

**Kapunakea Preserve, West Maui, Hawai'i  
Final Long-Range Management Plan  
Fiscal Years 2016-2021**

Submitted to the  
**Department of Land & Natural Resources  
Natural Area Partnership Program**

Submitted by  
**The Nature Conservancy – Hawai'i Operating Unit**  
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## EXECUTIVE SUMMARY

The Nature Conservancy of Hawai'i is an affiliate of The Nature Conservancy (TNC), an international private, non-profit organization based in Arlington, Virginia. The mission of The Nature Conservancy is to conserve the lands and waters on which all life depends. Since 1980, the Conservancy has protected more than 200,000 acres of natural lands in Hawai'i and works with other public and private landowners to protect the islands' key watersheds. The Conservancy manages a statewide network of 11 preserves totaling 40,000 acres and works in 12 coastal communities to protect the coral reefs and near-shore waters of the main Hawaiian Islands.

The State's Natural Area Partnership Program (NAPP) is an innovative program that aids private landowners in the management of their native ecosystems. NAPP provides matching funds (\$2 state to \$1 private) for the management of qualified private lands that have been permanently dedicated to conservation. Kapunakea Preserve is one of two state-funded Nature Conservancy of Hawai'i (TNCH) preserves on Maui. Kapunakea was approved for NAPP funding in 1992, and soon thereafter TNCH implemented the management programs described in our initial plan, *Kapunakea Preserve FY1992 – FY1997 Long-Range Management Plan (LRMP)*. In 2008, a revised Environmental Assessment was authorized. Funding was reauthorized for additional six-year periods in 1997 with an updated long-range plan and EA in 2003, and most recently in 2009 for the *Kapunakea Preserve FY2010 – FY2015 Long Range Management Plan*. In 2014, the NAPP program implemented the use of a streamlined, data-driven spreadsheet to propose and report on deliverables. The spreadsheet is attached and referred to throughout this document in the relevant programmatic sections

TNCH is currently seeking reauthorization of NAPP funding for the next six-year period for the programs described within this *Kapunakea Preserve FY2016–FY2021 Long-Range Management Plan*. This plan continues the programs implemented under the previous plans and environmental assessments. Herein, we request **\$663,600** in matched state funds for the six years spanning FY2016 – 2021. This is a 15% total reduction in our request for support from the last long-range plan (\$781,880). This plan was prepared in compliance with the NAPP agreement between the state, TNCH, and Hawai'i Administrative Rules Chapter 13-210.

We successfully implemented the resource management projects of the previous six-year long-range plan. See Table 1 and Figures 1–4.

Table 1. Overview of Kapunakea Preserve Accomplishments by Programs, FY10–FY14 (5 Years)

<b>Indicator</b>	<b>Measure of Success</b>
<b>Ungulate Control</b>	
Total animal catches in upper and lower preserve	<ul style="list-style-type: none"> <li>• Zero pigs removed from upper preserve (Figs. 1 &amp; 2). Upper preserve ungulate free since 1999</li> <li>• 63 pigs removed in lower preserve (Fig. 2)</li> </ul>
Total snares checked	<ul style="list-style-type: none"> <li>• All snares checked four times annually in lower preserve &amp; semiannually in upper preserve</li> </ul>
Miles of fence installed maintained or replaced in Kapunakea	<ul style="list-style-type: none"> <li>• ~1800 meter fence maintained monthly or semi-monthly</li> <li>• New Honokōwai valley fence completed (72 m) &amp; maintained</li> <li>• Gates improved or replaced</li> </ul>
<b>Invasive Plant, Invertebrate and Small Mammal Control</b>	
Acres and total numbers of priority invasive plants treated or removed	<ul style="list-style-type: none"> <li>• 646 <i>Tibouchina</i> plants removed from upper bogs</li> <li>• 2897 strawberry guava outliers removed</li> <li>• 126 <i>Clidemia</i> removed</li> <li>• 70 strawberry guava treated with Herbicide Ballistic Technology<sup>1</sup></li> </ul>
# of discovered or reported incipient, invasive species removed	<ul style="list-style-type: none"> <li>• 2 <i>Juncus planifolius</i> were removed in the upper bogs along Transect 3</li> <li>• A small population of <i>Acacia mearnsii</i> was detected, treated &amp; confirmed dead</li> </ul>
<b>Resource Monitoring</b>	
Frequency of ungulate sign	<ul style="list-style-type: none"> <li>• 2 transects monitored semi-annually (9968 m total)</li> <li>• Transects stations above 3500' showed zero sign of ungulates (Fig. 3)</li> </ul>
Acres surveyed for plant infestations	<ul style="list-style-type: none"> <li>• Aerial surveys conducted for <i>Tibouchina</i> &amp; <i>Psidium</i> mapping and priority weed outlier identification</li> <li>• Presence/absence of priority weeds documented on transects (Fig. 4)</li> <li>• 106 acres surveyed on the ground for strawberry guava, with all individuals treated</li> <li>• 19 acres surveyed on the ground for <i>Tibouchina</i> with all individuals treated</li> <li>• 15 acres surveyed on the ground for <i>Clidemia</i> with all individuals treated</li> <li>• Weeds controlled at LZs, campsites &amp; upper trails</li> <li>• Priority weed maps have been updated quarterly</li> </ul>
<b>Rare Species Protection and Research</b>	
Numbers of new rare taxa discovered and/or mapped	<ul style="list-style-type: none"> <li>• Rare plant surveys conducted annually via PEP</li> <li>• 6 PEP targets found in Preserve</li> <li>• 45 new rare taxa locations for <i>Liparis hawaiiensis</i> (10), <i>Bobea sandwicensis</i> (26), <i>Bonamia menziesii</i> (2), <i>Exocarpus gaudichaudii</i> (2), <i>Melicope hawaiiensis</i> (2), <i>Partulina perdix</i> (2), &amp; <i>Pterodroma sandwichensis</i> ('ua'u) (1)</li> </ul>
Number of research projects supported in Kapunakea	<ul style="list-style-type: none"> <li>• Access support was provided to PEPP for <i>Colubrina oppositifolia</i> scouting, &amp; MNBG for <i>Colubrina oppositifolia</i> air layering trials</li> <li>• Access was granted to PEP for independent rare plant surveys</li> <li>• 2 invertebrate &amp; 1 botanical research project conducted</li> </ul>

<sup>1</sup> HBT efforts were not funded by NAPP funds

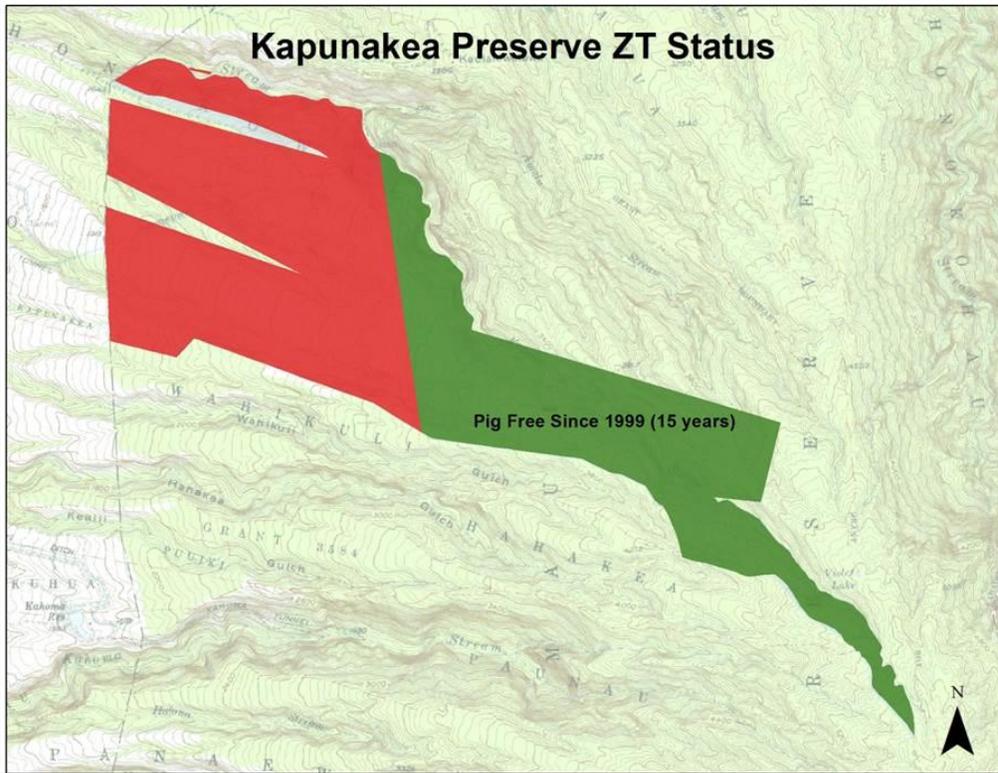


Figure 1. Kapunakea's upper areas (above 3,200') have been pig free for ~ 15 years.

