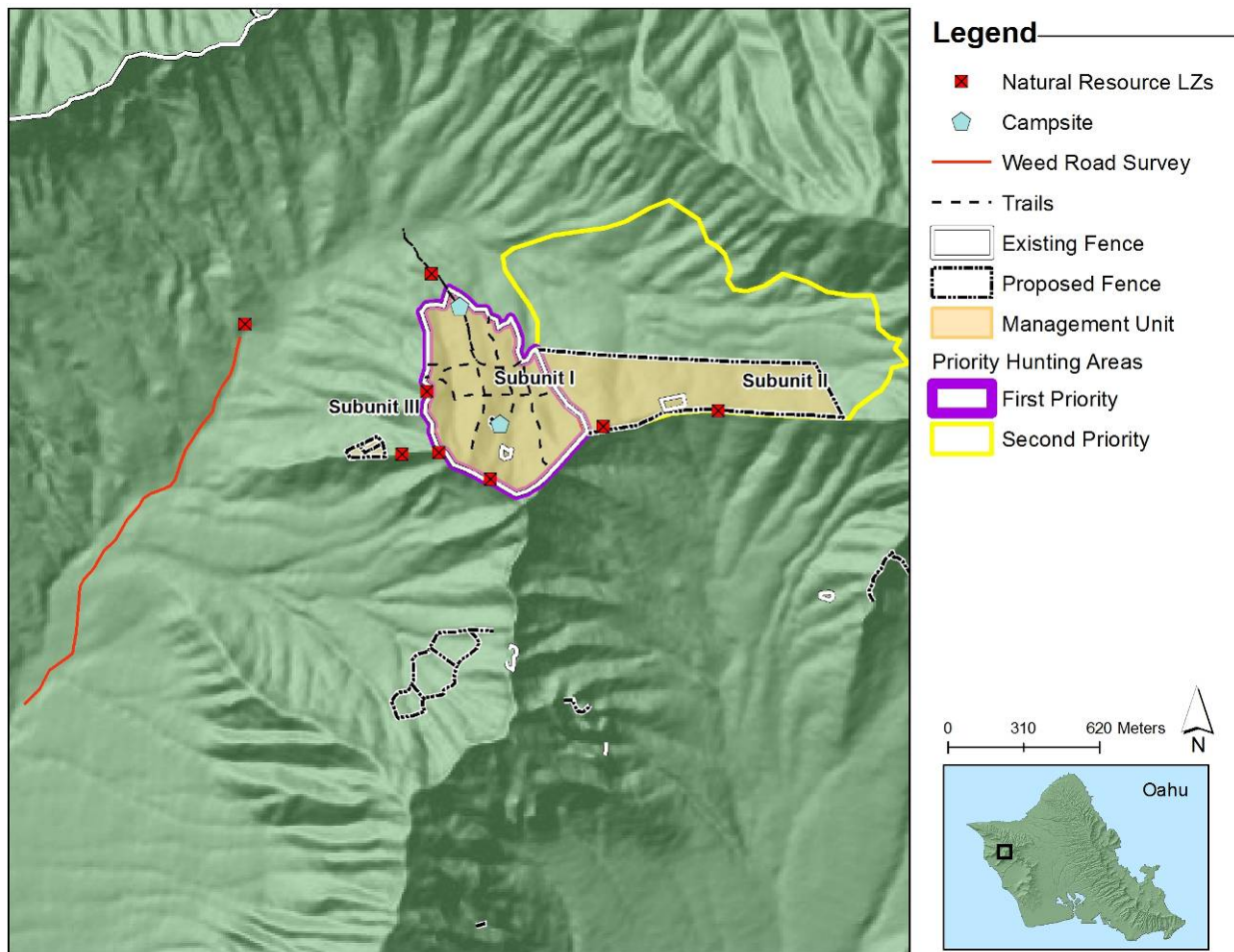
There is a perimeter fence around Subunit I. In the past year, fence checks have been done quarterly and additionally in conjunction with other Management Unit (MU) actions, thus, increasing the monitoring frequency of fence integrity. A few minor repairs were made to the fence due to canopy downfall, however, these did not result in any ungulate breach into the enclosure. Fences are prone to damage from tree fall, particularly after extreme weather/high wind events. Vandalism has been one issue in the past. Building relationships with local hunters and educating them about the need for fences to protect native resources has been successful in building community awareness and reducing incidences of vandalism.

Community Hunter Program

The community hunting program in Makaha is a collaborative effort between the Board of Water Supply, Oahu Army Natural Resources Program and community hunters. The goal is to protect rare species in the region. Hunters are educated about the area's resources, gain access and remove pigs. The partners plan to continue beneficial collaborative efforts and will hopefully minimize misunderstandings between hunters and natural resource workers as well as vandalism to the fence.

In the past year, efforts have been increased in establishing and maintaining the Volunteer Community Hunter Program. The community hunting areas are shown in order of ungulate control priority: 1) **Purple Zone**- Subunit I fence perimeter which was declared ungulate free in early 2009; this is the default priority hunting area if fence should be breached by pigs. 2) **Yellow Zone**- Currently being hunted by community teams to take pressure off the Subunit I fence.

Ungulate and Survey Locations at Makaha



Weed Control

Weed Control actions are divided into 4 subcategories:

- 1) Vegetation Monitoring
- 2) Surveys
- 3) Incipient Taxa Control (Incipient Control Area - ICAs)
- 4) Ecosystem Management Weed Control (Weed Control Areas - WCAs)

These designations facilitate different aspects of MIP/OIP requirements.

Vegetation Monitoring

Vegetation Monitoring Objectives

Primary Objectives

- Assess the cover of alien plant species within a specific MU to determine if it is less than 50% across the sampled unit or continuing to decrease to ultimately meet that threshold requirement (Makua Implementation Team et al. 2003).
- Re-read vegetation monitoring transects every three years. The next planned monitoring cycle for this area is in quarter 1 of 2012 (MIP year 10).

Secondary Objectives

- Monitor the status of native plant species within the MU.
- Assess the status and changes in bare ground (not vegetated areas) within the MU.
- Determine if any ungulates (feral pigs or goats) are detected within the fenced portion of a MU.

Statistical Thresholds

All of the sampling and analysis methods addressed in this protocol are based on the following assumptions:

- The probability of making a Type I error (detecting change or difference when none exists) is <10% (Alpha = .10)
- The probability of making a Type II error (missing change or difference that does exist) is <20%.
- Minimum detected change or difference between two samples being compared is 10% over the sampling period.

Sample Size Considerations

A post hoc sample size was calculated using the statistical thresholds mentioned above and the standard deviation of 28. The minimum sample size for this MU would be 105 stations which is less than what the sample size of 121 taken.

Vegetation Monitoring Methods

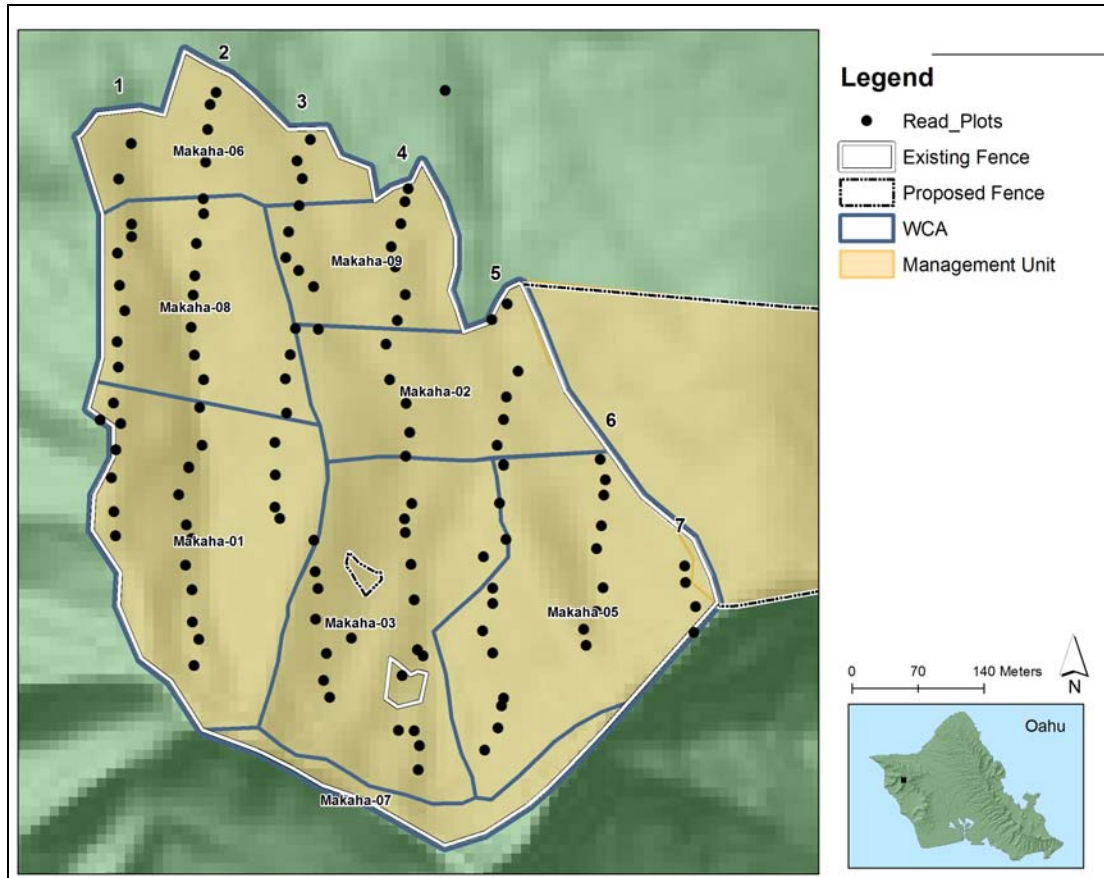
Refer to the monitoring section in the 2008 yearend report.

