

State of Hawaii
DEPARTMENT OF LAND AND NATURAL RESOURCES
Division of Forestry and Wildlife

May 27, 2022

Chairperson and Members
Board of Land and Natural Resources
State of Hawaii
Honolulu, Hawaii

Land Board Members:

SUBJECT: AUTHORIZATION OF FUNDING FOR THE NATURE CONSERVANCY FOR \$2,636,067 DURING FY 23-28 FOR CONTINUED ENROLLMENT IN THE NATURAL AREA PARTNERSHIP PROGRAM AND ACCEPTANCE AND APPROVAL OF THE WAIKAMOI PRESERVE LONG RANGE MANAGEMENT PLAN, TMK 2-3-05:04, MAUI

BACKGROUND:

The State's Natural Area Partnership Program was established in 1991 and provides matching funds (\$2 State to \$1 private) for the management of qualified private lands that have been permanently dedicated to conservation (Hawai'i Revised Statutes § 195-6.5).

The attached Long-Range Management Plan (LRMP) for Fiscal Years 2023-2028 provides a detailed description of the natural resources protected in the Preserve and the management activities planned over the next six years. Although Natural Area Partnership agreements are made in perpetuity, funding is authorized on a six-year basis to allow for regular periodic State and public review.

A Finding of No Significant Impact was issued for this project in 2000, which includes all activities proposed in this continuing LRMP.

The Board approved an LRMP for Waikamoi Preserve on March 23, 2018, for FY 19-24. The attached LRMP for FY 23-28 would replace that previous version. The new LRMP aims to update new activities proposed for management and provide additional funding to accommodate increased management costs. This new LRMP will streamline contracting by consolidating funding for the activities occurring in Waikamoi and other areas under a conservation easement held by The Nature Conservancy that contribute to the overall ecosystem health of Maui Nui and the Waikamoi Preserve. There is an existing active LRMP and Partnership Agreement for the adjacent Waikamoi Preserve – East Maui Irrigation Addition (TMK 2-4:016:004, por.) for FY21-26, which was approved by the Board on April 24, 2020. This proposed FY23-28 LRMP and Partnership Agreement includes the activities proposed in the FY21-26 plan. Chapter 13-210-8(e), Hawai'i Administrative Rules, permits activities to be funded outside the Preserve boundaries if that

management improves the natural resources found within the Preserve. The adjacent East Maui Irrigation Addition management actions directly support the management of the Waikamoi Preserve. By consolidating these activities into a single Partnership Agreement there is no longer a need for the EMI Partnership Agreement, which can be terminated if this new agreement is approved.

RECOMMENDATIONS:

That the Board:

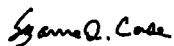
- 1) Approve the Waikamoi Preserve Long-Range Management Plan submitted for Fiscal Years 2022-2028;
- 2) Authorize the matching funding for the management of the Waikamoi Preserve for the full six-year period as outlined in the Long-Range Management Plan for Fiscal Years 2022-2028; and
- 3) Authorize the Chairperson to negotiate and sign a Partnership Agreement with The Nature Conservancy, subject to approval as to form by the Attorney General's office.

Respectfully submitted,



DAVID G. SMITH, Administrator
Division of Forestry and Wildlife

APPROVED FOR SUBMITTAL:



SUZANNE D. CASE, Chairperson
Board of Land and Natural Resources

Attachment

Waikamoi Preserve

East Maui, Hawai'i

Long-Range Management Plan Fiscal Years 2023-2028



to the
Hawai'i Department of Land and Natural Resources

By



The Nature Conservancy, Maui Program
April 2022

EXECUTIVE SUMMARY

The Nature Conservancy (TNC) is an international private, non-profit organization based in Arlington, Virginia. Informed by science and guided by traditional values and practices, we apply innovative, nature-based solutions to our world's toughest challenges so that nature and people can thrive. The mission of The Nature Conservancy is to conserve the lands and waters on which all life depends. Established in 1980, TNC's Hawai'i program has forged partnerships to manage 14 preserves and other sites across the Hawaiian Islands and has grown to include Palmyra Atoll. In Hawai'i we work with government agencies, private landowners, businesses, community partners and local stakeholders to protect and restore Hawai'i's native watershed forests, coral reefs and nearshore fisheries for the ecological value and the many benefits they provide to people. In 1991, TNC helped to pioneer the watershed partnership model, which now includes more than 2.2 million acres of conservation land statewide.

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. Waikamoi Preserve was approved for NAPP funding in 1992, and this Waikamoi Long-Range Management Plan (LRMP) follows the last plan covered in fiscal years (FY) 2019–2024. The Nature Conservancy's Maui terrestrial program manages four NAPP preserves: Waikamoi, East Maui Irrigation (now Mahi Pono) Waikamoi Addition, Kānepu'u and Kapunakea. The Nature Conservancy of Hawai'i (TNCH) is seeking reauthorization of NAPP funding for the next six-year period for the programs described within this *Waikamoi Preserve FY2023–FY2028 Long-Range Management Plan*. This plan builds upon and extends the programs implemented under the previous plans and environmental assessments. Herein, we request funding annually in matched state funds for the six years spanning FY23–FY28. This plan was prepared in compliance with the NAPP agreement between the state, TNCH, and Hawai'i Administrative Rules Chapter 13-210.

The state Department of Land and Natural Resources (DLNR), which administers the NAPP, is kept apprised of our progress in the preserves through written reports and an annual inspection. Semiannual and annual plans and reports are submitted in February and September, respectively. These documents are posted on the DLNR NAPP website.