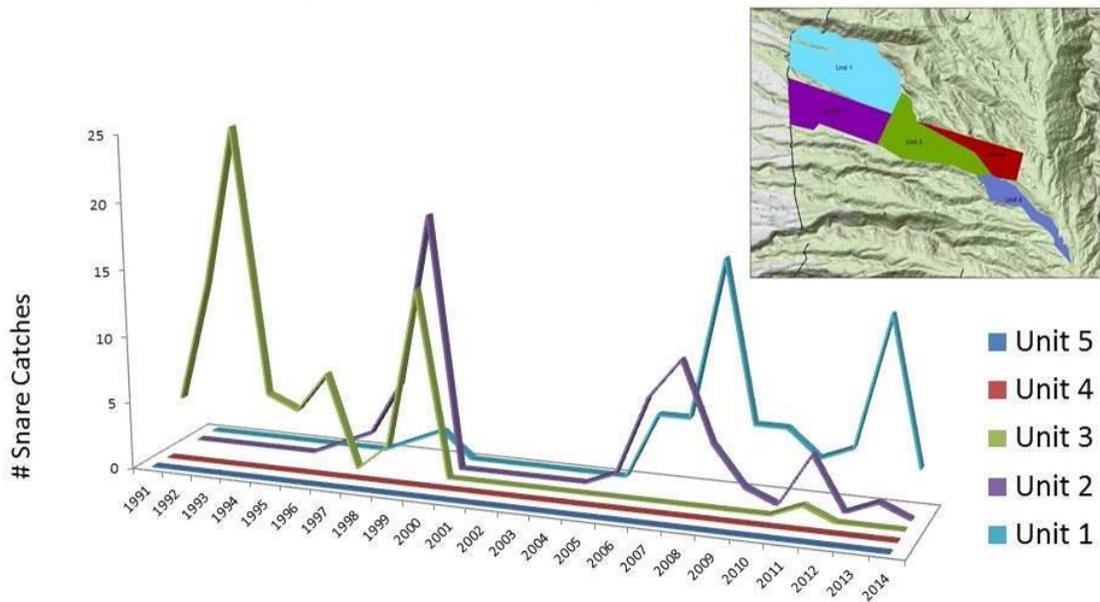
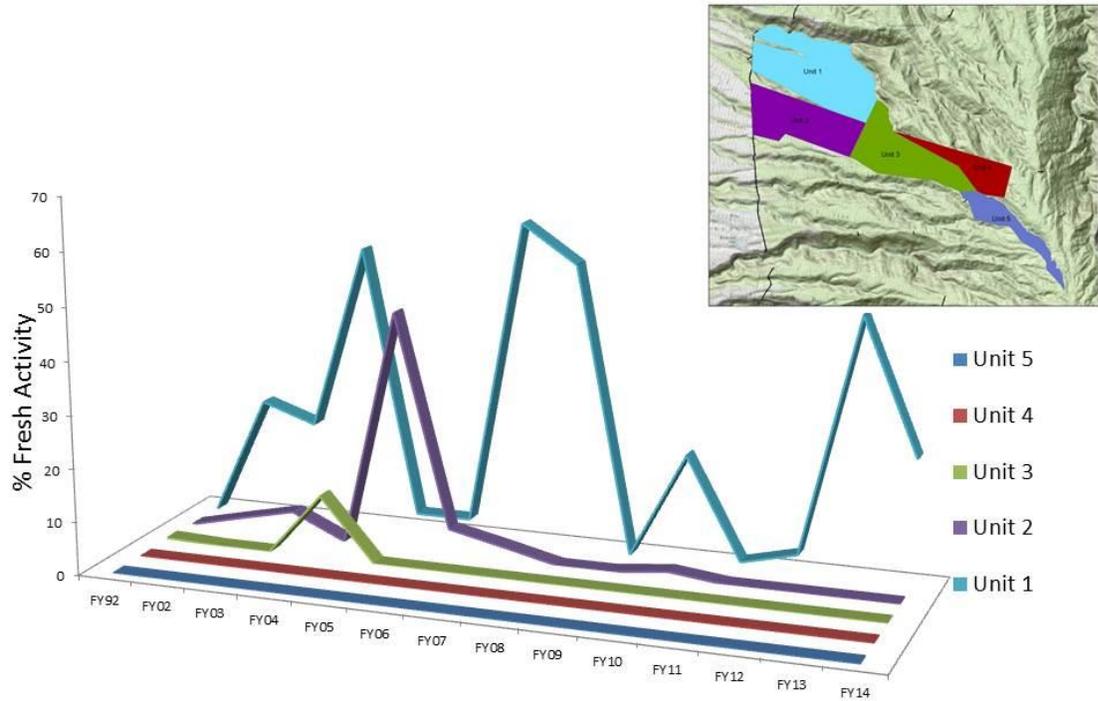


Figure 2. Kapunakea ungulate catches by unit, 1991-2014.



Unit 4 data for FY92 and FY14 only.

Figure 3. Kapunakea Ungulate Transect Activity, FY92-FY14.

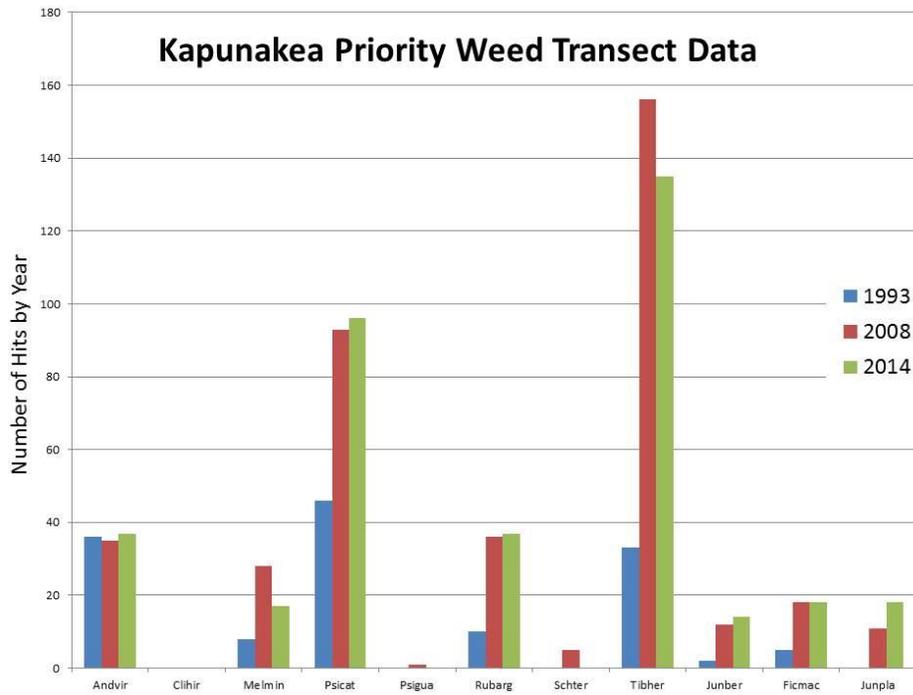


Figure 4. Kapunakea Weed Transect Presence, 1993-2014.

Over the next six years TNCH plans to continue to subaward or contract management activities at Kapunakea. During the past 8 years, the West Maui Mountains Watershed Partnership (WMMWP) helped to manage Kapunakea via a subaward to Tri-Isle RC&D. WMMWP is mandated to conserve and protect 50,000 acres of important forest lands of West Maui, which includes Kapunakea Preserve. WMMWP considers continuation of Kapunakea’s management programs key to the viability of the West Maui Mountains. As such, TNC seeks to continue to subaward with WMMWP or other expert contractor to conduct primary and ongoing management activities in Kapunakea Preserve.

## ANNUAL DELIVERABLES SUMMARY

The annual deliverables listed below are estimated projections, and are derived directly from the NAPP Deliverables spreadsheet (also attached), for easy reference.

<b>UNGULATE CONTROL</b>					
<i>Subunit</i>	<i>Threat</i>	<i>Current Status</i>	<i>Goal Action</i>	<i>Goal Quantity of Action</i>	<i>Frequency</i>
Unit 1 Kapunakea	Pigs	Decreasing	# traps checked	186	Quarterly
Unit 2 Kapunakea	Pigs	Decreasing	# traps checked	295	Quarterly
Unit 2 Kapunakea	Pigs	Decreasing	# traps checked	39	Semiannual
Unit 3 Kapunakea	Pigs	None present	# traps checked	186	Quarterly
Unit 4 Kapunakea	Pigs	None present	# traps checked	317	Semiannual
Unit 5 Kapunakea	Pigs	None present	# traps checked	0	Semiannual
Honokowai, outside of Preserve	Pigs	Decreasing	# traps checked	61	Quarterly
Honokowai, outside of Preserve	Pigs	Decreasing	# traps checked	93	Semiannual
<b>FENCE WORK</b>					
<i>Fence Section</i>	<i>Goal Action</i>	<i>Goal Meters for Action</i>	<i>Frequency</i>		
W17	Inspect/maintain	590	Monthly		
W17A	Inspect/maintain	150	Monthly		
W22	Inspect/maintain	72	Monthly		
W19	Inspect/maintain	63	Monthly		
W16	Inspect/maintain	1111	Monthly		
W20	Inspect/maintain	55	Semiannual		
W12	Inspect/maintain	126	Semiannual		
<b>WEED CONTROL</b>					
<i>Subunit</i>	<i>Species Targets</i>	<i>Action</i>	<i>Acres of Survey</i>	<i>Weed Status</i>	<i>Frequency</i>
Unit 1 Kapunakea	Psicat as biocontrol target	Other	424	Constant	Annual
Unit 2 Kapunakea	Psicat biocontrol	Other	310	Constant	Annual

Unit 2 Kapunakea	Acamea	Ground sweep and control	1	Decreasing	Annual
Unit 2 Kapunakea	Clihir	Ground sweep and control	4	Decreasing	Annual
Unit 3 Kapunakea	Psicat	Ground sweep and control	20	Decreasing	Annual
Unit 4 Kapunakea	Tibher	Aerial survey, no control	50	Unknown	Annual
Unit 4 Kapunakea	Tibher	Ground sweep and control	3	Unknown	Annual
Unit 5 Kapunakea	Tibher	Ground sweep and control	6	Decreasing	Annual

### MONITORING

<i>Transect/Station Name</i>	<i>Transect length</i>	<i>Monitoring type</i>	<i>Action</i>	<i>Quantity of action</i>
KAPUNAKEA2	3139 m	Weed and ungulate	Check	Semiannually
KAPUNAKEA3	6829 m	Weed and ungulate	Check	Semiannually
Honokōwai	2950 m	Weed and ungulate	Check	Semiannually

### SPECIES MONITORING

<i>Species</i>	<i># species expected</i>	<i>Proposed Action</i>	<i>Frequency</i>
Alemac	12	Check	Biannual
Bidmic	1	Check	Other
Bobsan	27	Check	Biannual
Bonmen	5	Check	Biannual
Cleobl	2	Check	Biannual
Colopp	2	Check	Biannual
Cyalob	2	Check	Biannual
Cyrfil	2	Check	Biannual
Cyrmun	10	Check	Other
Exogau	10	Check	Biannual
Hibkok	3	Check	Other
Liphaw	50	Check	Biannual
Parper	-	Check	Other
Partap	-	Check	Other
Plahol	1	Check	Biannual
Ptesan	-	Check	Other
Ranmau	4	Check	Other
Sanfre	2	Check	Biannual
Syccum	-	Check	Biannual
Vescoc	-	Check	Other

# RESOURCE SUMMARY

## General Setting

Kapunakea Preserve was established in 1992 through a perpetual conservation easement with Pioneer Mill Company, Limited. The current landowner is Kā'anapali Land Management Corp., successor in interest to Pioneer Mill Company, Limited. The conservation easement seeks to preserve and protect the natural, ecological and wildlife features of the property. Kapunakea Preserve is 1,264 acres. The preserve's upper elevations are recognized as among the highest quality native areas in the state. Kapunakea Preserve is adjacent to two other natural areas that are actively managed: Pu'u Kukui Watershed Preserve (which is privately owned and part of the NAP program) and the Honokōwai section of the state West Maui Natural Area Reserve (NAR). The WMMWP is mandated to conserve and protect important forest lands of West Maui, which include Kapunakea Preserve, Pu'u Kukui and the West Maui NARs. These managed native forests and natural areas comprise more than 13,000 acres of contiguous, managed watershed. Kapunakea Preserve is an integral part of a continuous, managed watershed, serving as the primary source of freshwater for area residents, farms and businesses and providing essential habitat for a number of rare, native, and endangered species.