MU Vegetation Monitoring

From August – October of 2009 baseline vegetation monitoring was conducted for the Makaha subunit 1 management unit. The total effort including commute time was 557 hours. A total of 121 plots were read

and 84 acres covered. MU monitoring will be conducted every three years and will provide OANRP with trend analyses on vegetation cover and species diversity.

MU Monitoring Transects



Vegetation Monitoring Analyses

Baseline data collect in 2009 showed that the mean percent alien vegetation cover in the understory was 38% and in the canopy it was 66% (refer to MU % vegetation cover table below). The mean alien percent cover met the management goal of 50% or less non-native cover in the understory but didn't in the canopy (Refer to the map above).

As more datasets are collected for this area over time, trends in canopy change can be used by OANRP to determine how effective current weed management strategy is at reaching IT goals. Several variables of particular interest are how bare ground area will change relative to the removal of ungulates and the spread and percent cover change of invasive species in both the canopy and understory.

Ungulates were removed from the management unit in 2009. This initial baseline monitoring showed that the mean percent cover of bare ground was 74%.

The most common invasive trees in the Makaha MU were *Psidium cattleianum*, *Toona ciliata*, and *Coffea arabica*. On a WCA scale, these species are the main targets for weed control due to their ecosystems altering ability. In the next five years a majority of the weed management will focus on WCA's 1, 3, and 5 (priority 1 WCAs). Priority 1 WCAs will be the main focus since the majority of rare species are

located within them. The weed control strategy will be to target *P. cattleianum*, *T. ciliata*, and *C. arabica* in native patches and prevent monotypic stands from expanding. Percent vegetation cover for *Psidium cattleianum*, *Toona ciliata*, and *Coffea arabica* that fall within the priority 1 area were taken out from the baseline dataset and summarized (refer to target species table below). Weed sweeps will be conducted once annually in WCA 1, WCA 3 once every two years in WCA 3, and once every three years for WCA 5. Canopy weed control effort will be gradual around rare plant taxa in order to minimize drastic light level changes. OANRP will continue to track these species; monitoring both the movement and percent cover change over time. The percent cover trend will indicate if current management strategy is an effective method for containing these species. Species distribution maps for *P. cattleianum*, *T. ciliata*, and *C. arabica* will also be compared to future maps in order to track the decline/spread of these species (Refer to the maps below). Other significant weeds that will be targeted during sweeps will be *Grevillea robusta* and *Spathodea campanulata*. In the priority 1 area the five year goal is a zero tolerance for *S. campanulata* and a reduction of mature *G. robusta* from a mean percent occurrence from 8% to 5%.

MU Percent Vegetation Cover Analysis

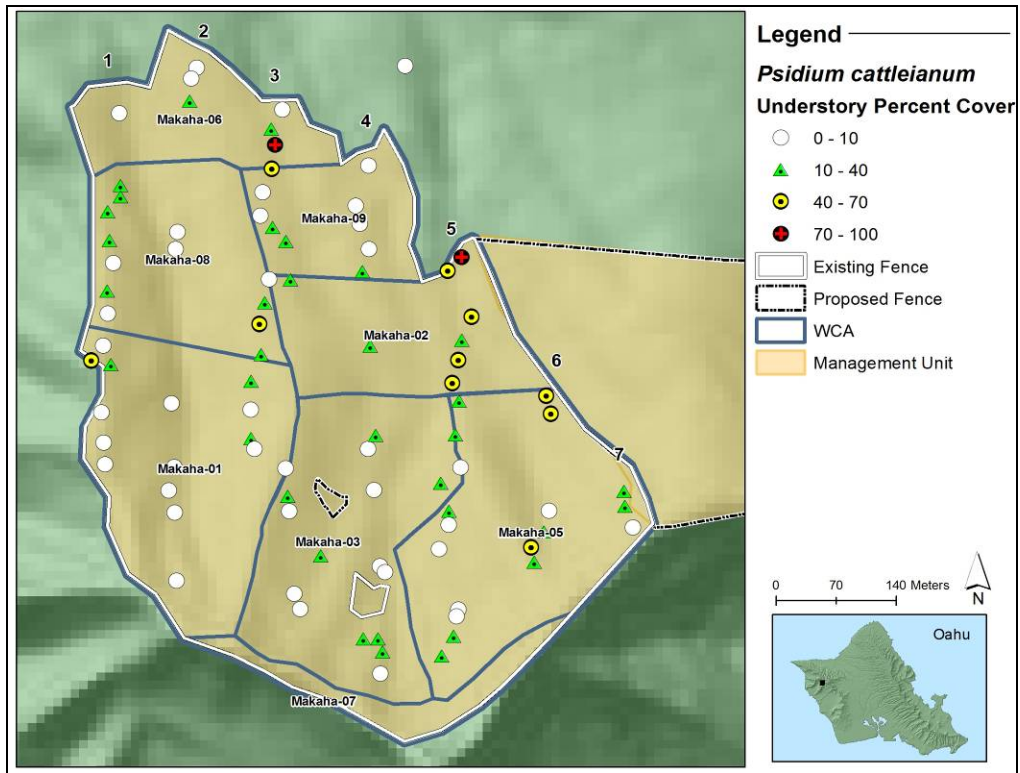
MU % Vegetation Cover Analysis							
Variable	*N	Mean	Standard Error of Mean	Standard Deviation	Q1	Median	Q3
Native Shrubs Understory	121	12.6	1.5	16.4	0.5	7.5	15
Native Ferns Understory	121	1.2	0.2	2.7	0	0.5	0.5
Native Grass Understory	121	0.7	0.3	3.3	0	0	0
Bryophytes	121	2.4	0.4	4.8	0.5	0.5	2.5
Total Native Understory	121	14.2	1.5	16.7	2.5	7.5	25
Alien Shrubs Understory	121	33.7	2.3	25.4	15	25	55
Alien Ferns Understory	121	5.2	0.9	10.2	0	0.5	2.5
Alien Grass Understory	121	1.7	0.8	9.3	0	0	0.5
Bare Ground	121	73.9	2.2	24.3	55	85	95
Total Alien Understory	121	38.2	2.3	25.5	15	35	55
Total Native Canopy	121	28.1	2.4	26.5	5	25	45
Total Alien Canopy	121	65.9	2.6	28.5	55	75	95
Total Canopy	121	80.8	1.5	16.8	75	85	95

*N = # of Plots Read

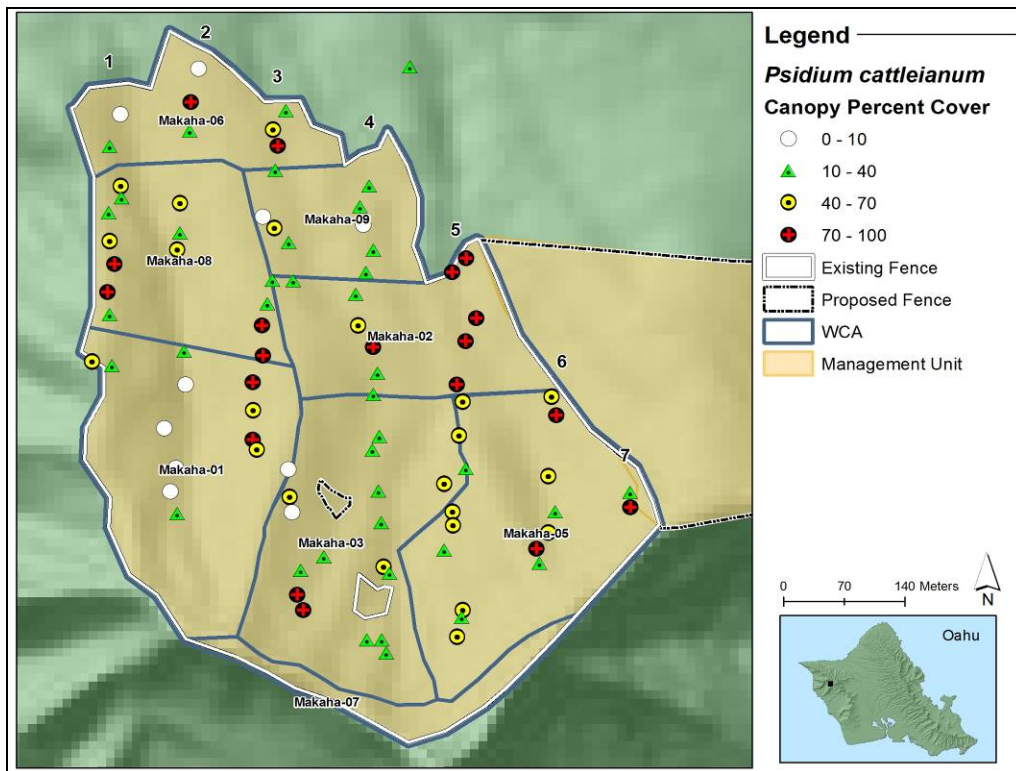
Target Species Percent Cover in WCAs 1, 3, and 5