Deliverables Summary

We successfully implemented the resource management projects of the previous six-year long-range plan, as well as many others. See Table 1.

Table 1. Overview of Accomplishments, Jul. 2016-Feb. 2022

	Indicator	Measure of Success
Ungulate Control	Total animal catches	<ul style="list-style-type: none"> 1 deer, 2 pigs (EMI Addition)
	Total traps checked	<ul style="list-style-type: none"> 281 groups checked multiple times/yr.
	Total hunts conducted	<ul style="list-style-type: none"> 7 hunts, 3 catches in DMU
	Miles of fence constructed and maintained	<ul style="list-style-type: none"> 18 miles of fence maintained and checked multiple times/yr.
	Ungulate monitoring transects installed and monitored	<ul style="list-style-type: none"> 13 500m ungulate monitoring transects checked semiannually
Invasive Plant Control	Acres and total numbers of priority invasive plants treated or removed	<ul style="list-style-type: none"> 75 <i>Cortaderia jubata</i> plants treated by MISC
		<ul style="list-style-type: none"> 731 acres surveyed for ginger with an estimated 13,914 total m² of ginger treated
		<ul style="list-style-type: none"> 16 acres surveyed for gorse
		<ul style="list-style-type: none"> 157 acres surveyed for pines on the ground
		<ul style="list-style-type: none"> 3,500 acres surveyed for pines from the air
		<ul style="list-style-type: none"> 14,196 pines treated
Resource Monitoring	Frequency of ungulate sign on ungulate transects	<ul style="list-style-type: none"> From 66% activity in FY15 to 0% in FY22
	Miles surveyed for plant infestations	<ul style="list-style-type: none"> ~ 200 annually
Rare Species Protection and Research	Number of new rare taxa locations discovered	<ul style="list-style-type: none"> 22 locations of 35 different species documented & mapped
	Number of species out planted and recovered	<ul style="list-style-type: none"> 2 rare species outplanted
	Number of research projects supported	<ul style="list-style-type: none"> 29 research projects supported

RESOURCE SUMMARY

General Setting

The 5,230-acre Waikamoi Preserve was established in 1983 through a perpetual conservation easement with the landowner, Haleakalā Ranch Company. The preserve lies west of the state's 7,500-acre Hanawī Natural Area Reserve (NAR), and its southern boundary runs along Haleakalā National Park. These managed areas, together with other state and private lands on the northeast slopes of Haleakalā, represent one of the largest intact native rain forests in the state, comprising more than 100,000-acres of essential watershed forests. Active management of Waikamoi Preserve is essential to protecting the entire 100,000-acre area.

In 2013, TNC obtained a conservation easement over 3,721 acres of East Maui Irrigation Co. Ltd. (EMI, now Mahi Pono) lands adjacent to Waikamoi Preserve. The land is some of the highest quality and weed-free native forest in the state, in addition to being prime forest bird habitat. The parcel is bordered by the State of Hawai'i Ko'olau Forest Reserve, the Hanawī Natural Area Reserve, Haleakalā National Park, and lies immediately below TNC's original Waikamoi Preserve, with which it shares a long seven-mile boundary; today we collectively refer to the two parcels together as Waikamoi Preserve, totaling 8,951 acres (Figure 1).