## Flora and Fauna

Kapunakea contains 11 native-dominated natural communities, ranging from lowland shrublands to montane forests and bogs, including the rare 'ōhi'a mixed montane bog (Figure 5, Appendix 1). Four of the communities are not found in the nearby West Maui NAR, most notably koa/ 'ōhi'a (*Acacia koa*/*Metrosideros polymorpha*) lowland mesic forest and lama/'ōhi'a (*Diospyros sandwicensis*/*Metrosideros polymorpha*) lowland mesic forest. Figure 1 depicts the vegetation communities present in Kapunakea Preserve, established through TNC's Ecoregional Planning process.

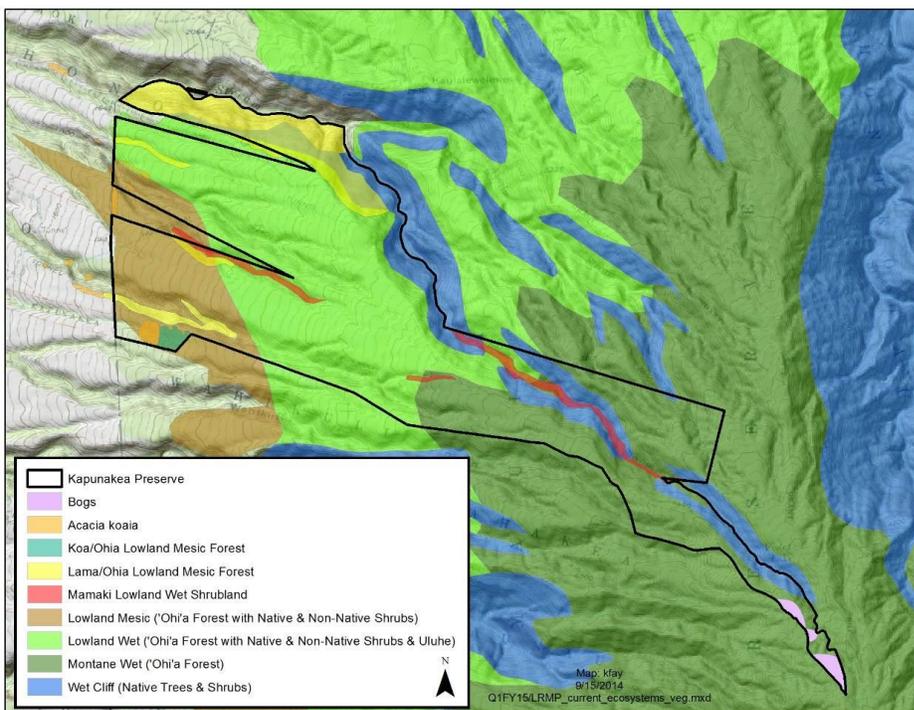


Figure 5. Kapunakea Preserve natural communities.

Kapunakea protects at least 34 rare plants (Appendix 2), including six PEP target species and thirteen endangered plant species. At least eight of Kapunakea's rare plants have not been seen in the adjacent NAR. Four native forest birds are found in Kapunakea: 'āpāpāne, 'i'iwi, 'āmakīhi, and pueo; the white-tailed tropicbird is also found in the Preserve. 'Ua'u have also been heard there. Populations of four species of rare Hawaiian tree snails have recently been documented at Kapunakea: *Partulina perdix*, *P. tappaniana*, *P. crocea*, and *Perdicella kuhnsi* (Appendix 3). These snails probably were once widespread and abundant on Maui, but in many areas their numbers have declined precipitously in this century due to habitat destruction, collection, and the depredation by introduced animals. A number of other snails also occur at Kapunakea, including tornatellinines and species of *Auriculella*, *Succinea*, and *Philonesia*.

## MANAGEMENT

### Management Considerations

#### Pig Ingress

Ungulate management at Kapunakea is focused on keeping the upper elevations entirely pig free to protect the most intact native communities and the adjacent Honokōwai NAR. However, we continue to strive for ungulate free status in the lower less native-dominated areas. Pig captures in lower Kapunakea briefly spiked in FY13 and FY14 due to pig ingress from the Honokōwai valley bottom. Ground and aerial scouts, in addition to scouting adjacent Pu'u Kukui Watershed lands, confirmed that animals were coming from the north ridges. As a result, TNC had subawardee WMMWP install a strategic wing fence in FY14. The 72 meter wing fence in Honokōwai Valley has apparently greatly reduced ingress into Kapunakea Preserve (Figures 6 and 7). Snare groups were also added in hotspot areas. In addition, Pu'u Kukui Watershed is in the process of completing a Kahana boundary fence which should prevent any ungulate ingress from the north into the Preserve. Providing there is sufficient funding, TNC plans to replace the more than 20 year old lower Preserve pig boundary fence with pig/deer fence during the six-year period, likely FY2020-FY2021. See Figures 7 and 8.

#### Remoteness

Kapunakea is remote and rugged. Given limited resources, the entire preserve cannot be managed equally. Management is concentrated at the most urgent threats (e.g., halting pig ingress), and in areas that contain special plants, animals, and native natural communities (e.g., the rare montane bog community).

#### Adjacent managed areas

Kapunakea Preserve is adjacent to two areas that are also managed to protect natural resources: Pu'u Kukui WMA (privately owned) and the Honokōwai section of the state West Maui NAR (Figure 2). TNCH works closely with both Maui Land Co., managers of Pu'u Kukui WMA, and with the State Division of Forestry and Wildlife, who are responsible for management of the NAR. Several agreements are used to coordinate management and sharing of staff, equipment, and expertise in order to maximize management efficiency.

#### Access

The preserve is bounded on the west (mauka) side by private agricultural lands (Figure 9), some of which recently have been transitioned into 3 to 7 acre farm lots. As a result, public access is limited, and we carefully coordinate our management and interpretive activities around the gate schedule and access limitations. See Figures 9-10.

### **Human-related threats**

Threats related to human activities have increased in West Maui in recent years, including vandalism and trespassing. The Preserve’s lower boundary fences and gates have suffered from vandalism at various times (Figure 11). Other human-related threats that are possible in or adjacent to the Preserve include dirtbike riding, illegal marijuana cultivation, and unauthorized hikers making trails, all of which can result in soil erosion and invasive species introductions.

Maui and the drier areas of leeward Maui in particular, face wildfire threats that are becoming more challenging due to increasing ignitions, drought episodes, and land use changes (Figure 12). The West Maui Mountains Watershed Partnership joined the West Maui Fire Task Force and helped to create the Western Maui Community Wildlife Protection Plan. The plan helps bring wildfire hazard information, planning, and action opportunities to all of the parties involved. We have added a program—Fire, Emergency, and Safety—to address this threat.

### **Mitigating impact from management**

The primary strategy for protection of Kapunakea is to prevent the further introduction and/or spread of destructive alien species. Special care must be taken to avoid negative side effects of management activities. For example, trails and management activities are designed to prevent further weed and ungulate invasion. This strategy requires helicopter access to most parts of the preserve. Interpretive and educational uses are limited in scope. Guidelines are followed to minimize impacts such as trampling and weed dispersal.



Figure 6. New Honokōwai Valley fence installed in FY14.

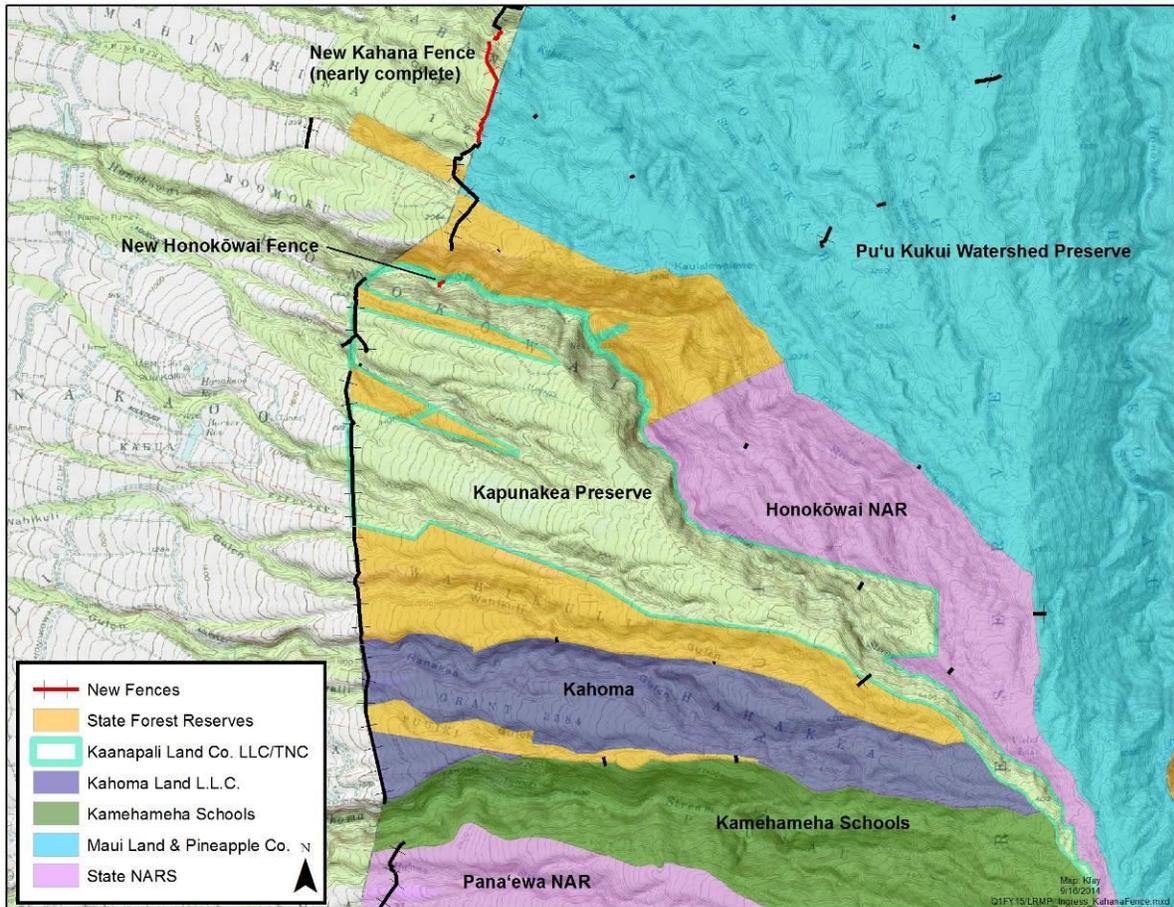


Figure 7. Kapunakea Preserve, adjacent landowners, and new Honokōwai wing fence and PKW Kahana boundary fence.