Target Species % Cover in WCA 1, 3, and 5							
Variable	*N	Mean	Standard Error of Mean	Standard Deviation	Q1	Median	Q3
<i>Toona ciliate</i> canopy	65	5.7	1.4	11.6	0.0	0.0	8.0
<i>Toona ciliate</i> understory	65	3.2	0.9	6.9	0.0	1.0	3.0
<i>Psidium cattleianum</i> canopy	65	24.2	3.1	25.0	0.0	15.0	45.0
<i>Psidium cattleianum</i> understory	65	9.0	1.6	12.6	0.3	2.5	15.0
<i>Coffea arabica</i> canopy	65	7.3	2.6	21.0	0.0	0.0	0.3
<i>Coffea arabica</i> understory	65	6.4	2.0	15.8	0.0	0.0	2.5
*N = # of plots							

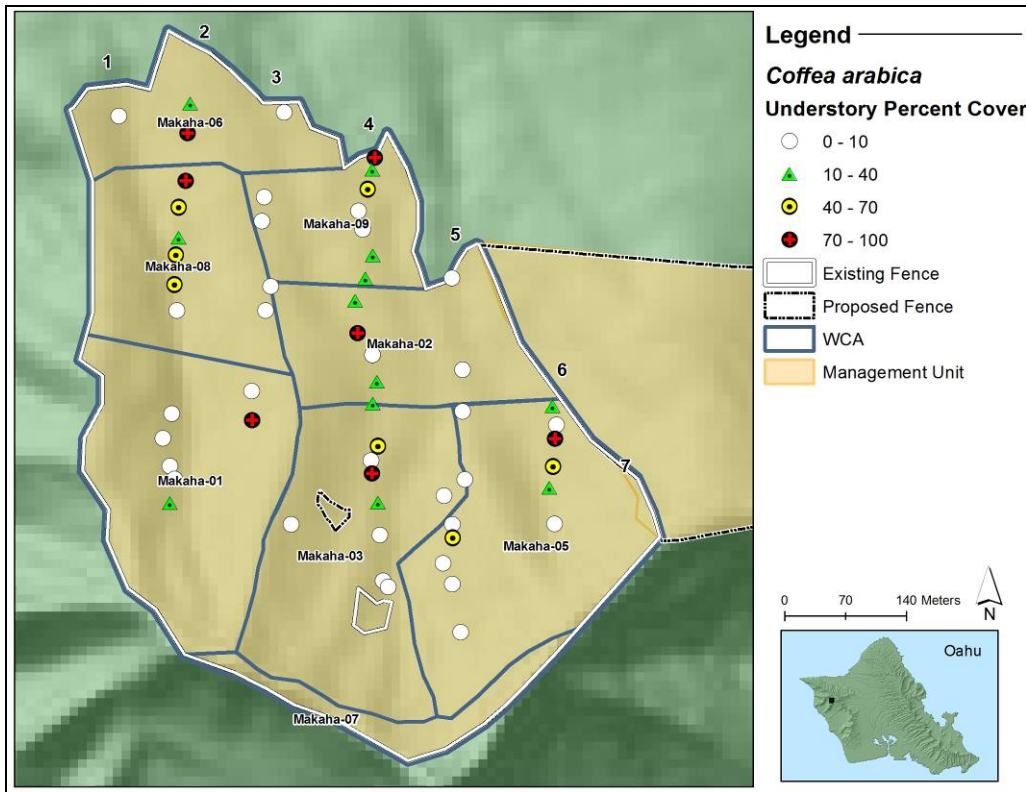
Psidium cattleianum distribution in the understory



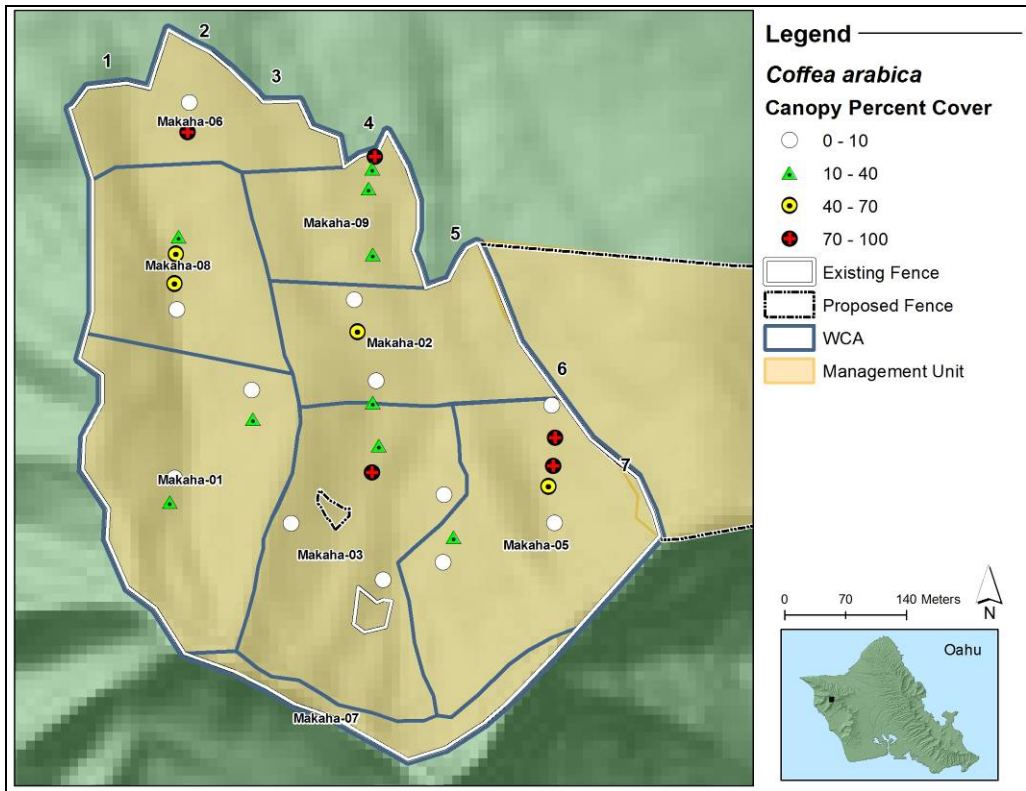
Psidium cattleianum distribution in the canopy



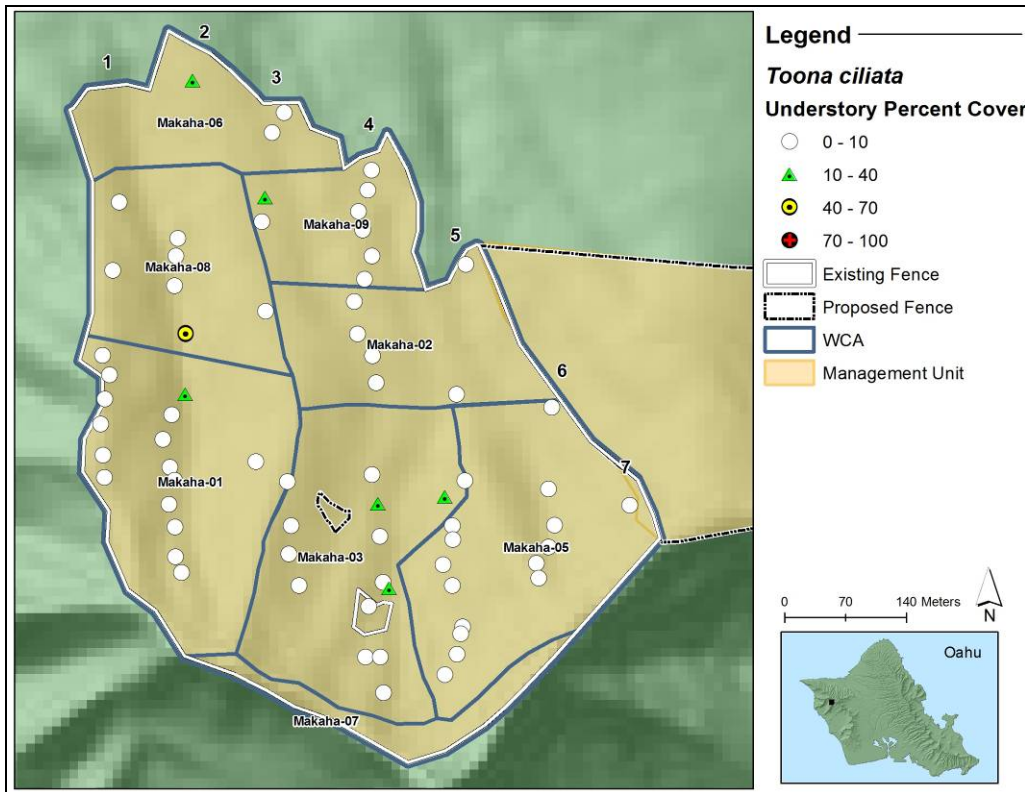
Coffea arabica distribution in the understory