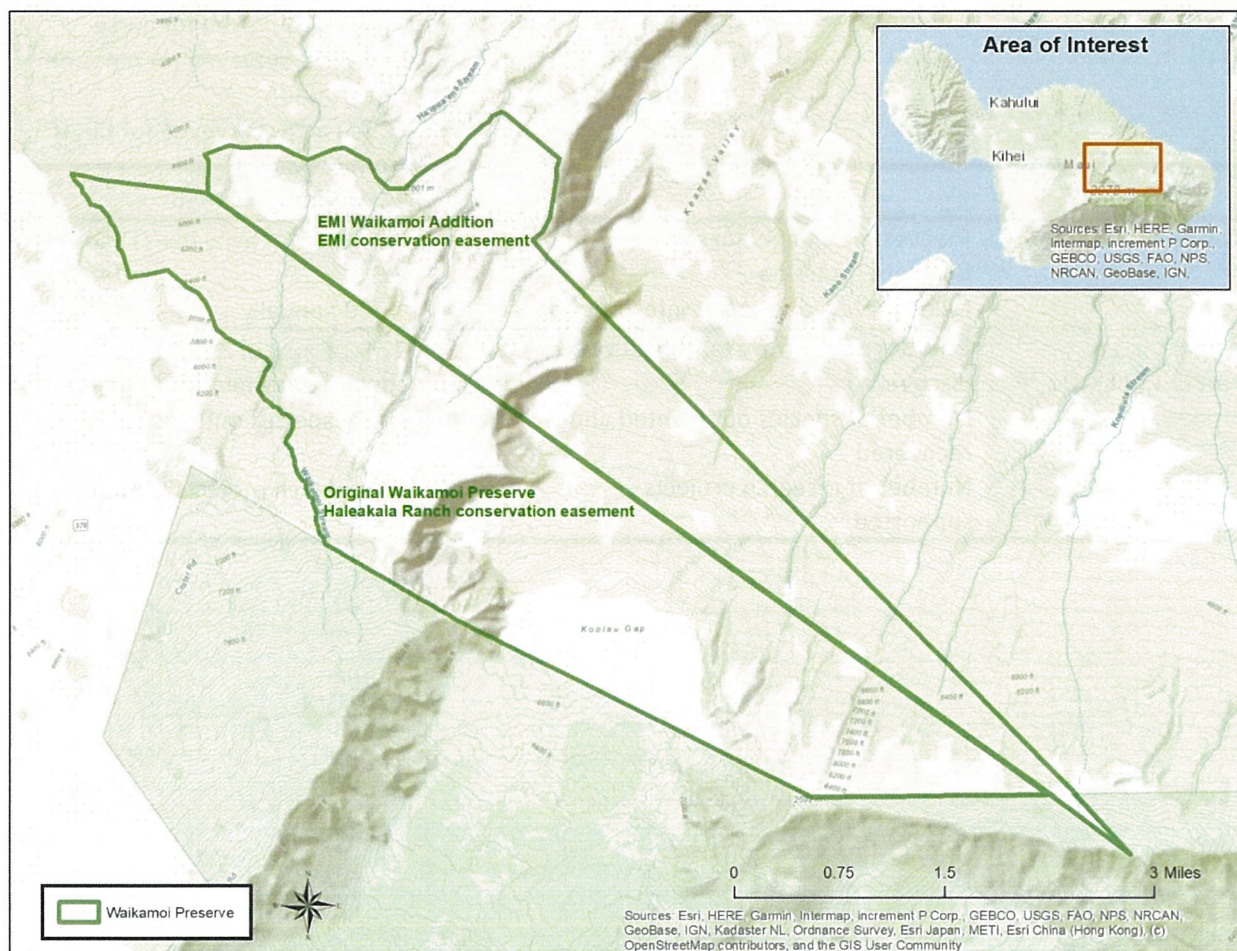


Figure 1. Waikamoi Preserve and EMI Addition easements.

Flora and Fauna

Fourteen terrestrial native natural communities are represented in Waikamoi Preserve, two of which are considered rare: *Deschampsia* subalpine mesic grassland and māmane (*Sophora chrysophylla*) subalpine dry forest (figure 2). To date, 49 plant species are tracked by TNC and the state's Plant Extinction Prevention Program staff (although not all are PEPP targets) they include single-island endemics, listed endangered or listed threatened by the US Fish and Wildlife Service.

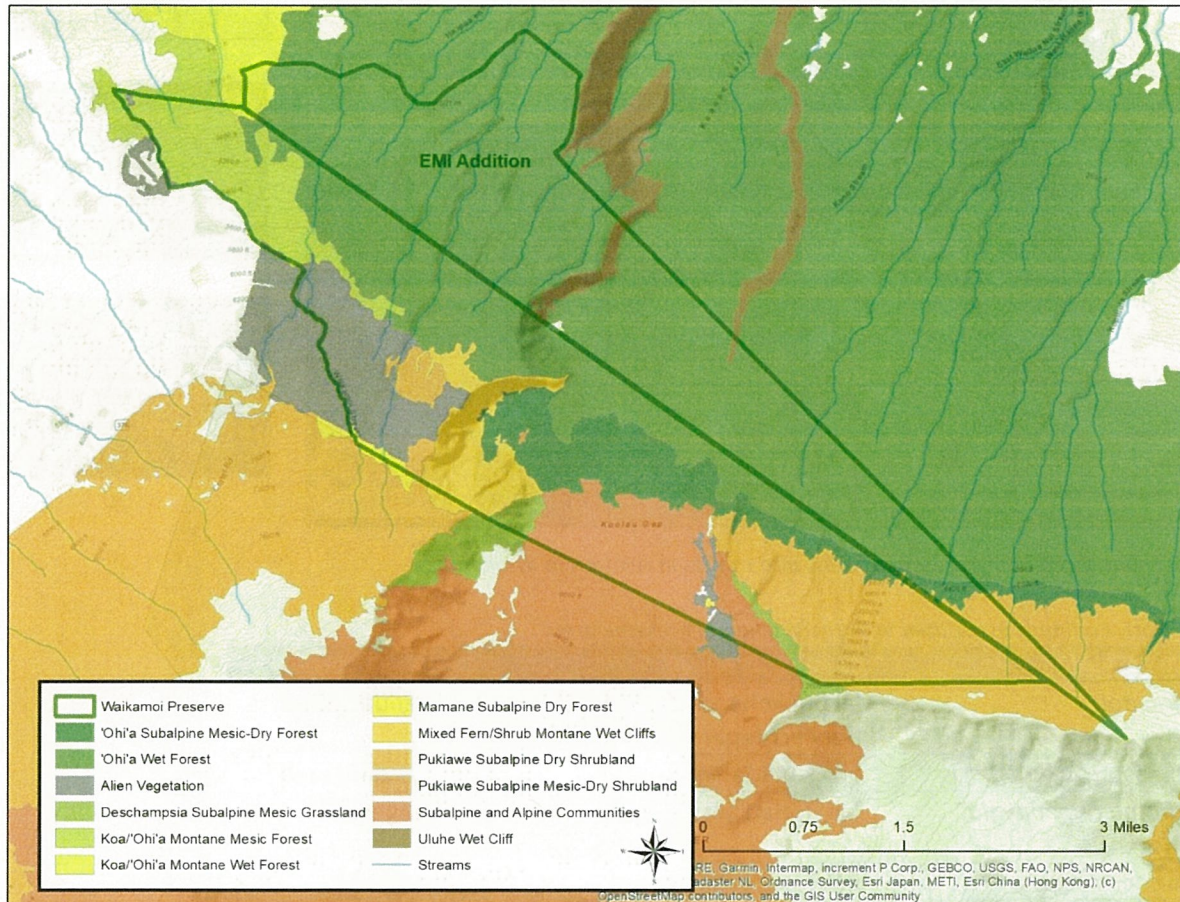


Figure 2. Waikamoi Preserve boundary, natural communities, and streams.