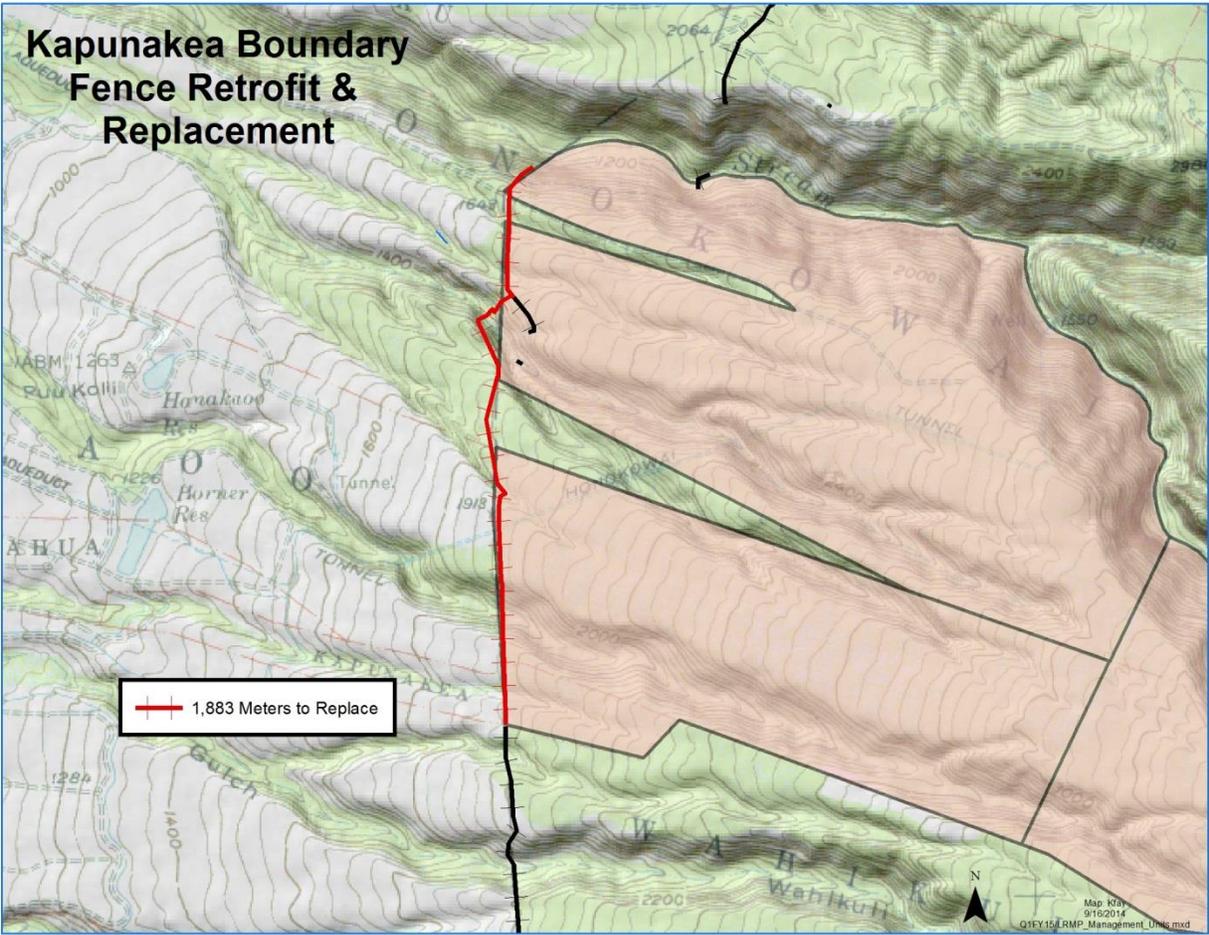


Figure 8. The now 20 year old lower Kapunakea Preserve boundary fence needs to be replaced with 8' deer fence by year 5 of this plan.

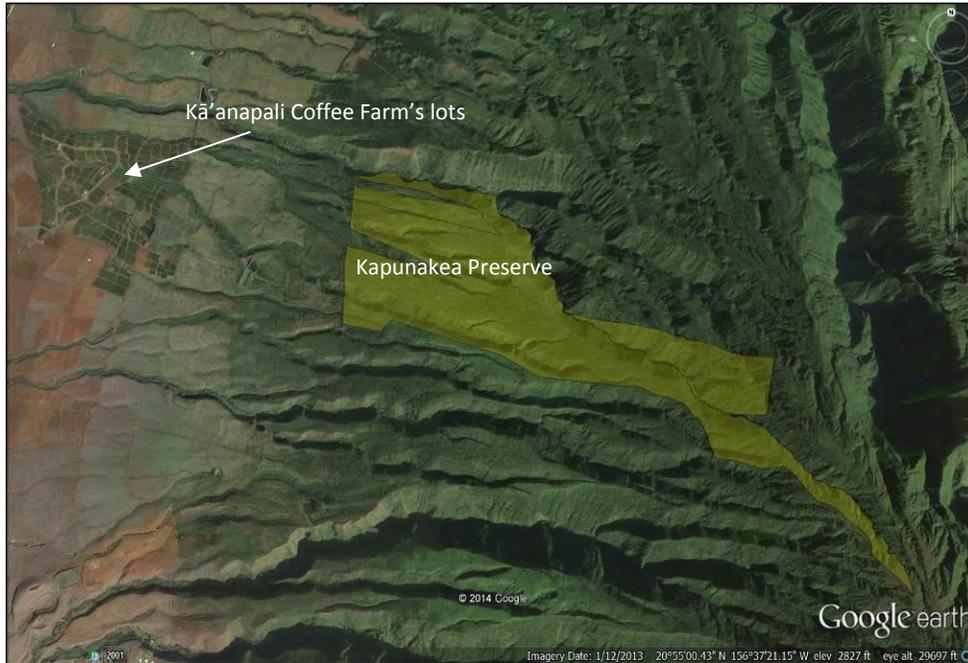


Figure 9. Kapunakea Preserve lies above Kā'anapali Coffee Farms agricultural lands.



Figure 10. Kā'anapali Coffee Farms lies just below Kapunakea Preserve, and is the main access to the Preserve. Access is through a gate that is closed daily at 4pm.



*Photo courtesy WMMWP.*

Figure 11. The Honokōwai ditch gate was vandalized in FY12, and repaired with fencing material.



*Photo courtesy WMMWP.*

Figure 12. Wildfire threats are increasing across the West Maui landscape.

## Management Units

Kapunakea is managed as five units (Figure 13) defined by topographic boundaries, similarity of natural community types, and threats.

- Unit 1 consists of the lowland (up to 3,000 feet elevation) portion of the preserve that is closest to Kapāloa Stream. It's native portions are primarily comprised of 'ōhi'a lowland mesic forest and uluhe (*Dicranopteris linearis*) lowland mesic shrubland. Non-native vegetation is dominant in the gulch bottoms and some ridge tops. This unit is approximately 50% native dominant.
- Unit 2 encompasses the remainder of the preserve's lowland elevations. It contains five native communities, and non-native vegetation is dominant in the gulch bottoms and some ridge tops. Because *Tibouchina* and strawberry guava are prevalent throughout the unit, we aim to prevent their spread into other units, rather than eliminate them from Unit 2 (as the costs would be prohibitive). This unit is approximately 60% native dominant.
- Unit 3 comprises the majority of the preserve's mid-elevations (3,000 – 4,000 feet) and follows Kapāloa Stream along its northeast boundary. The four montane communities in Unit 3 are dominated by uluhe or 'ōhi'a; māmakī (*Pipturus albidus*) lowland wet shrubland occurs along the streambed. The uluhe and 'ōhi'a-dominated communities are intact above 3,400 feet, with minimal weed problems. Our management focus in this unit is to eliminate ungulates and control weed invasions. This unit is approximately 90% native dominant.
- Unit 4 begins on the east side of Kapāloa Stream, and continues to the preserve's eastern boundary. The upper elevations in this unit must be reached by helicopter, due to the steep gulch walls. Management focuses on preventing new invasions. This unit is comprised entirely of native vegetation with only occasional weed presence.
- Unit 5, encompassing the highest elevations of the preserve, is Kapunakea's most pristine unit. Initial survey data and more recent monitoring results have shown that this area contains only a few scattered alien plants (including *Tibouchina*). The management priority is to remove threats from this area before they damage the rare 'ōhi'a bogs. Access is by helicopter only. Travel is conducted from the upper elevations down to avoid transport of weeds that occur in lower elevations.

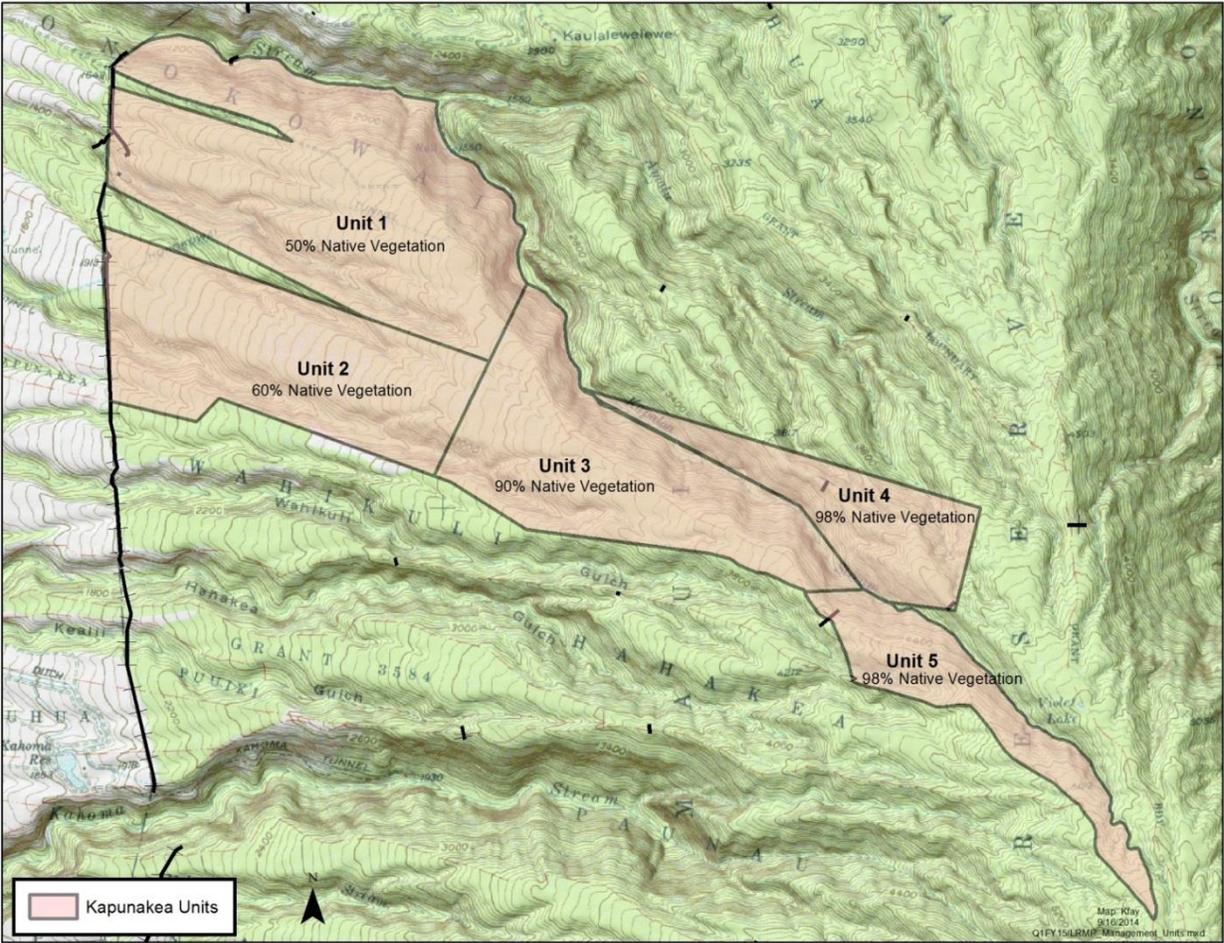


Figure 13. Kapunakea Preserve boundaries and management units.