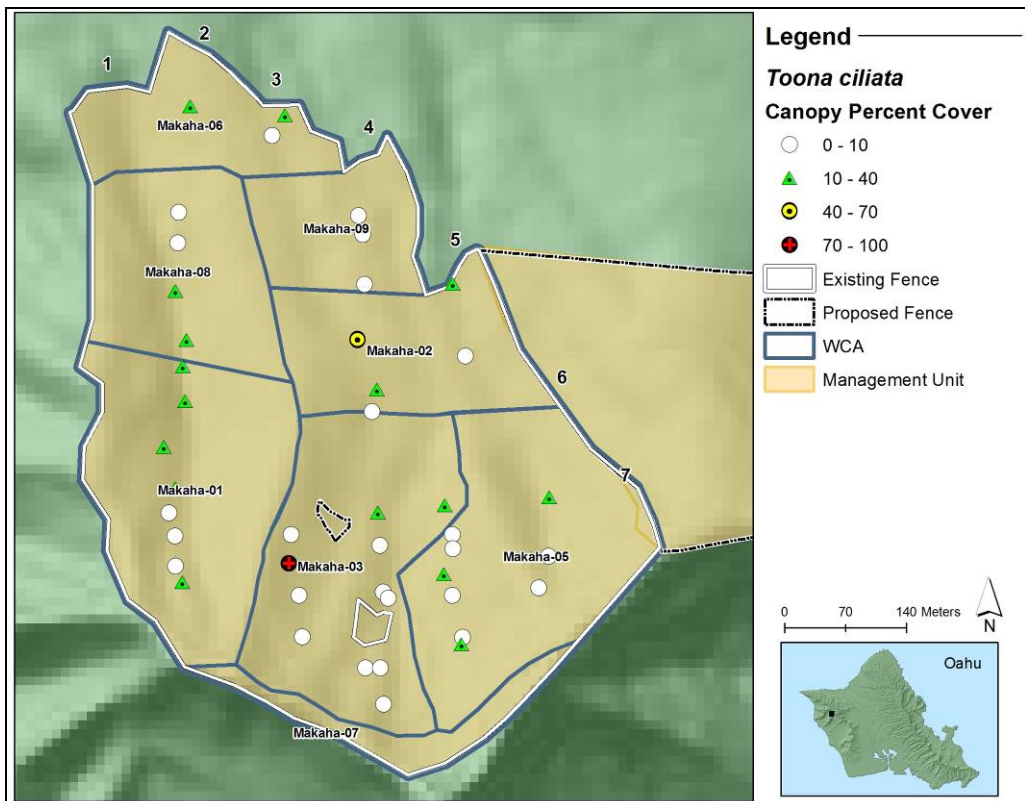
Coffea arabica distribution in the canopy



***Toona ciliata* distribution in the understory**



***Toona ciliata* distribution in the canopy**



Vegetation Monitoring Response:

- Increase weeding efforts if the alien vegetation goals are not being met in the MU.

Surveys

Army Training: No

Other Potential Sources of Introduction: NRS, pigs, public hikers

Survey Locations: Landing Zones, Fencelines, High Potential Traffic Areas, Roads

Management Objective:

- Detect the establishment of any new invasive alien plant or animal species through regular surveys along roads, landing zones, camp sites, fencelines, trails, and other high traffic areas (as applicable).
- Survey roads annually.
- Develop protocol for monitoring weeds along the fenceline transects.

Monitoring Objectives:

- Quarterly surveys of LZs (if used).
- Quarterly surveys of campsites for weeds (if used).
- Note unusual, significant or incipient alien taxa during the course of regular field work.

Management Responses:

- Any significant alien taxa found will be researched and evaluated for distribution and life history. If found to pose a major threat, control will begin and will be tracked via Incipient Control Areas (ICAs).

Surveys are designed to be the first line of defense in locating and identifying potential new weed species. Roads, landing zones, fencelines, and other highly trafficked areas are inventoried regularly; Army roads and LZs are surveyed annually, non-Army roads are surveyed annually or biannually, while all other sites are surveyed quarterly or as they are used. At Makaha, only roads and LZs are currently surveyed. See the *Survey Locations and Hunting Areas in Makaha* map. NRS will consider installing additional surveys in other high traffic areas as needed.

Incipient Taxa Control (ICAs)Management Objectives:

- As feasible, eradicate high priority species identified as incipient invasive aliens in the MU by 2015.
- Conduct seed dormancy trials for all high priority incipients by 2015.

Monitoring Objectives:

- Visit ICAs at stated revisitation intervals. Control all mature plants at ICAs and prevent any immature or seedling plants from reaching maturity.

Management Responses:

- If unsuccessful in preventing immature plants from maturing, increase ICA revisit interval.

ICAs are drawn around each discrete infestation of an incipient invasive weed. ICAs are designed to facilitate data gathering and control. For each ICA, the management goal is to achieve complete eradication of the invasive taxa. Frequent visitation is often necessary to achieve eradication. Seed bank, dormancy and life cycle information is important in determining when eradication may be reached. NRS will compile information for each ICA species and conduct research to understand the biology of incipient species.

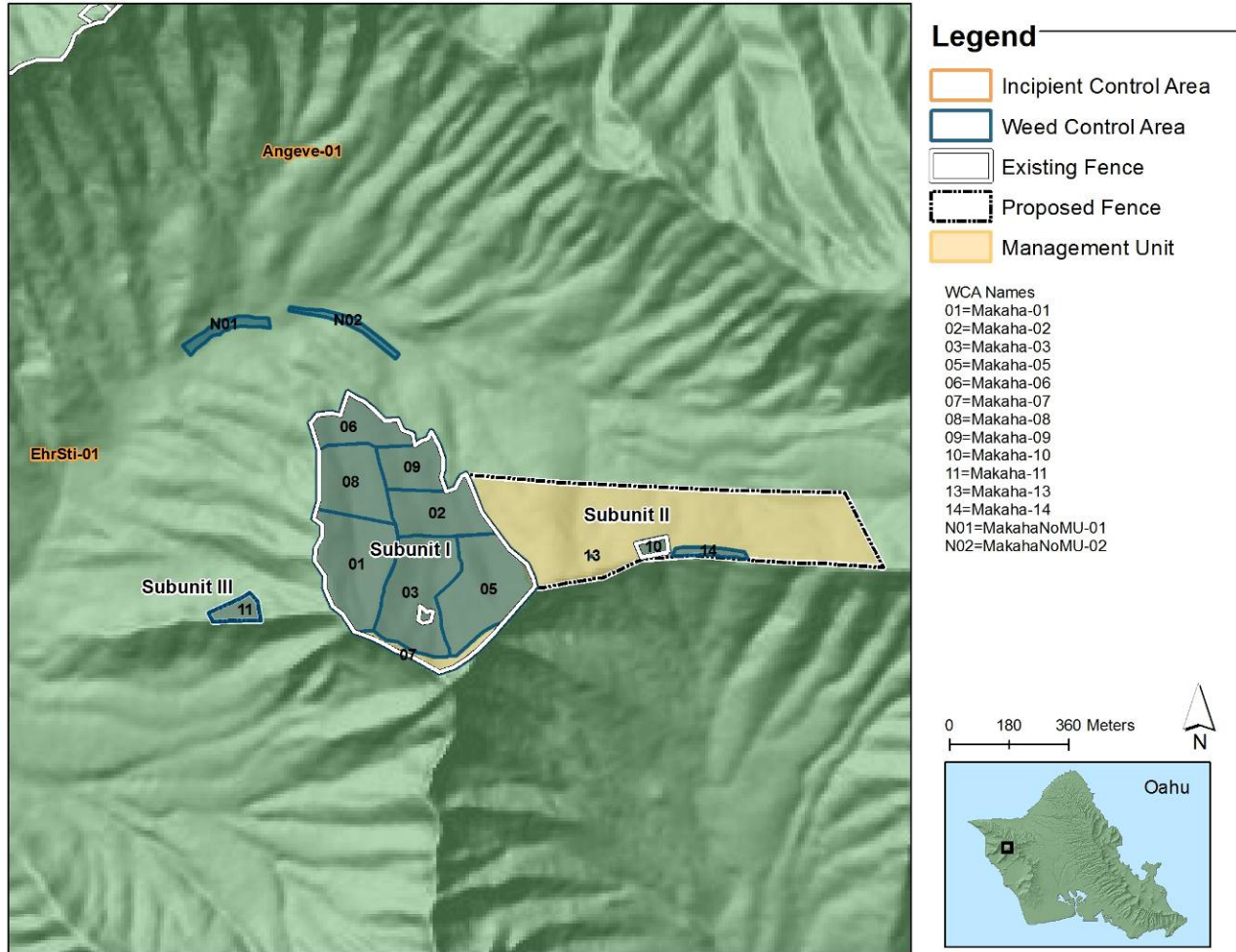
The Makaha MU was not evaluated in Appendix 3.1 of the MIP. This Appendix lists significant alien species and ranks their potential invasiveness and distribution. The table below summarizes incipient invasive taxa at Makaha, and is a substitute for Appendix 3.1. While the list is by no means exhaustive, it provides a good starting point for discussing which taxa should be targeted for eradication in an MU. ICAs are not designated for every species in the table below; however, occurrences of all species in the table should be noted whenever staff is in Makaha. All current ICAs are mapped. Three management designations are used here: Incipient (small populations, eradicable), Control Locally (significant threat posed, may or may not be widespread, control feasible at WCA level), and Widespread (common weed, may or may not pose significant threat, control feasible at WCA level).