Thirteen native birds have been historically reported from Waikamoi Preserve and of those, five have a federal listing: 'ākohekohe (*Palmeria dolei*), Maui parrotbill or kiwīkiu (*Pseudonestor xanthophrys*) (see Figure 3), and dark-rumped petrel or 'ua'u (*Pterodroma phaeopygia sandwichensis*) are endangered, and nēnē goose (*Branta sandvicensis*) and 'i'iwi (*Drepanis coccinea*) are listed as a threatened species. The Newell's shearwater or a'o (*Puffinus auricularis newellii*) has also been documented in the Preserve and is listed as threatened. Maui 'akepa (*Loxops coccineus ochraceus*), po'ouli (*Melamprosops phaeosoma*), and Maui nukupu'u (*Hemignathus lucidus affinus*) was proposed extinct in 2021. The endangered Hawaiian hoary bat or 'ōpe'ape'a (*Lasiurus cinereus*) is also found in the preserve.

It is anticipated that there is significant invertebrate diversity in Waikamoi Preserve. Although more remains to be learned about the molluscan fauna, at least six genera of native land snails have been reported in Waikamoi Preserve.

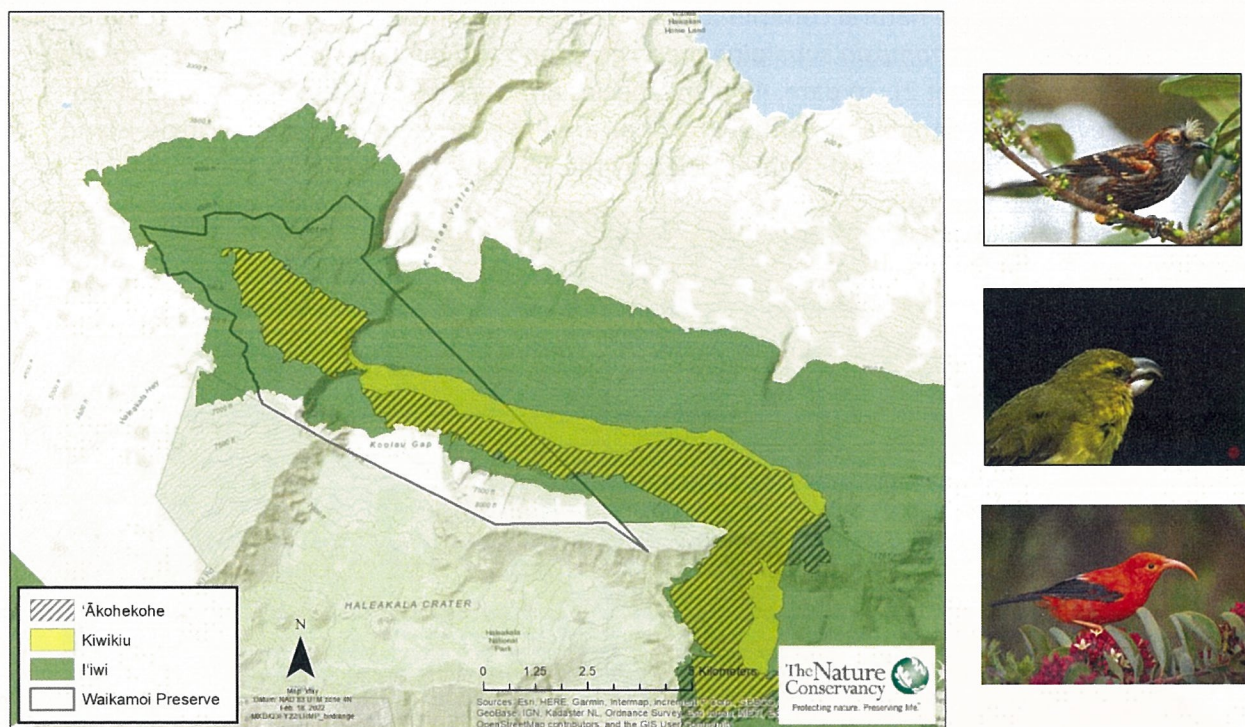


Figure 3. Endangered and threatened forest bird ranges in relation to Waikamoi.

Table 2. Native animals associated with the Waikamoi Preserve area.