## Management Programs

Although the following management programs are described separately, they form an integrated management approach. For each program listed in the following section, we have indicated a major goal and described the management methods chosen. Also included are highlights of past and current achievements and key management issues. Finally, key objectives to achieve the goal are listed by year for FY2016–FY2021.

### Program 1: Non-native Species Control

#### A. Ungulate Control



Pigs destroy the native understory and groundcover, exposing bare soil.

#### Program Goals

- Remove all ungulates from fenced, native-dominant areas
- Prevent ungulate ingress into native-dominant areas
- Enhance the effectiveness of boundary and strategic fences

#### Program Description

The elimination of ungulates in Kapunakea Preserve and on adjacent partnership lands continues to be our highest priority. Ungulate damage has been substantially reduced since 1994, especially in upper elevation areas. However, it is known that pigs continue to find their way into the preserve from adjacent lands. During the period FY10-FY14, pigs entered the Preserve at one time or another due to one or a combination of: 1) a fence breach in Hā'enanui in FY10, 2) a fence breach in the Powerline fence in FY13, 3) Honokōwai valley south wall ingress, and 4) vandalism along lower boundary fences periodically. Each one of these issues was addressed immediately via fence repairs or new fencing. See Figure 14. We will continue consistent scouting, ungulate removal, and monitoring efforts as needed. Some resources may be shifted to weed control should we deem ungulate levels low enough to justify this shift.

The ungulate control program utilizes a combination of fencing, snaring, and hunting to bring pig populations down to zero as rapidly as possible and prevent them from re-establishing. The lower

boundary of the preserve was constructed in FY1993-1995, and replaced an aging Forest Reserve boundary fence. This fence is key to preventing ungulate ingress into the Preserve; as such it is likely that ongoing maintenance and possible additions to this lower boundary fence will be necessary during the next six years. In FY14, TNC had subawardee WMMWP install a strategic 72 meter wing fence in Honokōwai Valley. In the coming years similar short strategic fences may be necessary at possible points of pig ingress. In addition, the fence and snare check schedule and associated labor may be shifted if deemed necessary for the most effective management program over the six year period. Figure 7 depicts current and proposed fences in Kapunakea Preserve and on adjacent lands, and Figure 14 depicts recent fence improvements.

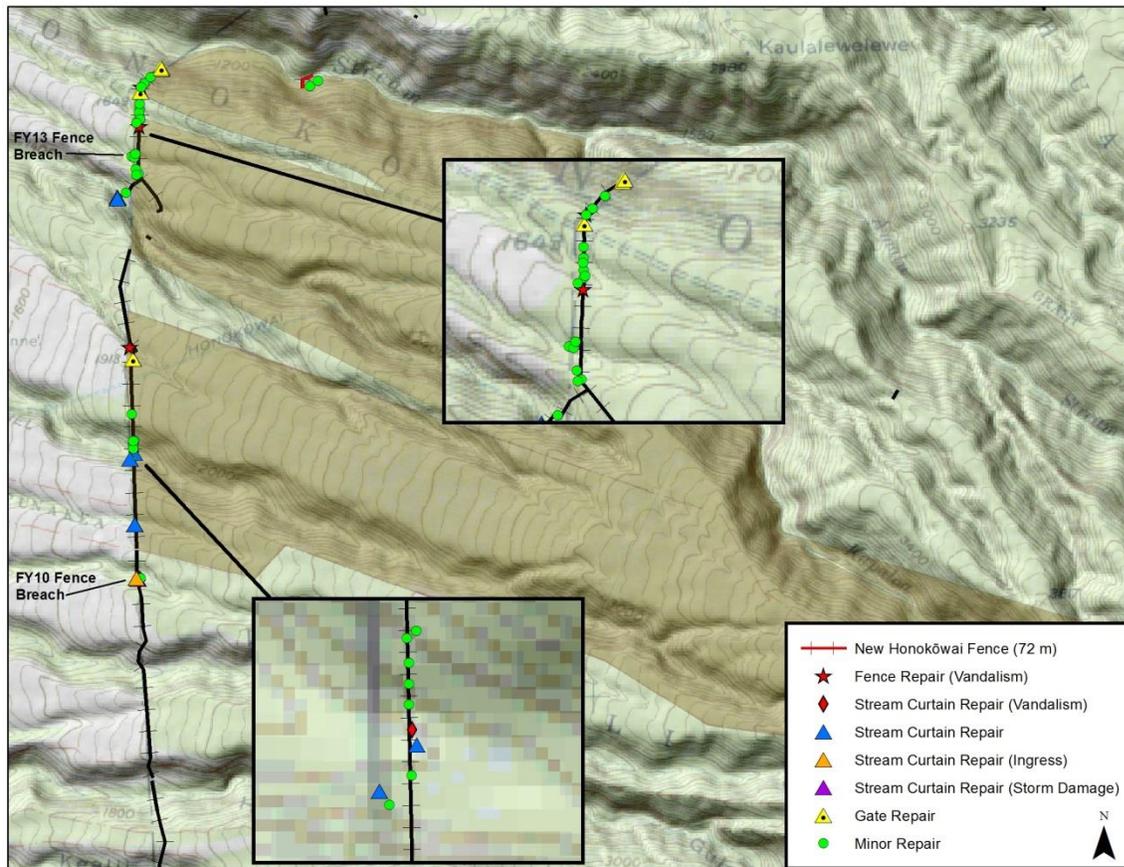


Figure 14. FY14 fence improvements at Kapunakea.

Snaring is still the most effective and feasible technique for controlling pigs in areas too remote, rugged, and/or fragile for frequent hunting, and where hunting cannot remove low-density pig populations from sensitive sites. Until an effective alternative can be found, snares will continue to be placed in pig-damaged areas. Additionally, if warranted by high levels of pig activity, we will snare other areas of the preserve (and other strategic areas). Traps in the upper areas of the Preserve are checked semi-annually, and traps in the lower areas of the Preserve are checked quarterly. In addition, through our subawardee the West Maui Mountains Watershed Partnership, we have begun installing and maintaining a trap network on area just north of the Preserve on State Forest Reserve land. Additional traps may be installed in this area in the short-term as needed.

In the past few years, axis deer (*Axis axis*) have greatly expanded their range on Maui to include West Maui areas near Ukumehame, Kapalua, and Kahakuloa. Control efforts for axis deer may be needed in the near future to protect the preserve, and existing hogwire fences may need to be retrofitted to be 8' high deer fence. Such retrofits are currently underway throughout the West Maui Watershed. The existing lower boundary fence in the Preserve is more than 20 years old, degraded, and only 48". This fence will need to be replaced in the next six year period with deer/pig fencing, pending available funding (Figure 8). The boundary fence crosses both state and private land. We hope to fund this fence replacement with state CIP funds, Department of Water supply, NAPP or another funding source.

As part of our routine management program, we will continue to: 1) survey for axis deer and goats on West Maui during routine helicopter operations; 2) assist the WMMWP and neighboring land managers with ungulate control efforts; and 3) participate as members of the Maui Invasive Species Committee (MISC).

### Ungulate Control Activities

Years 1–6 (2016–2021):

- Conduct monthly inspections and repairs of Kapunakea's lower elevation fences, making repairs as necessary. Inspect fences in Units 3, 4, and 5 and upper elevation strategic fences semiannually, making repairs as necessary. Map and document breaches and record time between observed breach and repair.
- Check animal control traps semi-annually in the mid and upper elevations of the preserve.
- Check animal control traps quarterly in the lower section of the preserve.
- Implement contract hunting in key areas if needed.
- Complete one ground scout in any "hotspot" areas to determine whether pigs are present or entering the preserve through boundary fences or natural barriers.
- Replace lower Preserve boundary fence with deer fencing (1883 meters) in FY2020 or FY2021.<sup>2</sup>

Status of Public Hunting Opportunities: The conservation easement between TNC and Kā'anapali Land Management Corp. requires that there be no unaccompanied public hunting. Kapunakea Preserve is closed to hunting with dogs due to increased animal control efforts in the Preserve. However, TNC staff may accompany public hunters hunting without dogs upon request, on a case-by-case basis. Limited public hunting opportunities that will not interfere with other management are available in coordination with scheduled work trips.

**This program represents an estimated 70% of the overall effort and budget in this long range management plan.**

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<sup>2</sup> Replacement of lower boundary fence will not be funded by NAPP

## B. Invasive Plant Control

### Program Goals

- Remove habitat-modifying weeds from high-quality native habitats
- Prevent the introduction or spread of problem weeds
- Prevent the establishment and spread of habitat-modifying priority weeds



### Program Description

The most important aspects of our weed control program are to control established weeds in intact native communities, and to prevent the introduction of new species of alien plants. We focus on containment and suppression of priority weed species that threaten intact high elevation native forests, and attempt to reduce their established cover. In some cases, when weeds are considered a direct threat to rare plant populations occurring in alien-dominant habitat, localized control actions may be taken.

In order to prevent weed establishment, we will continue to enforce strict procedures to remove weed seeds from equipment and clothing before people enter the preserve. Helicopter flights will originate from areas free of aggressive weeds, and all equipment and clothing will be inspected and cleaned. Of the alien plants already established in the preserve, many are shade intolerant and pose no major problem if the native forest canopy and ground cover remain intact. There are other alien plants, however, that displace native vegetation over large areas; these habitat-modifying plants are considered **priority weeds** for management (Table 2).