Summary of Target Taxa

Taxa	Management Designation	Notes	No. of ICAs
<i>Angiopteris evecta</i>	Incipient	One mature was found in 2009 on the north side of the valley, outside of the MU. NRS will monitor in Nov. 2010 and remove any plants found.	1
<i>Cissus repens</i>	Control locally	Only location found on Oahu. Localized just off of road in between pumping station and the heiau combo-lock gate. OISC is controlling this population.	0
<i>Coffea arabica</i>	Widespread	Forms a band across MU. NRS will aggressively remove. (See WCA actions)	0
<i>Cordia alliodora</i>	Control locally	One of two locations found on Oahu (Waimea Valley is other site). Localized at Kaneaki Heiau, appears to be naturalizing. NRS will assist other organizations (i.e. BWS, OISC, Waianae Mountains Watershed Partnership) with control	0
<i>Dicliptera chinensis</i>	Control locally	Spreads rapidly. Localized in <i>C. superba</i> fence. NRS will aggressively remove. (See WCA actions)	0
<i>Ehrharta stipoides</i>	Incipient	Two mature were found in 2007 in parking lot. Monitored annually as part of road survey. Not seen since 2007.	1
<i>Mahogany spp.</i>	Control locally	Found on Keaau side of valley. Needs to be identified and area surveyed.	0
<i>Melia azederach</i>	Control locally	Uncommon in MU. NRS will target wherever seen.	0
<i>Pimenta dioica</i>	Control locally	Uncommon in MU. NRS will target wherever seen.	0
<i>Psidium cattleianum</i>	Widespread	Forms monotypic stands. NRS will evaluate the potential to be controlled with chipper.	0
<i>Rubus argutus</i>	Control locally	Control technique needs to be developed. Current control methods not 100% effective. NRS are careful to not transport seeds.	0
<i>Sideroxylon persimile</i>	Control locally	Found along access road and in Kamaili. Need to confirm species and survey for extent.	0
<i>Spathodea campanulata</i>	Control locally	NRS are currently controlling within the fence.	0

Taxa	Management Designation	Notes	No. of ICAs
<i>Toona ciliata</i>	Widespread	Spreads rapidly. NRS are currently targeting mature individuals. (See WCA actions)	0
<i>Trema orientalis</i>	Control locally	Uncommon in MU. NRS will target wherever seen.	0
<i>Triumfetta semitrilobata</i>	Widespread	NRS are removing from trails and targeting in WCAs.	0

Incipient and Weed Control Areas in Makaha



Ecosystem Management Weed Control (WCAs)

MIP Goals:

- Within 2m of rare taxa: 0% alien vegetation cover where removal does not harm rare taxa
- Within 50m of rare taxa: 25% or less alien vegetation cover
- Throughout the remainder of the MU: 50% or less alien vegetation cover

Management Objectives:

- Maintain 50% or less alien vegetation cover in the understory across the MU.
- Reach 50% or less alien canopy cover across the Priority 1 areas in MU within the next 15 years.
- In WCAs within 50m of rare taxa, work towards achieving 25% or less alien vegetation cover in understory and canopy.

Management Responses:

- Increase/expand weeding efforts if MU vegetation monitoring (conducted every 3 years) indicates that goals are not being met.

Vegetation monitoring in subunit I of Makaha indicates that the area meets the MU 50% or less alien cover goal in the understory, but does not meet the goal in the canopy. Many of the WCAs are drawn around rare taxa sites; based on vegetation/topography type. Currently, none of the WCAs meet the 25% or less weed cover goal for areas near rare taxa. Areas near rare taxa will be continued to be prioritized. The WCAs with top priority are 1, 3 and 5 due to rare taxa; therefore, weeding efforts are focused in these areas. The lower priority WCAs are 2, 6, 8 and 9 due to the lack of rare taxa. However, prolific seeding species such as *T. ciliata*, *S. campanulata* and *C. arabica* are targeted and volunteer efforts will continue in these areas. Within the areas of *A. mustelina* presence, NRS will seek to avoid unintentional negative impact by being cognizant of snail presence and avoiding control of preferred trees.

WCA: Makaha-01 (Upper Makai Gulch)

Veg Type: Mesic Ridge / Mid-Slope / Gulch

MIP Goal: 25% or less alien cover around *F. neowawraea* and other rare taxa in the central part of the WCA. 50% or less alien cover elsewhere.

Targets: All weeds, focusing on *C. arabica*, *P. cattleianum*, *S. terebinthifolius*, and *T. ciliata*.

Priority: High

Notes: There is a wild *F. neowawraea* and reintroductions of *F. neowawraea* in this WCA. This area has some predominantly native areas. Other rare species found in this WCA include *M. tenuifolia*, *Tetraplasandra kawaiensis*, *S. ruber* and *A. mustelina*. OANRP staff plan to work around the reintroductions twice a year and across the entire WCA once every year. This WCA contains the core of *T. ciliata* and is the primary target of WCA-wide sweeps.

WCA: Makaha-02 (Upper Flag City)

Veg Type: Mesic Ridges / Mesic Gulches

MIP Goal: 25% or less alien cover

Targets: All weeds, focusing on *T. ciliata*.

Priority: High priority around *F. neowawraea*, low priority for the rest of the WCA.

Notes: There is *P. macrocarpa* located near the north eastern corner. Much of this WCA is very weedy with large *P. cattleianum* and *C. arabica* stands. OANRP staff plan to work across the entire WCA once every two years.

WCA: Makaha-03 (Chaher /Fluneo Gulch)

Veg Type: Mesic Mid-Slope

MIP Goal: 25% or less alien cover

Targets: All weeds, focusing on, *T. ciliata*, *P. cattleianum*, *S. terebinthifolius*, and *C. arabica*.

Priority: High

Notes: This WCA contains the greatest number of rare taxa in Subunit I both in terms of total number of plants and diversity of species. This area hosts wild populations of *A. macrococcus* var. *macrococcus*, *F. neowawraea*, *I. laurifolium*, *M. makahae*, *M. tenuifolia*, *V. chamissoniana* subsp. *chamissoniana*, *G. meyenii*, *T. kavaiensis*, *S. lanceoloidea*, *S. ruber*, *D. falcata* and *A. mustelina*. Reintroductions of *C. superba* subsp. *superba*, *F. neowawraea*, *C. herbstii*, and *P. kaalaensis* have been implemented. OANRP staff must be extremely careful when weeding around all rare taxa, especially *C. herbstii* which have been observed to be recruiting heavily. Due to the density of managed taxa, the future actions in this WCA are high priority. OANRP plan to work around the reintroductions and rare taxa twice a year.

WCA: Makaha-05 (Hesarb Ridge)

Veg Type: Mesic Forest

MIP Goal: 25% or less alien cover

Targets: All weeds, focusing on, *T. ciliata*, *P. cattleianum*, *S. terebinthifolius*, and *C. arabica*.

Priority: High.

Notes: *S. nuttalii* have been reintroduced into this area. *H. arbuscula*, *G. meyenii*, *A. macrococcus* var. *macrococcus*, *S. lanceoloidea*, *L. Kaalae*, *S. hookeri*, *P. macrocarpa*, *M. makahae*, and *A. mustelina* occur naturally. OANRP staff must be extremely careful when weeding around all *A. mustelina*. A buffer of about 1.5m around all *H. arbuscula* should not be weeded to prevent trampling. One of the OANRP staff goals for this WCA is to promote recruitment around mature *H. arbuscula*. Due to the density of managed taxa the future actions in this WCA are high priority. OANRP plan to work around the reintroduction and rare taxa twice a year.