SCIENTIFIC NAME	COMMON NAME	FEDERAL STATUS
<i>Palmeria dolei</i>	‘ākohekohe, crested honeycreeper	Critically endangered
<i>Pseudonestor xanthophrys</i>	kiwikiu, Maui parrotbill	Critically endangered
<i>Pterodroma phaeopygia sandwichensis</i>	‘ua‘u, Hawaiian petrel	Endangered
<i>Branta sandvicensis</i>	nēnē, Hawaiian goose	Threatened
<i>Puffinus auricularis newelli</i> ³	‘a‘o, Newell’s shearwater	Threatened
<i>Drepanis coccinea</i>	‘i‘iwi	Threatened
<i>Asio flammeus sandwichensis</i>	pueo	--
<i>Paroreomyza montana</i>	‘alauahio	--
<i>Himatione sanguinea</i>	‘apapane	--
<i>Hemignathus virens</i>	‘amakihi	--
<i>Lasiurus cinereus semotus</i>	‘Ōpe‘ape‘a Hawaiian Hoary Bat	Endangered
<i>Megalagrion nesiotes</i>	Damselfly, pinao ‘ula	Endangered

MANAGEMENT

Management Considerations

Waikamoi Preserve is adjacent to four large, managed natural areas: The Nature Conservancy's newest conservation easement – the 3,721 acre "Waikamoi Addition" acquired from EMI in 2014, Haleakalā National Park, the state Ko'olau Forest Reserve, and the state Hanawī NAR. In addition, in 1991 we helped initiate the formation of the East Maui Watershed Partnership (EMWP) with the State Department of Land and Natural Resources, EMI, Haleakalā Ranch Company, County of Maui, Haleakalā National Park, and Hāna Ranch Partners, LLC to implement a unified management plan for the East Maui watershed. Management efforts at Waikamoi complement the EMWP management plan's objectives, and TNC often conducts management on adjacent watershed lands to prevent ungulates and weeds from spreading into Waikamoi. Management activities between the Conservancy and EMWP are coordinated, with staff, equipment, and expertise frequently shared to maximize efficiency.

A primary strategy for the protection of Waikamoi Preserve is to remove ungulates to reduce damage to native vegetation and soils. In the last six years we removed one deer on the western boundary and two pigs in the EMI addition. Currently there is one known pig in the western Unit 1A and less than five deer in northern Waikamoi. Both ingress events were due to kona storms in 2021 which caused a large tree to fall, lifting a fence enough for 3-4 deer to get under in the northern section. In Unit 1A a stream curtain was damaged, and one pig and a deer got into the preserve.

With the exception of about 800 acres of exotic tree plantation (including non-native *Acacia*, *Thuja* spp., *Pinus* spp., and other conifers) adjacent to Haleakalā National Park's Hosmer Grove area, Waikamoi's 5,230 acres are dominated by native species. The Conservancy's weed management activities focus on controlling Himalayan ginger (*Hedychium gardnerianum*), invasive pines (*Pinus* spp.), and gorse (*Ulex europaeus*), and preventing the establishment of new priority weeds moving from adjacent lands.

A primary management objective is to prevent the introduction of habitat-modifying weeds, pest insects and plant disease. Special care is taken to minimize negative side effects of management activities. Due to *Ceratosystis* spp. (fungi that causes Rapid 'Ōhi'a Death), visitors and staff thoroughly clean gear before entering the preserve. Staff follow a strict cleaning protocol for all gear to remove seeds, debris, and insects to prevent accidental introduction of pest species to the preserve.

Protection of Waikamoi Preserve's forested watershed and stream headwaters will contribute directly to the ability to continue to provide fresh, abundant, clean water, forest health, ecosystem resilience and aquifer function and health. In the absence of conservation management activities, the native forest would quickly be overtaken by invasive nonnative weeds, greatly altering watershed function and aquifer recharge. As we experience the loss of native forest habitat to non-native plant and animal species the likelihood of widespread soil erosion increases, greatly impacting freshwater quality. It is well documented that erosion can lead to increased pollution and sedimentation in streams and rivers which feed our aquifers and surface water systems and eventually make its way to nearshore reef habitats. A UHERO analysis documents that continued TNC management activities at

Waikamoi over the next 50 years will prevent an estimated 4,300 tons of sediment per year from entering our waterways, thus avoiding large costs for water treatment.

We will continue to adapt our management to incorporate innovative strategies that are more effective and reduce costs in the long run, and that address new or changing threats. Climate change is already impacting Waikamoi and other native areas by accelerating invasive species invasions, altering native species distributions, and impacting native species habitat and overall forest health. In addition, longer periods of drought could significantly increase wildfire risk, especially in the conifer-dominated portion of the preserve and drier subalpine communities. Maintaining forest resilience and native-dominant habitat through the strategies outlined in this plan will be critical to adapting to and preventing climate change impacts at a greater scale.

We will continue to pursue new methods and technologies that enhance current management practices and provide a greater return on investment. Examples include artificial intelligence, machine learning, remote sensing, high-resolution mapping, unmanned aerial systems (e.g., drones), and infrared sensors and cameras; new application technologies that provide effective control of priority weeds using target-specific methods, precision application, and/or low rates of herbicides; and supporting exploratory research in countries of origin for our priority invasive plants, including collaboration for well-regulated releases of biocontrol agents onto priority alien pest species.

Management Programs

The following management programs are described separately but 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. We discuss the use of innovative tools where most relevant under each program. 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 FY2023–FY2028.

Program 1: Non-Native Species Control

A. Invasive Plant Control

Program Goal: To maintain large, native-dominated core areas within Waikamoi Preserve and adjacent areas that are free of the highest priority habitat-modifying weeds and prevent the introduction and spread of problem weeds to areas where they are not currently established.

Program Description: The highest priorities of our invasive plant control program are to minimize disturbances to intact native communities, prevent and suppress priority weeds that alter the hydrologic cycle, survey for and control outlying populations of priority weeds, and prevent the introduction of additional invasive plant species.