Table 2. Priority Weed Species for Management Above 3200' in Kapunakea Preserve

Scientific Name	Common Name
<i>Tibouchina herbacea</i>	Tibouchina
<i>Psidium cattleianum</i>	Strawberry guava
<i>Clidemia hirta</i>	Koster's curse

Table 3. Other important weed species to monitor in Kapunakea Preserve

Other Important Weed Species	
<i>Melinis minutiflora</i>	Molasses grass
<i>Rubus argutus</i>	Blackberry
<i>Paspalum conjugatum</i>	Hilo grass
<i>Holcus lanatus</i>	Velvet grass
<i>Ficus</i> spp.	Banyan
<i>Buddleia asiatica</i>	Butterfly bush
<i>Juniperus bermudiana</i>	Juniper
<i>Grevillea robusta</i>	Silk oak
<i>Andropogon virginicus</i>	Broomsedge
<i>Juncus planifolius</i>	Bog rush
<i>Hedychium coronarium</i>	White ginger
<i>Cortaderia jubata</i>	Giant Andean Pampas
<i>Acacia mearnsii</i>	Black wattle
<i>Passiflora suberosa</i>	Passiflora

We will continue to control weeds manually (by pulling or cutting), chemically (using herbicide), or with a combination of manual and chemical control methods. Herbicide use is limited, and in full compliance with the State of Hawai'i Department of Agriculture (HDOA) Pesticide Enforcement Division. Weed control staff are also certified through HDOA's Pesticide Enforcement Division. All herbicide use is in accordance with the product label and recorded in detail for reference and efficacy monitoring.

As the project evolves, we may employ other techniques or tools for weed control as they are developed. No new application methodology will be employed without full compliance with HDOA.

Target Species:

*Tibouchina herbacea* is rapidly expanding its range over West Maui. It has become widely established in the lower half of the preserve over the last 15 years. People, pigs, and wind seem to be the primary vectors of this habitat-modifying weed. Due to our diligence at scouting for and treating *Tibouchina* above 3,200 feet, we have minimized its establishment at higher elevations, despite our expectation that the infestations would explode beyond our control. We will continue to track the Department of Agriculture's success in identifying safe biocontrol agents for *Tibouchina* and, upon their demonstrated effectiveness, we will seek in-house approval to release them on TNC preserves. Dr. Tracy Johnson (Research Entomologist), who coordinates the biocontrol program at the Forest Service's quarantine facility in Volcano, has informed us that one potentially promising candidate has been identified, a beetle (*Syphrea uberabensis*) that consumes the roots and leaves of *Tibouchina herbacea*.

In FY12, support was given to Dr. James Leary to test Herbicide Ballistic Technology (HBT) for strawberry guava treatment. 70 guava were treated in a 44 minute window. Monitoring in FY13 indicated a high mortality rate and the experiment was deemed successful (Figure 15). Secondary impacts to non-target native plants surrounding the treated guava seemed minimal.



Figure 15. Herbicide ballistic technology (HBT) was successful in treating invasive strawberry guava trees, with no non-target native trees negatively affected.

In the past 15 years, we have halted the spread of strawberry guava (*Psidium cattleianum*) in lower Unit 3 by treating thousands of trees with herbicide, and pulling thousands of seedlings. As feral pigs are a

primary source for spreading strawberry guava, and we have significantly reduced pig numbers, the spread has slowed considerably. We continue to scout for this pest tree in critical areas above 3,200 feet, where the spread is very limited. However, short-term efforts spent on controlling strawberry guava at high elevations in Kapunakea will be shifted towards biocontrol during FY16. Recently a Brazilian scale (*Tectococcus ovatus*) was selected as a candidate for biocontrol of strawberry guava, after many years of research. *Tetracoccus* is currently being tested and Kapunakea Preserve will likely be a release site in FY16 to test efficacy at various elevations. TNC will assist with site selection, pre-release monitoring, release efforts, and post-release monitoring.

After finding 11 *Clidemia hirta* (1 mature and 9 immature) individuals in a discrete location in FY10, TNC and WMMWP decided to conduct *Clidemia* sweeps twice per year. This is a classic example of early detection-rapid response (EDRR), when action was taken to remove the initial mature plants and monitor vigilantly for localized recruitment. No other populations have been found, and recruited individuals regularly pulled have not reached reproductive maturity.

Black wattle (*Acacia mearnsii*) was found at limited locations years back and has been routinely monitored after initial control to ensure no seedlings survive. No history on its location has been verified, though it is suspected it was part of Territorial Forestry planting decades back and that these trees were survivors from that period; this species normally does not thrive in the dry shrubland, low elevation habitat where it was found. The action taken on this was another good example of selected EDRR to ensure the species did not become established at this site.

Florida blackberry (*Rubus argutus*) is widespread and continues to spread (primarily via birds), although our prior treatment of trailside plants has prevented it from gaining density along those routes. Blackberry continues to dominate habitat along steep gulches to 4,000' elevation, especially pig-disturbed terraces, where chemical control is impractical. Compared to other priority weeds, the behavior of this species does not show it outcompeting native species. That combined with its huge range and impracticality of physical control deems this species as unmanageable.

A tall thatch grass, *Andropogon virginicus* (broomsedge), has recently presented Kapunakea with new challenges. Besides being a habitat-modifying plant, this grass also poses a serious wildfire threat as a medium fuel during drought periods. Mechanical and chemical control efforts can be effective to limit the dominance of this weed along trails, camps, and especially landing zones.

We have had success at containing and shrinking populations of Hilo grass (*Paspalum conjugatum*) along strategic trails; as resources allow, future efforts will focus on maintaining that status for this shade-tolerant grass.

When feasible we control specific priority weeds along trails, campsites, and landing zones above 3,200 feet elevation, limiting current infestations in otherwise intact forest or shrubland. This also serves to minimize spread of priority weeds to new places during other preserve activities.

As part of our routine management program, we will continue to: 1) monitor for and control new weeds at landing zones, campsites, and upper trails; 2) train staff in the proper handling and application of herbicides; 3) participate as a member of the Maui Invasive Species Committee; 4) update aerial survey and range maps for *Tibouchina* and guava; and 5) cooperate with DOCARE in marijuana control as needed. We may employ innovative remote technologies such as remote sensing or high resolution aerial photography for weed mapping when deemed effective for detecting our highest priority weeds.

### Invasive Plant Control Activities

#### Year 1 (FY2016):

- Continue treatment of top habitat-modifying weeds above 3200' (especially *Tibouchina* and strawberry guava). Physical control of guava will be opportunistic only along infrastructure in FY16 while efforts are being focused on biocontrol releases.

#### Years 1–6 (2016–2021):

- Continue treatment of top habitat-modifying weeds above 3200' (especially *Tibouchina* and strawberry guava).
- Conduct *Clidemia* sweeps twice per year in “core area” below Mud camp.
- Monitor weeds as needed according to management priorities.
- Respond to new priority weed threats and map efforts.
- Update and maintain priority weed maps annually.
- Carryout localized weed control in landing zones, camps, key microhabitats and trails.
- Follow strict protocols to prevent inadvertent introduction and spread of priority weeds.
- Support State and County legislation, outreach, and funding efforts to develop and release biological controls for priority habitat-modifying weed species; cooperate with USFWS and DLNR to provide Kapunakea as a potential release site for new biocontrol agents.
- Support the Maui Invasive Species Committee (MISC) for programs pertaining to invasive species on West Maui, including pampas grass, fountain grass, and other target species as relevant.
- Monitoring and help develop, when feasible, innovative technological developments in invasive plant identification, mapping, and control. Implement when possible.
- Assist in site selection, pre-release monitoring, and post-release monitoring of strawberry guava biocontrol (*Tectococcus ovatus*).

**This program represents an estimated 17% of the overall effort and budget in this long range management plan.**

## C. Small Mammal Control, Invertebrate Pest, and Pathogen Prevention and Control

### Program Goals

- Increase our understanding of threats posed by small mammals
- Prevent the introduction and spread of small mammals, non-native insects, mollusks, pathogens, and other pests deemed to be a significant threat, and reduce their negative impact where possible

### Program Description

Non-native insects and small mammal damage is evident throughout Maui's native ecosystems. Rats, mice, cats, and mongoose pose a threat to many native birds including the endangered ground nesting nēnē. Prior research and management attempts have shown intensive rat control to exceed realistic budgets in terms of staff and logistics. In addition the long-term impact from maintaining intensive rat trapping can cause significant damage to native plant communities. However, TNC supports a long-term program aiming at protecting larger landscapes from small mammal depredation and has contributed toward trials that may result in the aerial application of rodenticide. We also implement protocols for cleaning and monitoring to prevent the accidental introduction of new alien species.

Lack of resources precludes a full-scale predator control program. We will follow strict established protocols for cleaning and monitoring to prevent the accidental introduction of new alien species. We will also support partners on developments toward aerial application of rodenticides and consider other partner led predator control strategies should they become feasible.

Since *Puccinia psidii* was first found on Maui and the conservation community became vigilant about mapping location on 'ōhi'a, staff observes anything resembling this rust and reports if needed. Staff also are aware of unusual arthropod sightings, and anything new is reported, identified, and evaluated for management action.

### Small Mammal, Pest, and Pathogen Control Activities

Years 1–6 (2016–2021):

- Support viable control programs for small mammals or other pests by our partners.
- Support other scientific research into effects of small mammals and their effective control.
- Support research on *Puccinia rust* or other forest pathogens; continue to monitor for presence.

**This program represents an estimated 1% of the overall effort and budget in this long range management plan.**

## Program 2: Resource Monitoring, Rare Species Protection, and Research

### Program Goals

- Conduct and support monitoring and research to track the status of biological and physical resources of the preserve
- Maintain spatial and other data sufficient to measure success and inform adaptive management, policy makers, and funders
- Prevent the extinction of rare species in the preserve
- Encourage and assist with research that increases our understanding and management of the area's natural resources



### Program Description

The goal of our resource monitoring program is to track biological and physical resources of the preserve, evaluate changes in these resources over time, and improve efficacy of management responses. TNCH uses data from the U.S. Fish and Wildlife Service to identify rare and endangered species and those that are listed as “candidate” or “species of concern”. Biological surveys have shown that the preserve protects numerous rare species, many of which are federally listed as endangered (Appendices 2 and 3).

We have established a network of monitoring plots to quantify and better understand Kapunakea's baseline vegetation. We completed a monitoring report for Kapunakea in 1995. The monitoring transects established at that time included: 1) 10,000 meters of permanent belt transects for monitoring the distribution, frequency, and relative abundance of feral ungulates and alien plant species, and 2) 41 permanent, 250 square meter plots for obtaining in-depth quantitative data on forest vegetation (Figure 16). A few of the permanent 250 m<sup>2</sup> plots were revisited in FY15 to assess passive recovery of native vegetation following ungulate reduction. TNC will begin systematic annual vegetation monitoring to establish “snapshot” looks at the quality and rate of vegetation recovery over time, using existing 250 m<sup>2</sup> plots located along transects.