WCA: Makaha-06 (Camp Ridge)

Veg Type: Mesic Ridge

MIP Goal: 50% or less alien cover

Targets: All weeds, focusing on *T. ciliata*.

Priority: Low.

Notes: Waianae High School volunteers are the major weeding resource for this WCA. The main focus of volunteer groups is currently weed control in the lower section surrounding the *A. koa* transplants and archaeological site to mitigate weed threats from high foot traffic entering the fence through the gate. The OANRP staff focus in this WCA is to sweep for mature *T. ciliata* and other tree weeds.

WCA: Makaha-07 (Sub Unit I Fenceline)

Veg Type: Mesic Ridge

MIP Goal: 50% or less alien cover

Targets: All weeds, focusing on, *P. cattleianum*, *C. hirta*, *S. terebinthifolius*, *T. ciliata*, *T. semitrilobata*, and grasses

Priority: Medium.

Notes: Mostly cliff face, this WCA does include *V. chamissoniana* subsp. *chamissoniana*. The moderate priority is due to the importance of fence maintenance. Creating a weed buffer reduces seed transfer from weeds outside the management unit. High foot traffic is a concern for introducing weeds along the fenceline through predominantly native areas.

WCA: Makaha-08 (Lower Makai Gulch)

Veg Type: Mesic Ridges / Mesic Gulches

MIP Goal: 50% or less alien cover

Targets: All weeds, focusing on *T. ciliata*.

Priority: Low.

Notes: There are no managed taxa in this WCA. This weedy area is dominated by *T. ciliata*, *C. Arabica*, *G. robusta*, *S. terebinthifolius* and *S. campanulata*. OANRP staff plan to work across the entire WCA once a year to sweep for mature *T.ciliata* and other prolific seeders.

WCA: Makaha-09 (Lower Flag City)

Veg Type: Mesic Forest

MIP Goal: 50% or less alien cover

Targets: All weeds, focusing on, *T. ciliata*, *S. terebinthifolius*, *G. robusta*, *C. arabica*, *S. campanulata* and grasses.

Priority: Low

Notes: There are no managed taxa in this WCA. OANRP staff plan to work across the entire WCA once a year to sweep for mature *T.ciliata* and other prolific seeders.

WCA: Makaha-10 (Cyalon Fence)

Veg Type: Mesic Forest

MIP Goal: 25% or less alien cover

Targets: All weeds, focusing on, *P. cattleianum*, *G. robusta*, *C. hirta*, and *R. argutus*

Priority: High.

Notes: This WCA is located in subunit II. There is a wild population of *C. longiflora* within this WCA. This area is predominantly native forest. Other rare species found in this WCA are *P. cornuta* var. *decurrens*, and *B. elatior*. OANRP plan to work across the entire WCA every six months until MIP goals are achieved.

WCA: Makaha-11 (Makaha Nerang Ridge)

Veg Type: Mesic Forest

MIP Goal: 25% or less alien cover

Targets: All weeds, focusing on, *P. cattleianum*, *G. robusta*, *S. terebinthifolius*, *Melia azederach* and *R. argutus*

Priority: Low

Notes: This WCA not within any MU. There is a wild population of *N. angulata* within this WCA, but it is not a Manage For Stability population. Minimal weed control will be conducted, to facilitate the collection of propagules from this rare plant site.

WCA: Makaha-13 (Cyagri)

Veg Type: Mesic Forest

MIP Goal: 25% or less alien cover

Targets: All weeds, focusing on, *P. cattleianum*, *S. terebinthifolius*, and *C. hirta*.

Priority: High

Notes: There is a wild population of *C. grimesiana* subsp. *obatae* in this WCA. OANRP plan to work around the wild population annually to create a buffer from weeds.

WCA: Makaha-14 (Makaha-Waianae Kai Burn site)

Veg Type: Mesic Ridge

MIP Goal: 50% or less alien cover

Targets: All weeds, focusing on, *R. argutus*, *B. asiatica*

Priority: High.

Notes: This area used to be predominantly native. It burned in 2003. Rehab led by BWS was done to outplant common natives. Due to the burn, the area is mostly open canopy and is used as a landing zone. The surrounding area is comparatively native canopy with *A. koa* and *M. polymorpha*.

WCA: MakahaNoMU-01,02 (Access Trail)

Veg Type: Mesic Forest

MIP Goal: 50% or less alien cover

Targets: All weeds, focusing on, *T. semitriloba*.

Priority: High.

Notes: These WCAs are located along the access trail and is highly susceptible to weed spread due to heavy foot traffic from NRS, hunters and pigs. They will be combined into one continuous WCA.

Rodent Control

Species: *Rattus rattus* (Black rat), *Rattus exulans* (Polynesian rat), *Mus musculus* (House mouse)

Threat level: High

Control method: Localized control (small scale bait station and rat trap grids)

Seasonality: Year-round at tree snail locations

Number of control grids: 2 (8 bait stations, 16 rat traps)

Primary Objectives:

- To maintain rodent populations at a level that facilitates stabilized or increasing tree snail populations and to implement rodent control if determined necessary for the protection of rare plants.

Management Objective:

- Establish and maintain localized small scale bait station and rat trap grids around two *A. mustelina* populations.
- Implement rodent control on a small scale if determined necessary for the stability of rare plant populations.

Monitoring Objective:

- Monitor *Alectryon macrococcus* var. *macrococcus*, *Cyanea superba* subsp. *superba*, *Cyanea grimesiana* subsp. *obatae*, *Cyanea longiflora*, *Dubautia herbstobatae*, *Fleuggea neowawraea*, and *Hesperomannia arbuscula* to determine the occurrence of fruit/plant predation by rats. Monitor tree snails to determine if rats are impacting the tree snail populations within the rat control areas.

Localized Rodent Control Actions:

- Localized control consists of bait stations and rat traps deployed around trees containing tree snails. Bait stations and rat traps are maintained every 4 to 6 weeks.

Slug Control

Species: *Deroceras leave*, *Limax maximus*, *Veronicella cubensis* confirmed

Threat level: High

Control level: Localized

Seasonality: Wet season

Number of sites: No control currently taking place, however, surveys to occur at *Cyanea grimesiana* subsp. *obatae*, *C. longiflora*, and *C. superba* subsp. *superbsa* wild and reintroduction sites

Primary Objective: Eliminate slugs to facilitate germination and survivorship of rare plant taxa.

Management Objective:

- If additional Special Local Needs labeling is approved by USFWS and HDOA control slugs at sensitive plant populations via Sluggo application.

Monitoring Objectives:

- Annual census monitoring of *Cyanea grimesiana* subsp. *obatae*, *C. longiflora*, and *C. superba* subsp. *superba* seedling recruitment following fruiting events.
- Annual census monitoring of slug densities during wet season.

Predatory Snail Control

Species: *Euglandina rosea* (rosy wolf snail)

Threat level: High

Control level: Localized

Seasonality: Year-Round

Number of sites: 2 sites *A. mustelina*

Acceptable Level of Activity: Not tolerated within a 20 m radius of known *A. mustelina* populations

Primary Objective: Eliminate predatory snails to promote *A. mustelina* survival.

Management Objective:

- Continued to develop better methods to control predatory snails.
- Keep sensitive snail populations safe from predatory snails via currently accepted methods (such as hand removal of alien snails within 20 m radius of known *A. mustelina*).

Monitoring Objectives:

- Annual searches for predatory snails to confirm their absence or presence in proximity to *A. mustelina*.

No baits have been developed for the control of predatory snails. Little is known regarding their distribution and prey preference. Control is limited to hand removal. Opportunistic collection of *E. rosea* in this MU suggests they are common in gulches but are not as abundant on ridges where *A. mustelina* occur. Preliminary research by M. Meyer (2007)¹⁰ indicates that *E. rosea* does not disperse long distances (on average they move <0.25 m per day). This data suggest that keeping a 20 m *Euglandina* free buffer around *A. mustelina* populations would be adequate to protect native snails.

Ant Control

Species: *Anoplolepis gracilipes* confirmed

Threat level: Unknown

Control level: Only for new incipient species

Seasonality: Varies by species, but nest expansion observed in late summer, early fall

Number of sites: Three; Makaha parking lot LZ, and the two *A. mustelina* snail locations

¹⁰ Meyer, M. 2007. 2007 Status Reports for the Mākua Implementation Plan and the Draft O‘ahu Implementation Plan. Appendix 3-4: Year 2: Microhabitat utilization, population size estimates, and possible control of the introduced predatory snail *Euglandina rosea* on O‘ahu, Hawai‘i. http://manoa.hawaii.edu/hpicesu/DPW/2007_YER/Appendicies/Appendix_3-4_Eugros_research.pdf Accessed October 14, 2010

Acceptable Level of Ant Activity: Unknown, systematic ant sampling not yet undertaken

Primary Objective: Collect data on species present and control if ant densities are high enough to threaten rare resources.