Climate change will facilitate expansion of invasive plants at the expense of native plants better equipped for water capture, with the potential to greatly alter the hydrologic cycle and decrease groundwater recharge. We will continue to build on weed progress achieved in prior years by focusing on high priority populations with particular focus on Himalayan ginger and conifers. Ginger and conifers have been spreading across east Maui, which requires a more aggressive approach to

get in front of its expansion. Because much of the preserve is remote and requires large amounts of resources to scout and find ginger, we have been attempting to identify ginger via drone and aerial imagery by creating algorithms with artificial intelligence and machine learning techniques.

In addition to this innovative approach to weed location identification, we will utilize a youth conservation corps team to conduct systematic ginger control sweeps in an approximately 500-acre area in western Waikamoi above and adjacent to water collection infrastructure. On top of providing TNC dedicated, intensive resources to control and mitigate the Himalayan ginger in Waikamoi, the team will be given an opportunity to gain on the ground field experiences that will help facilitate and enhance their conservation careers. This partnership will be the first time TNC has utilized a dedicated conservation corps that will spend at least a month committed to ginger control. This intensive effort will give us the opportunity to control and suppress the invasion of Himalayan ginger in a critical area of western Waikamoi more effectively. After the team completes their sweep, TNC will shift to a schedule of a three-year retreatment with hotspot control. A three-year retreatment cycle will allow teams to manage the ginger population and the seed bank by treating individuals before they reach maturity and further contribute to an already fertile seed bank. A previous retreatment cycle of 4 years proved too long and ineffective due to the rapid growth rate of Himalayan ginger.

Himalayan ginger will also be treated via Herbicide Ballistic Technology (HBT) in areas that are inaccessible to ground control teams. Remote isolated populations on steep ridges in Ko'olau gap are contributing to the significant spread of ginger on the western end of the gap and causing ground crews to focus considerable efforts controlling it in these areas. The use of HBT will suppress these seed sources and allow control efforts within Ko'olau gap to be better managed.

We are currently treating conifers on the ground and via aerial application and continue to refine our techniques for optimal efficacy. Research over the past 2 decades has helped us expand and refine our ground control treatments for conifers. We now use a direct injection technique which causes mortality to the target with very little herbicide use. We also apply herbicide via aerial-precision application via helicopter, which allows the pilot to specifically target individual trees with a minimal chance of harming non-target plant species. This is especially helpful in cliff areas where conifers grow along the Hanakauhi and Pu'u Ko'olau pali. In the past we have leveraged resources from conservation partners, resulting in better collaboration with this technique and across landowner and management boundaries. However, we discovered that not having in-house equipment hindered our ability to undertake missions when and how we needed; therefore we intend to purchase and build our own aerial weed control equipment setup*, as the need to re-treat conifers once a year has been consistent. We have been using small unmanned aerial systems (sUAS; a.k.a. drones) to monitor existing weed control areas and to detect new populations of Himalayan ginger in Ko'olau Gap and other areas where access is difficult. This is also cost effective in that we are avoiding additional helicopter use for these tasks when it is feasible to use the UAV.

Gorse is persistent in a localized area in Waikamoi. Gorse seeds can stay in the soil and be viable for around 20 years. We had been on a 7-year re-treatment cycle; however, we are shortening our re-treatment cycle to 3-4 years because we are seeing recruitment of seedlings in known hotspot areas (totaling ~ 10 acres).

Treatment of other priorities such as *Fraxinus uhdei*, and *Cortaderia jubata*, during pre-determined intervals can keep these plants in suppression mode. Also targeted are habitat-modifying weeds just beginning to invade Waikamoi, such as *Psidium cattleianum*, *Ilex aquifolium*, *Tibouchina herbacea*, *Cinnamomum camphora*, *Setaria palmifolia*, and *Rubus glaucus*, with the goal of preventing establishment. Included last are potentially future priority weeds moving through adjacent lands but not yet established in Waikamoi, including *Passiflora molissima* (banana poka) and *Morella faya* (faya tree).

Invasive Plant Control, 2023-2028

We will continue to build on weed progress achieved in prior years by focusing on high priority populations with particular focus on Himalayan ginger and three species of conifers.

Activities:

- Sweep and control Himalayan ginger throughout the native-dominant areas, focusing on outliers; maintain control of the leading edge of ginger invasion from adjacent EMI lands and the Makawao Forest Reserve.
- Identify weeds using artificial intelligence or machine learning techniques utilizing aerial imagery.
- Use a specialized team to strategically suppress the western Waikamoi ginger population*.
- Utilize innovative Herbicide Ballistic Technology (HBT) technique to suppress ginger populations growing on cliff faces that are inaccessible to ground crews.
- Conduct routine weed monitoring and control of habitat-modifying weeds at landing zones, fences, and camp infrastructure.
- Scout for, map, and monitor potential habitat-modifying invasive plants and monitor efficacy of treatments using sUAS. Implement other vegetation and/or weed surveys if cost-effective methods are available.
- Control conifers via on the ground injection and aerial precision application from helicopters in select areas. Purchase and build aerial spray equipment*.
- Support and share innovative approaches with partners and landowners.
- Prevent other incipient weed or pathogen establishment by continuing strict inspection and cleaning procedures to prevent their introduction.
- Continue interaction with HISC to provide support for biocontrol funding, especially for Himalayan ginger.
- Explore the innovative use of drone-assisted herbicide application for localized, hard to reach weed populations.