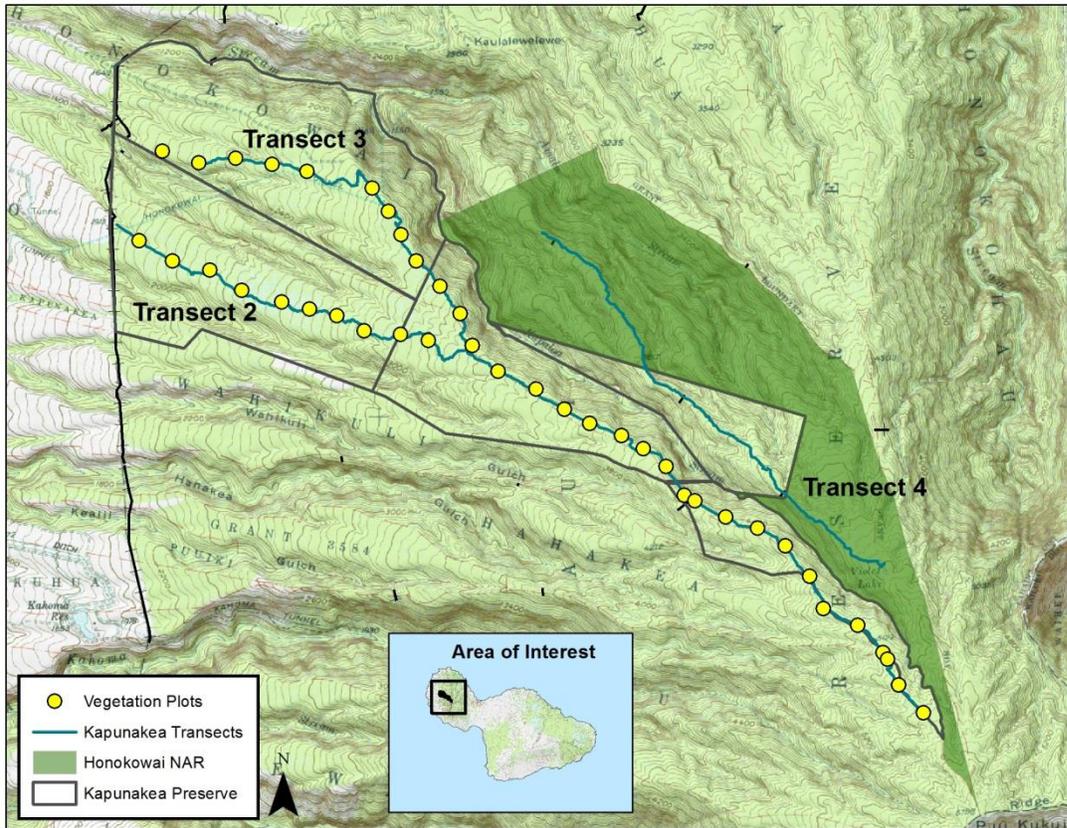


Figure 16. Vegetation monitoring plots are located along existing ungulate monitoring transects.

We may employ new passive monitoring technologies such as remote sensing, high resolution aerial photography for vegetation monitoring, and remote photo monitoring for fire, ungulates and/or ungulate traps. Other monitoring tools may be employed as they become available and are deemed effective.

Formal surveys were conducted annually at Kapunakea by botanists from the HBMP. Their reports and accompanying maps are kept in TNC Maui files. These surveys have yielded some significant results. For example, more than three-fourths of the endangered māhoe tree population (*Alectryon macrococcus* var. *macrococcus*) known on West Maui are concentrated in Kapunakea Preserve. The Plant Extinction Prevention Program (PEPP), administered through the Pacific Cooperative Studies Unit (PCSU) and coordinated by DOFAW, is actively visiting known locations of rare plants. PEPP is focused on target species at Kapunakea, with the intent to collect seed for future propagation of rare plants. Accurate mapping and vigor of these populations is a byproduct of the PEPP work.

TNC Maui staff also routinely monitor various rare plants. Staff will continue to identify, map, and recover rare plant populations during routine management activities. When available, fruit will be collected and given to PEPP for propagation. We will continue to support and assist PEPP with outplanting and monitoring of rare plants, in addition to sharing GIS data on rare plant locations in West Maui.

Bird surveys were conducted during various years along the same transects by observers trained in the U.S. Fish and Wildlife Service’s Hawai’i Forest Bird Survey methodology. The purpose of these surveys is

to document the relative abundance of all bird species in the forest. In the future, we will conduct bird surveys only during the state’s routine bird surveys (every 5 years).

We will continue to encourage independent research in Kapunakea by offering necessary application materials to researchers online. Although no Conservancy funding for research is provided to projects, we provide technical guidance and logistical support to approved research.

#### Resource Monitoring, Rare Plant, and Research Activities

Years 1–6 (2016–2021):

- Undertake annual vegetation plot monitoring.
- Monitor and maintain threat monitoring transects – Kapunakea transects 2 and 3 twice per year, and Honokōwai “Transect 4” once per year.
- Continue to support PEPP in search and assessment of rare species populations to determine protection needs and to reduce threats.
- Maintain and update current maps of rare species populations. Update database regularly.
- Provide logistical support to researchers.

**This program represents an estimated 5% of the overall effort and budget in this long range management plan.**

### **Program 3: Community Outreach**

#### Program Goal

To build public understanding and support for the management of the watershed and preservation of natural areas.

#### Program Description

Sustaining biologically significant native ecosystems throughout the state requires an educated, empowered and mobilized public and private constituency. Our main goal is to increase conservation and advocacy for these areas through an understanding of the importance of, threats to, and protection efforts towards watersheds on Maui.

Currently, there is limited on-site public outreach at Kapunakea Preserve. TNC no longer provides scheduled monthly access to Kapunakea Preserve and other interpretive hikes. However, individuals may accompany staff and assist on field projects if they have relevant experience. The WMMWP implements a public education and awareness program including environmental education and volunteer assistance programs. There is not current funding to employ a volunteer and community outreach coordinator; however, TNC will continue to research the best way to engage the community through available and potential future resources.

#### Community Outreach Activities

Years 1–6 (2016–2021):

- Participate in one or two community events per year to encourage constituents to support our work, such as the Maui Ag Fest in Waikapū.
- Present slide shows and talks as requested by community and school groups.
- Lead special hikes for targeted community members.

**This program represents an estimated 1% of the overall effort and budget in this long range management plan.**

## **Program 4: Fire, Emergency, and Safety**

### Program Goal

Provide staff with training and equipment that will allow them to assist primary fire and rescue agencies during a fire or emergency on or adjacent to the preserve.

Program Description: All staff are trained in basic first aid and CPR. Other training may include advanced wilderness first aid, fire suppression and pre-suppression, helicopter safety, and hunter's education. Field staff are provided with first aid kits and required to use proper personal protective equipment (PPE) when conducting field work. The TNC Maui fire plan enables an immediate multi-agency response to wildfires within and adjacent to Kapunakea Preserve.

A recent fire that burned over 50 acres just below the Preserve in September 2014 highlights the necessity and urgency of fire prevention and protection efforts. We will need to be prepared to undertake fire prevention practices that will be outlined in the West Maui Task Force Fire Plan, such as fire breaks and bulldozing fire lanes.

Access roads below the Preserve are maintained by the landowner regularly, about once per year. The landowner periodically offers to grade the two access roads to Kapunakea (Eucalyptus and Powerline roads). We will continue to coordinate with the landowner to have access roads in Kapunakea maintained as much as possible. In addition, because the *Andropogon* (broomsedge) poses a fire hazard in the dry season, we will mow and treat the grass annually prior to the dry season.

### Fire, Emergency, and Safety Activities

Years 1–6 (2016–2021):

- Provide emergency training opportunities for staff including but not limited to maintaining current First Aid and CPR certifications.
- Conduct annual first aid kit inventory and resupply.
- Maintain fire suppression training for key staff.
- Purchase equipment as needed to allow proactive prevention and immediate response to fire threats.
- Respond to emergencies or fire threats.<sup>3</sup>
- Maintain and improve access roads and firebreaks in high risk areas of preserve.

**This program represents an estimated 1% of the overall effort and budget in this long range management plan.**

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<sup>3</sup> TNC staff will respond to fire threats only as requested by the State

## **Program 5: Watershed Partnerships**

### Program Goal

Assist the long-term effective management of the native ecosystems of West Maui by the West Maui Mountains Watershed Partnership.

### Program Description

TNC helped to found the WMMWP and continues to play an active role in the partnership. The WMMWP provides protection for about 50,000 acres on West Maui administered by a coordinator and field crew (first hired in 2000). Activities include fencing, ungulate removal, and resource monitoring programs for all of West Maui's native forests. As a partner, we helped set management priorities, fundraise and administer projects. TNC Maui will continue to provide the WMMWP with guidance and training, and we will participate in management activities on partnership lands as needed. We will likely also continue to contract with the WMMWP or another viable entity for ungulate and weed removal and monitoring.

### Watershed Partnership Activities

Years 1–6 (2016–2021):

- Participate in regularly scheduled partnership and Executive Committee meetings to help set priorities for the WMMWP.
- Assist the WMMWP in accomplishing fundraising and management priorities.

**This program represents an estimated 5% of the overall effort and budget in this long range management plan.**

Table 1. Approximate person days for FY16 for contracted Kapunakea management activities

Description:		When	PD	Annual Freq.	PD Annual Total	Annual Helicopter Hours estimate
<b>Snare Checks All</b>	Unit 1 & Honokowai	Q1,2,3,4	10	4	40	0
	Unit 2	Q1,2,3,4	8	4	32	0
	Unit 3	Q2,Q4	7	2	14	3
	Unit 4	Q2, Q4	2	2	4	3
	Unit 5	Q2,Q4	2	2	4	3
	Prep time & decon & data					24
<b>Ungulate Scouting</b>		Q2,Q4	4	2	8	2
<b>Weed control</b>		Q2,Q4	4	2	8	2
Biocontrol release & monitoring (5 sites) Top of powerline, eucalyptus, below mud camp, kapu 3, honokowai valley			2		10	
Pictometry analysis Unit TBD (Psicat, ficus, juniper)			2		2	
Resweep Psicat control areas, Fence LZ to Mud camp			8	1	8*	
Prep time & decon & data					8	
<b>Planning meetings: weeds, mgmt., etc.</b>		Q1,Q3	2	2	4	
<b>Fence/gate inspection and routine repair</b>		Q1-4			47	2
Significant maintenance / repair for fences/gate					6*	
<b>Monitoring:</b>						
Ungulate (TR 2 & 3 2x, TR 4 1x) & weed transects (1x)		Q2,Q4	9	2	18	4
Veg plot monitoring 9 plots Unit 1			2	3	6	
8. Research support		Q1-4	2	1	2	
9. GIS/maps		Q1-4	4	2	8	
Access road/parking mowing and treatment		Before dry season	6	1	6	
10. Reporting NAPP reports and Annual plan		Q3-4	5	2	10	
<b>Totals:</b>					<b>251</b>	<b>16</b>
<b>* If extra funding secured for FY16:</b>					<b>272</b>	<b>19</b>