Management Objective:

- If incipient species are found and deemed to be a high threat and/or easily eradicated locally (<0.5 acre infestation) begin control.

Monitoring Objective:

- Sample ants at Makaha parking lot LZ, and the two *A. mustelina* snail locations. Use samples to track changes in existing ant densities and to alert OANRP to any new introductions.
- Look for evidence of ant tending of aphids or scales on rare plants.

Ants have been documented to pose threats to a variety of resources, including native arthropods, plants (via farming of Hemipterian pests), and birds. It is therefore important to know their distribution and density in areas with conservation value. This can be accomplished using a survey methodology developed by S. Plentovich (UH Manoa). The protocol for sampling ants appears in Appendix 6-1 (this document).

Standardized surveys have not yet taken place. Opportunistic collection confirms that the Yellow Crazy Ant *Anoplolepis gracilipes* is present at the Makaha LZ (1,100 ft elevation). This species is widespread at elevations below 1,500 feet and any attempt at control would be temporary. While control is not recommended at this time, future surveys are needed to ensure new species are not introduced.

Black Twig Borer (BTB) Control

Species: *Xylosandrus compactus*

Threat level: High

Control level: Localized

Seasonality: Year-Round

Number of sites: Variable, depends on when air layers are taken from *F. neowawraea* or *A. macrococcus* var. *macrococcus*

Acceptable Level of Activity: Unknown

Primary Objective: Enhance success of air layering rare plant species

Management Objective: Reduce air layer failure due to BTB

OANRP has conducted extensive testing on the efficacy of trap deployment to reduce BTB damage. Results have been mixed. There is no significant evidence that trapping reduces damage, however, no other methods exist. As air layers appear to be heavily attacked but are only exposed to BTB for a finite amount of time, trap deployment and maintenance will take place until the air-layers either clearly succeed or fail. For more information on trap catch and efficacy please refer to Chapter 6.1 (this document).

Fire Control

Threat Level: Medium

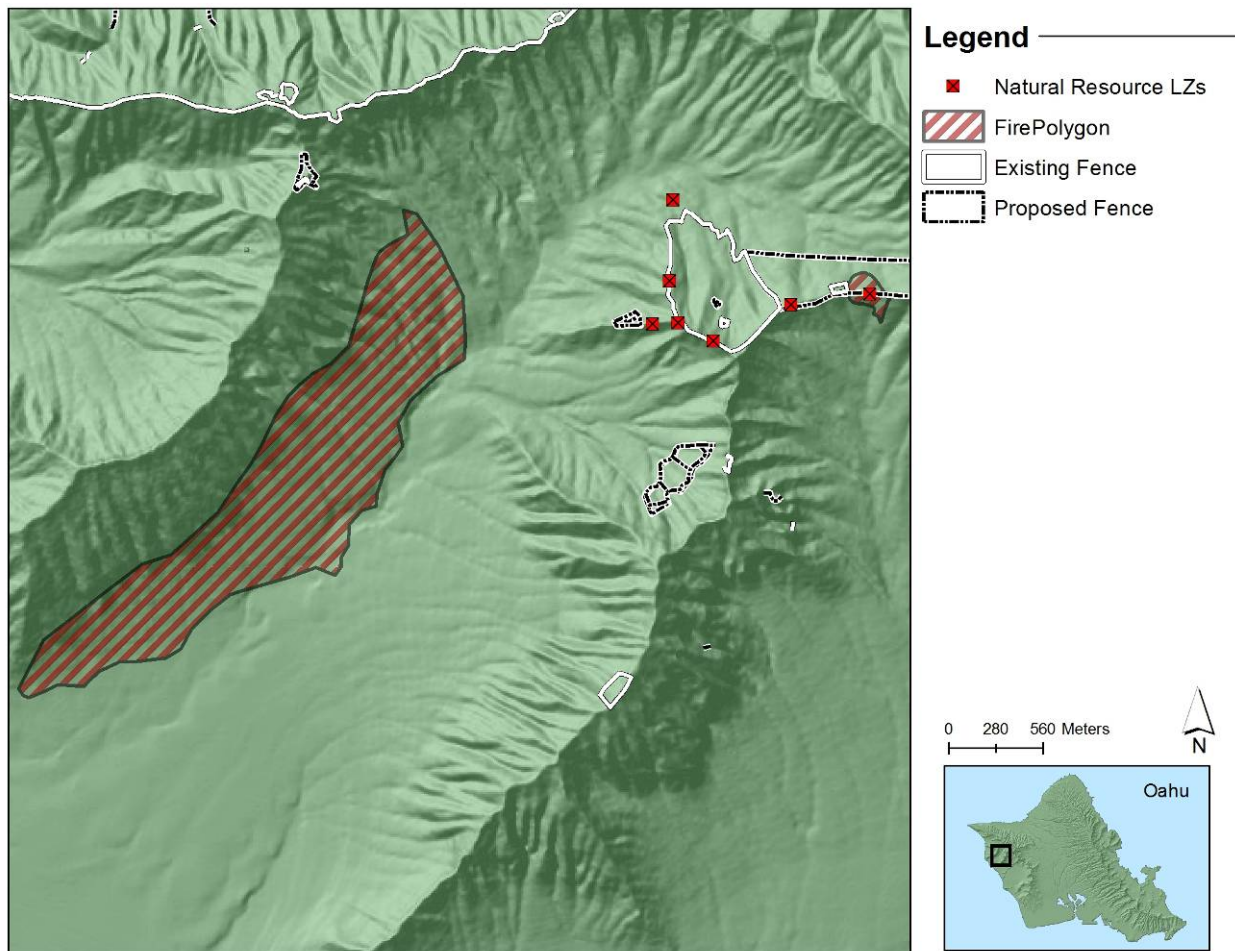
Available Tools: Fuel breaks, Visual Markers, Helicopter Drops, Wildland Fire Crew, Red-Carded Staff.

Management Objective:

- To prevent fire from burning any portion of the MUs at any time.

Preventative Actions

There is little infrastructure/construction which would be helpful to reduce fire threat. OANRP will focus on maintaining good communication with the Wildland Fire Working Group to facilitate positive on-the-ground fire response. OANRP will maintain red-carded staff to assist with fire response.

Burned Areas in Makaha

Action Type	Actions	MIP Year 7 Oct 2010- Sept 2011				MIP Year 8 Oct 2011- Sept 2012				MIP Year 9 Oct 2012- Sept 2013				MIP Year 10 Oct 2013- Sept 2014				MIP Year 11 Oct 2014- Sept 2015			
		4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3
		Vegetation Monitoring	Conduct vegetation monitoring across the accessible areas of Makaha.																		
General Survey	Survey Lyon-Makaha LZ whenever used, not to exceed once per quarter. If not used, do not need to survey.																				
	Survey Makaha Parking Area LZ whenever used, not to exceed once per quarter. If not used, do not need to survey.																				
	Survey Upper Makai Makaha LZ whenever used, not to exceed once per quarter. If not used, do not need to survey.																				
	Survey Middle Makai - Makaha LZ whenever used, not to exceed once per quarter. If not used, do not need to survey.																				
	Survey Lower Makai Makaha LZ whenever used, not to exceed once per quarter. If not used, do not need to survey.																				
	Survey Makaha Camp Ridge LZ whenever used, not to exceed once per quarter. If not used, do not need to survey.																				
	Survey Kumaipo Ridge LZ whenever used, not to exceed once per quarter. If not used, do not need to survey.																				
	Survey Burn Site LZ whenever used, not to exceed once per quarter. If not used, do not need to survey.																				
	Survey road from first gate to parking area at the end of the road.																				
	Survey Kumaipo burn site for germination from erosion control breaks																				
Develop and install fenceline weed monitoring protocol																					

Action Type	Actions	MIP Year 7 Oct 2010- Sept 2011				MIP Year 8 Oct 2011- Sept 2012				MIP Year 9 Oct 2012- Sept 2013				MIP Year 10 Oct 2013- Sept 2014				MIP Year 11 Oct 2014- Sept 2015			
		4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3
			Collect sample of unknown Mahogany sp. on NW side of valley. Depending on what species is, evaluate whether a survey is justified to determine extent of species spread. Use data to evaluate infestation, discuss with OISC/OED, and determine possibl																		
	Collect sample of Sideroxyylon persimile from NW side of valley and confirm identification with Bishop Museum. Depending on what species is, evaluate whether a survey is justified to determine extent of species spread. Use data to evaluate infestation.																				
ICA	MakahaNOMU-EhrSti-01. Monitor/control EhrSti in parking lot every year. Pick and remove from field any potentially mature fruit. This species is cryptic and can be difficult to id.																				
	MakahaNOMU-AngEve-01. Monitor/control AngEve in north Makaha every 6 months to a year. Foliar spray of G4 works well; to reduce non-target drift, cut off large fronds of mature plants and treat when new croziers appear.																				
	Conduct trials to determine best means of controlling CorAll. Need to locate trial site, either at Makaha (check with BWS) or at Waimea Botanic Garden (check with David Orr).																				
	MakahaNOMU-CorAll-01. Monitor/control CorAll infestation near heiau. Joint effort with OISC, BWS, heiau kupuna, Waianae Mts. Watershed Partnership. OANRP not the lead on this project, but an active participant. Timeline to be determined by OISC.																				