Table 3. Priority weed species for management

Scientific name	Common name
Top Priority Species	
<i>Hedychium gardnerianum</i>	Himalayan ginger
<i>Pinus</i> spp.	Mexican weeping pine, Monterey pine
<i>Ulex europaeus</i>	Gorse
<i>Cryptomeria japonica</i>	Tsugi pine
<i>Acacia melanoxylon</i>	Blackwood acacia
<i>Fraxinus uhdei</i>	Tropical ash
<i>Cortaderia jubata</i>	Pampas grass
Early Detection/Rapid Response species	
<i>Psidium cattleianum</i>	Strawberry guava
<i>Ilex aquifolium</i>	English holly
<i>Tibouchina herbacea</i>	Cane tibouchina
<i>Cinnamomum camphora</i>	camphor tree
<i>Setaria palmifolia</i>	palmgrass
<i>Andropogon virginicus</i>	broomsedge
<i>Cyathea cooperi</i>	Australian tree fern
<i>Clidemia hirta</i>	Koster's curse

B. Ungulate Control

Program Goal: To protect large native-dominated areas and watershed within and adjacent to the Waikamoi by removing all ungulates and preventing future invasion.

Program Description: The importance of Waikamoi Preserve as a refuge for native rare and endangered Hawaiian birds, 47 endangered plant species, and seventeen natural communities cannot be overstated. It is one of the most viable and intact remaining native forests in the state. Ungulate damage is one of the greatest threats to the preserve and critical East Maui watershed headwaters, and we strive to maintain the Preserve at zero-tolerance ungulate levels.

The original 5,230-acre Waikamoi Preserve has been ungulate free since 2009, until recently. This project will ensure that zero tolerance ungulate status in Waikamoi is maintained through frequent fence inspections and repairs, consistent ungulate trapping, scouting, and monitoring. GIS tracks are recorded with GPS or mobile app any time staff, volunteers, contractors, or partners are in Waikamoi. All management activities serve as “scouting” for ungulate sign or disturbance, in addition to ungulate transect monitoring. We take an “early detection, rapid response” approach to ungulates, and will immediately prioritize response to any ungulate sign detected in the Preserve.

We regularly inspect and repair ~ 18 miles of fencing throughout the Preserve. These fences are critical to ensuring no ungulate ingress – particularly pigs or axis deer. All critical boundary fences are checked quarterly with any deterioration or breaches addressed and fixed immediately. If a breach occurs or is suspected a mesh network of game cameras is deployed to record animals for easier deployment of traps or crew to remove the animal.

We maintain a network of remote traps as insurance in case a breach did occur, so that ungulates can not establish in the Preserve. We continue to strategically hone this network to focus on any hotspot areas from the past or areas where we know there is significant pig or deer pressure outside the fence. The network contains about 1,300 traps currently which may be scaled up or down depending on ungulate presence or absence.

Absence of ungulate activity in the Preserve is confirmed and documented semiannually, depending on the date of last ungulate activity. A network of thirteen 500-meter ungulate monitoring transects are read for sign vs. no sign of ungulates. We will consider strategically downscaling this network due to multiple years of no animal sign in the preserve. This monitoring serves as a measurable, relative index of ungulate activity as the project continues and is used to gauge the effectiveness of our control strategies and techniques.

FY23–FY28

The focus of our ungulate control program in FY2023–2028 will be to maintain zero ungulate activity in Waikamoi Preserve. We will continue to streamline, improve, and refine management activities, implement innovative approaches, and share our experiences and knowledge with partners.

The current regime of fencing, hunting, and trapping in remote areas for ungulate removal has proven effective. Remote trapping remains an essential tool in an integrated program for ungulate removal and control. Boundary fences are checked and maintained on a regular schedule and will be

repaired and replaced incrementally as needed. We may identify new areas that can benefit from strategic fencing or wing extensions. Over the next six years, we will explore new strategies and techniques so that our ungulate control program continues to be as effective, efficient and humane as possible. Notice of any significant changes to the management program will be included in semi-annual progress reporting.

Activities

- Inspect all boundary fences on a quarterly or semiannual basis and make repairs immediately. Internal fencing that shares boundaries with EMI Addition will be checked semi-annually. Inspect fences immediately following storms or other natural or suspected events (e.g., vandalism). Identify new fencing needs and add strategic fences as needed.
- Maintain zero ungulates throughout Waikamoi. Regularly check and maintain traps, streamlining in areas that have never caught.
- Scout for ungulates routinely and track animal catches. Update pig activity and scout maps annually.
- Annually monitor 13 500 meter transects to monitor for animal ingress.
- Prevent invasion of axis deer into Waikamoi Preserve by supporting Haleakalā Ranch activities to maintain the DMU fence and assist with hunting and activities within the “Ukulele” project as requested and feasible.
- Deploy innovative mesh network game cameras to determine animal habits for more effective control.
- Use UAV mounted FLIR camera and scope to assist hunting.
- Test innovative and new monitoring technologies, such as UAV-mounted FLIR cameras or remote IP fencing monitoring systems.

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

Program Goal: To prevent the introduction 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, pathogens and small mammals threaten native ecosystems and their function. Preventing or controlling these threats will contribute to the survival of endangered species and the habitats they require for survival.

Rapid Ōhi’a Death (ROD) has affected more than 175,000 acres on Hawai’i Island as of 2019. It has been found on Kaua’i, O’ahu and Maui. TNC has implemented strict sanitation protocols and restricted access to preserves for those traveling from islands impacted by ROD. TNC is also a founding member of the Maui Nui ROD working group, which is currently dormant given the lack of detections in Maui Nui.