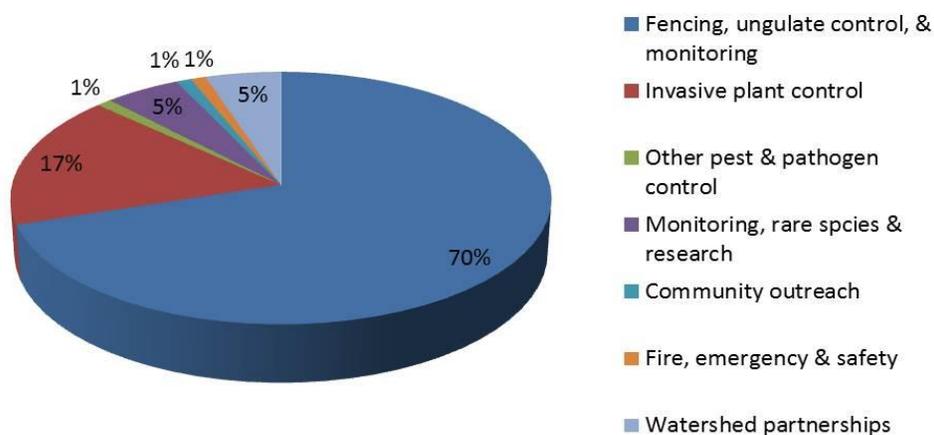
## ENVIRONMENTAL REVIEW COMPLIANCE

All actions being proposed for reauthorization in this Long-Range Management Plan are substantially similar to, and relevant to, the actions previously considered in the *Final Environmental Assessment of Kapunakea* for which we received a "Finding of No Significant Impact" in 2008.

## BUDGET SUMMARY

The table in the next section summarizes the six-year budget for the Kapunakea project. Through the NAPP program, the state pays two-thirds of the management costs outlined in this long-range plan and TNC funds (from private and other government sources) the remaining one-third.

**Kapunakea NAPP FY2016-2021 Budget Allocations**



The Conservancy's Maui operation maintains a full time base staff of seven. These staff also periodically work on Lāna'i and Molokai whose programs are supervised by the Maui Nui office. An estimated .53 FTE of Maui base personnel costs for managing Kapunakea Preserve are funded by the Kapunakea NAPP budget. However, this number may fluctuate depending on the use of contractors vs. staff to complete deliverables. Technical and annual planning support is also included, and other island support staff may charge a small portion of their time to this project. The Nature Conservancy's annually negotiated fringe benefits rate will also accrue on all salary costs.

The NAPP portion of this budget does not include miscellaneous project-related costs such as vehicle expenses. NAPP funds will cover a portion of staff or subaward expenses to conduct fence checks/maintenance and ungulate/weed removal and miscellaneous project-related field supplies. Note that the contractual line item includes some helicopter time. The Conservancy routinely provides

trainings for staff to improve job performance, and in addition to these trainings, supervisory staff regularly attend meetings in Honolulu.

An overhead rate is included (subject to slight change each year) to recognize the Conservancy's indirect costs for facilities, accounting, legal, and other administrative support. The NAPP program will pay only 10% of the Conservancy's overhead rate of 22.48% (FY15), leaving the remainder as a portion of the Conservancy's one-third match.

Budgetary Constraints: This Kapunakea NAPP budget represents a significant reduction in funding since the last LRMP (2010–2015). As such, TNC has modified deliverables in some areas to accommodate the lower funding amount. We have identified objectives above that will not be covered by NAPP funds. However, should TNC receive significant private funds in addition to the NAPP funds, we hope to complete these specific management activities. This will depend entirely on TNC's statewide priorities and its ability to raise additional funds. We will report on progress on all accomplishments in Kapunakea Preserve and on adjacent lands regardless of funding source.

## BUDGET TABLE

	<b>FY2016</b>	<b>FY2017</b>	<b>FY2018</b>	<b>FY2019</b>	<b>FY2020</b>	<b>FY2021</b>	<b>TOTAL</b>
<b>Labor and Fringe</b>	20,000	20,000	20,000	20,000	20,000	20,000	<i>120,000</i>
<b>Supplies/ Equipment</b>	2,000	2,000	2,000	2,000	2,000	2,000	<i>12,000</i>
<b>Travel</b>	2,000	2,000	2,000	2,000	2,000	2,000	<i>12,000</i>
<b>Subcontracts</b>	124,818	124,818	124,818	124,818	124,818	124,818	<i>748,908</i>
<b>Baseyard</b>	2,000	2,000	2,000	2,000	2,000	2,000	<i>12,000</i>
<b>Subtotal</b>	150,818	150,818	150,818	150,818	150,818	150,818	<i>904,908</i>
<b>Overhead @ 10%</b>	15,082	15,082	15,082	15,082	15,082	15,082	<i>90,491</i>
<b>TOTAL</b>	<b>165,900</b>	<b>165,900</b>	<b>165,900</b>	<b>165,900</b>	<b>165,900</b>	<b>165,900</b>	<b><i>995,400</i></b>
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	<i>Total</i>
<b>Kapunakea Budget</b>	165,900	165,900	165,900	165,900	165,900	165,900	<i>995,400</i>
<b>Match (1/3 of total)</b>	55,300	55,300	55,300	55,300	55,300	55,300	<i>331,800</i>
<b>TOTAL NAPP REQUEST (2/3 of total)</b>	<b>110,600</b>	<b>110,600</b>	<b>110,600</b>	<b>110,600</b>	<b>110,600</b>	<b>110,600</b>	<b><i>663,600</i></b>

**Appendix 1**  
**Natural Communities of Kapunakea Preserve**

NATURAL COMMUNITY
Koa/'Ōhi'a (Acacia/Metrosideros) Lowland Mesic Forest <sup>^†</sup>
Lama/'Ōhi'a (Diospyros/Metrosideros) Lowland Mesic Forest <sup>^</sup>
Māmaki (Pipturus) Lowland Wet Shrubland
'Ōhi'a (Metrosideros) Lowland Mesic Forest <sup>^†</sup>
'Ōhi'a (Metrosideros) Lowland Mesic Shrubland
'Ōhi'a/Uluhe (Metrosideros/Dicranopteris) Lowland Wet Forest <sup>^</sup>
Uluhe (Dicranopteris) Lowland Wet Shrubland
'Ōhi'a (Metrosideros) Mixed Montane Bog
'Ōhi'a (Metrosideros)/Mixed Shrub Montane Wet Forest
'Ōhi'a /'Ōlapa (Metrosideros/Cheirodendron) Montane Wet Forest
Hawaiian Intermittent Stream

<sup>^</sup> = Not known from West Maui NAR

<sup>\*</sup> = Not known from Pu'u Kukui WMA

**Appendix 2**  
**Rare Native Species of Kapunakea Preserve**

SCIENTIFIC NAME	COMMON NAME	FEDERAL STATUS	IUCN STATUS
<i>Acacia koaia</i> <sup>†</sup>	koai'a, koai'e, koa'oha		VU
<i>Alectryon macrococcus</i> var. <i>macrococcus</i> <sup>^</sup>	'ala'alahua, māhoe	E	CE
<i>Alphitonia ponderosa</i>	kauila, kauwila, o'a		VU
<i>Anoectochilus sandwicensis</i>		SOC	VU
<i>Argyroxiphium caliginis</i>	'eke silversword		VU
<i>Bohea sandwicensis</i> <sup>^†</sup>	'ahakea		VU
<i>Bonamia menziesii</i> <sup>^†</sup>	-	E	CE
<i>Calamagrostis expansa</i>	-	C	VU
<i>Euphorbia olowaluana</i>	'akoko	SOC	NT
<i>Clermontia oblongifolia</i> sbsp. <i>Mauiensis</i>	'ōhā wai	E	VU
<i>Colubrina oppositifolia</i> <sup>^†</sup>	kauila	E	CE
<i>Ctenitis squamigera</i>	pauoa	E	CE
<i>Cyanea lobata</i> subsp. <i>lobata</i> <sup>1</sup>	Hāhā	E	
<i>Cyrtandra filipes</i> <sup>1</sup>	ha'iwale	E	
<i>Cyrtandra munroi</i>		E	
<i>Eurya sandwicensis</i>	ānini, wānini		VU
<i>Exocarpos gaudichaudii</i> <sup>†</sup>	heau		EN
<i>Geranium hillebrandii</i> (formerly <i>humile</i> )	Nohoanu, hinahina	E	
<i>Melicope orbicularis</i> <sup>*</sup>	alani		EN
<i>Myrsine vaccinioides</i>	kōlea	E	
<i>Neraudia melastomifolia</i> <sup>^†</sup>	ma'aloa, 'oloa		VU
<i>Nothoctrum latifolium</i> <sup>^†</sup>	'aiea	C	EN
<i>Platanthera holochila</i> <sup>1</sup>	-	E	
<i>Ranunculus mauiensis</i> <sup>1^†</sup>	makou	C	
<i>Sicyos cucumerinus</i> <sup>†</sup>	'ānunu, kūpala	SOC	

Number of rare plants in Kapunakea	34
<sup>1</sup> = Current PEP target	6
<sup>^</sup> = Not known from West Maui NAR	8
<sup>†</sup> = Not known from Pu'u Kukui WMA	12
<sup>*</sup> = Known from preserve historically (pre-1975)	3

**Federal Status:**

E = Endangered  
SOC = Special concern  
C = Candidate

**IUCN Status:**

CR = Critically Endangered  
EN = Endangered  
VU = Vulnerable  
LR/cd = Lower Risk/conservation dependent  
NT = Near Threatened

**Appendix 3**  
**Other Rare Species of Kapunakea Preserve**

SCIENTIFIC NAME	SPECIES TYPE	FEDERAL STATUS	IUCN STATUS
<i>Partulina perdix</i>	Land snail	n/a	EN
<i>Partulina tappaniana</i>	Land snail	n/a	EN
<i>Perdicella kuhnsi</i>		n/a	dd
<i>Pterodroma phaeopygia sandwichensis</i>	Forest bird	E	n/a
<i>Vestiaria coccinea</i>	Forest bird	Under review	VU

† = Not known from Pu'u Kukui WMA

**Federal Status:**

E = Endangered  
 SOC = Special concern  
 C = Candidate

**IUCN Status:**

CR = Critically Endangered  
 EN = Endangered  
 VU = Vulnerable  
 LR/cd = Lower Risk/conservation dependent  
 NT = Near Threatened  
 dd = data deficient

## Appendix 4 References and Related Documents

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