Action Type	Actions	MIP Year 7 Oct 2010- Sept 2011				MIP Year 8 Oct 2011- Sept 2012				MIP Year 9 Oct 2012- Sept 2013				MIP Year 10 Oct 2013- Sept 2014				MIP Year 11 Oct 2014- Sept 2015			
		4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3
			Monitor/control LepSco infestation along Kumaipo, towards Kaala. Joint effort with OISC, BWS, Waianae Mts. Watershed Partnership. OANRP to coordinate effort.																		
	Makaha-MorFay-01. Monitor/control Morfay every 6 months																				
General WCA	GPS boundaries of all existing WCAs. Use geographical and vegetation data. Use landmarks to mark in field																				
	GPS trails																				
	After completion of Subunit II, survey unit to scope potential weed control actions																				
	Scope creation of new WCAs in Subunit II to facilitate canopy weed and grass control.																				
	Define and GPS boundaries of new WCAs and begin control.																				
	Modify ERMUP to reflect these new WCAs																				
Makaha-01	Control Toocil across WCA annually. Target mature trees as top priority, then immature trees. If no native species present, spray seedling beds; otherwise, let seedling beds seld-thin. Treat other significant weeds during sweeps also: Grerob, Spac																				
	Control weeds across Phykaa and Fluneo Mak-I reintro zone/2 acre core every 3-6 months. Target understory weeds and gradual control of canopy weeds to prevent major light changes. Targets include: Schter, Budasi, Psigua, Psicat, Toocil.																				
Makaha-02	Control weeds around Fluneo reintro quarterly, as needed. Target understory, canopy, and grasses. Maintain high light levels at this site.																				

Action Type	Actions	MIP Year 7 Oct 2010- Sept 2011				MIP Year 8 Oct 2011- Sept 2012				MIP Year 9 Oct 2012- Sept 2013				MIP Year 10 Oct 2013- Sept 2014				MIP Year 11 Oct 2014- Sept 2015			
		4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3
			Control canopy weeds and select understory across WCA every 2 years. Focus around native forest patches. Target Toocil, Schter, Psicat, Riccom, Rubarg, Trisem.																		
Makaha-03	Control weeds around Chaher and Phykaa reintros every 6 months. Target understory weeds, some canopy control (TooCil). Spray Dicchi as needed.																				
	Control weeds around Fluneo reintros (1) quarterly. Target both canopy and understory, grasses especially; area to be maintained for high light levels.																				
	Control weeds around Cyasup reintro fence every 6 months. Target both understory and canopy species.																				
	Control Cofara, targeting thick stands. Possible Chipper site. Potential volunteer site. Goal: reduce Cofara by 25% every year. PUBLIC OUTREACH.																				
	Control canopy weeds and select understory across WCA every 2 years. Target Toocil, Schter, Psicat, Riccom, Rubarg, Trisem, TreOri, Schter, Psicat, Cofara. Focus around Flueno, Alemac but reduce cover gradually to prevent shocking light changes.																				
	Control weeds around Cenagr reintro zone annually. Target understory.																				
Makaha-05	Control weeds around Schnut reintro zone annually (both in donut fence and outside). Target understory (Clihir, Rubarg) and gradual canopy control (Schter, Psicat).																				
	Control understory weeds across Hesarb zone annually. Hesarb extremely sensitive to trampling; minimize effort directly around them.																				

Action Type	Actions	MIP Year 7 Oct 2010- Sept 2011				MIP Year 8 Oct 2011- Sept 2012				MIP Year 9 Oct 2012- Sept 2013				MIP Year 10 Oct 2013- Sept 2014				MIP Year 11 Oct 2014- Sept 2015			
		4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3
			Conduct canopy weed control across WCA; cover entire WCA once every 2 years. Gradually remove canopy so as to not drastically change light regime at any one time. Target Toocil.																		
Makaha-06	Facilitate Waianae Highschool field trips to this WCA. Includes: outreach about conservation and OANRP, weed control, planting.																				
	Control Psicat, Cofarb, other weeds surrounding mature Acakoa/common native forest patches every 6 months. Goal: treat 2 acres per year. Time control to avoid peak Psicat germination window; Dec -June ideal. Complement Waianae Highschool plots. Use volunteers.																				
	Conduct weed control across WCA every 2 years. Focus on significant weeds, particularly TooCil, GreRob, TriSem. Target understory in previously treated Psicat stands. Target canopy weeds other than Psicat across MU (Grerob, Toocil).																				
Makaha-07	Clear/maintain fence, as needed. Remove downed trees, spray grass, treat thick understory, as needed.																				
Makaha-08	Control mature Toocil across WCA annually. Goal: reduce potential spread of Toocil across MU. Treat other significant weeds during sweeps also: Grerob, Spacam, Trisem, isolated-small Cofarb.																				
Makaha-09	Conduct canopy and select understory weed control across WCA; cover entire WCA once every 3 years. Focus on TooCil, GreRob, SpaCam, TriSem, grasses.																				

Action Type	Actions	MIP Year 7 Oct 2010- Sept 2011				MIP Year 8 Oct 2011- Sept 2012				MIP Year 9 Oct 2012- Sept 2013				MIP Year 10 Oct 2013- Sept 2014				MIP Year 11 Oct 2014- Sept 2015			
		4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3
		Makaha-10	Control weeds across enclosure every 6 months. Focus around Cyalon and native forest patches. Target understory weeds (Clihir, Rubarg). Target canopy weeds for gradual control; reduce Psicat canopy by no more than 40% annually.																		
Makaha-11	MAY NOT MANAGE, MFS STATUS UNDER CONSIDERATION. Control weeds across (proposed) enclosure annually. Focus efforts around rare taxa (Abusan, Nerang, Nothum). Target understory (Rivhum) and canopy (Schter, Melaze). Increasing light levels in 10m radius will aid rare taxa.																				
	MAY NOT MANAGE, MFS STATUS UNDER CONSIDERATION. Experiment with cliffside weeding. Focus on ledges below mature Nerag, to facilitate recruitment.																				
Makaha-13	Control weeds in 2m buffer around Cyagrioba annually.																				
Makaha-14	Work at this site only in conjunction with BWS/DOFAW; these agencies should prompt trip scheduling. Conduct weed control across burn site at Kumaipo. Target Rubarg, Budasi, weedy trees.																				
MakahaNoMU-01, 02	Maintain trail to facilitate MU access. Conduct control as needed. In particular, target Trisem to reduce likelihood of it spreading via NRS.																				
Ungulate Control	Monitor and maintain fence integrity - Subunit I fence.																				
	Fence construction - Subunit II fence																				
	Monitor and maintain fence integrity - Subunit II fence.																				
	Fence construction - Kamaili fence																				
	Monitor and maintain fence integrity - Kamaili fence.																				
	Monitor and maintain fence integrity - Cyalon fence.																				

Action Type	Actions	MIP Year 7 Oct 2010- Sept 2011				MIP Year 8 Oct 2011- Sept 2012				MIP Year 9 Oct 2012- Sept 2013				MIP Year 10 Oct 2013- Sept 2014				MIP Year 11 Oct 2014- Sept 2015			
		4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3
			Monitor and maintain fence integrity - Chaher fence																		
	Maintain fence integrity - Cyasup fence																				
	Scope for ungulate sign throughout all fences.																				
	Trap building / maintenance, as appropriate.																				
Rodent Control	Install two small scale control grids for tree snail protection																				
	Maintain bait stations and rat traps every 4-6 weeks in snail areas																				
	Monitor rare plants and tree snails for predation by rodents																				
	Implement localized rodent control if determined to be necessary for the protection of rare plants																				
Predatory Snail Control	If <i>E. rosea</i> discovered in the vicinity of <i>A. mustellina</i> sites, conduct sweeps and remove predatory snails																				
Slug Control	Monitor slug activity at <i>Cyanea grimesiana</i> subsp. <i>obatae</i> , <i>C. longiflora</i> , and <i>C. superba</i> subsp. <i>superba</i> population(s)																				
BTB Control	Set traps with high release enthanol baits and replenish insectical strips once every three weeks at air layers established on <i>F. neowawraea</i> and <i>A. macrococcus</i> var. <i>macrococcus</i>																				
Ant Control	Conduct surveys for ants at <i>A. mustelina</i> sites and at Makaha LZ																				
	Implement control if deemed necessary																				

hatched=planned Qtr