The presence and distribution of *Plasmodium relictum*, spread by the *Culex quinquefasciatus* mosquito which subsequently causes avian malaria, is still being understood on east Maui. At Waikamoi Preserve studies are ongoing to help determine elevational gradient, presence, and distribution of *P. relictum* and *C. quinquefasciatus*. Waikamoi will be a future study site for the

incompatible insect technique which uses *Wolbachia* infected male mosquitos to suppress populations of mosquitos. *

Small Mammal and Other Invasive Control FY23–FY28

A reduction in NAPP funds precludes a full-scale predator control program at this time, instead we will support partners that choose to engage in predator control by allowing it in Waikamoi or seek funding from other sources to engage in it at Waikamoi. We will follow strict established protocols for cleaning and monitoring to prevent the accidental introduction of new alien species.

Activities

- Support partners or establish viable control programs for small mammals.
- Observe established TNC ROD prevention protocols. Respond immediately to ROD threat by having suspect trees sampled as deemed necessary.
- Support innovative Incompatible Insect Techniques and studies on *P. relictum*, *C. quinquefasciatus* and *Wolbachia*.

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

Program Goal: Conduct and support monitoring and research to track the status of biological and physical resources of the preserve, especially rare species, while encouraging and assisting with research that increases our understanding and management of the preserve’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, the agency responsible for administering the federal Endangered Species Act, to identify rare and endangered species and those that are listed as “candidate” or “threatened” species. Biological surveys have shown that the preserve protects numerous rare species, many of which are federally listed as endangered. Although protecting essential habitat is our main strategy to their protection, we also inventory the rarest species and take measures to protect them. 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 species. PEPP is focused on target species at Waikamoi, with the intent to collect seed for future propagation of rare plants. Accurate mapping and documentation of vigor of these populations is a byproduct of the PEPP work. We work closely with PEPP and support their efforts to protect and restore rare and endangered species found in the preserve.

Like PEPP, the Maui Forest Bird Recovery Project (MFBPR) does critical work in Waikamoi with endangered forest birds. Coordinated by DOFAW and administered through the PCSU, the MFBPR contributes to our understanding of critically rare birds found in the preserve by conducting rapid assessments for kiwikiu and ‘ākohekohe, along with genetic research (of all birds caught) to determine if they carry or have been infected with *P. relictum* in the past. We partnered with MFBPR and The University of Hawaii at Hilo’s Listening Observatory for Hawaiian Ecosystems (LOHE) lab to deploy songmeters in areas that should have kiwikiu and ‘ākohekohe to determine presence or

absence. Bird vocalizations will be used to train a computer in a machine learning project to recognize the two species. We support MFBRP with their research and share GIS data and sample results quarterly.

Plans to install a network of small weather sensors that send and share data with a larger weather station will help document microclimates that will help inform mosquito movement and life cycles. They will facilitate the eventual release of mosquitos for the incompatible insect technique that is currently being developed. These sensors will also add to the data that is documenting climate change and weather patterns.

We also encourage and support independent research aimed at answering important resource and management questions. Twenty-nine research projects were undertaken in Waikamoi from FY17 through Feb. FY22, including studies on lobelioids, moths, forest birds, bryophytes, fruit flies, spiders, seabirds, land snails, bats, and the economic value of our work.

Resource Monitoring, Rare Species Protection and Research FY23-FY28

We may employ new passive monitoring technologies such as remote sensing, high resolution aerial photography and videography for vegetation monitoring, songmeters, and remote photo monitoring. Other monitoring tools may be employed as they are developed and become available.

We will continue to encourage independent research in Waikamoi 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.

Activities

- Support forest bird preservation through participation and assistance with IIT *Wolbachia* planning and release.*
- Continue to support PEPP in search and assessment of rare species populations to determine protection needs and to reduce threats.
- Support MFBRP in rapid assessments for kiwiku and ākohekohe and sampling for avian disease.
- Maintain and update current maps of rare species populations. Update database as necessary.
- Review and provide technical guidance to research proposals as necessary.
- Establish and monitor test plots conifer-invaded habitat to document the success of passive and active restoration efforts to create and expand mosquito-free forest bird habitat.
- Establish a network of sensors to measure microclimate and weather patterns associated with mosquito movement and life cycle.*

Program 3: Partnerships & Outreach

Program Goal: Support partners, especially the East Maui Watershed Partnership and the Maui Invasive Species Committee (MISC), where cooperative management activities mutually benefit Waikamoi Preserve and the partners. Work with partners to leverage our impact on community education and outreach to ultimately build public understanding and support for the preservation of natural areas.

Program Description: The EMWP provides protection for about 100,000 acres on East Maui and is administered by a coordinator and field crew. Activities include fencing, ungulate removal, invasive plant removal, and resource monitoring programs for all of East Maui's native forests. TNC's Maui Field Office helped to form and has actively participated in partnership activities from the beginning in 1991. As a partner, we helped set management priorities, fundraise, and administer projects. Initially, we supervised and trained EMWP crews in ungulate and weed removal, monitoring techniques, fence building, and a wide array of safety procedures including rappelling, helicopter travel, and wilderness survival. We continue to work closely with EMWP, as TNC has awarded EMWP a subcontract to conduct some management activities in Waikamoi. We meet regularly with EMWP staff and crew to discuss priorities, strategies, and management actions and techniques.

EMWP has a thriving community outreach program that is focused on the local schools and community through their annual Malama Wao Akua art event. TNC offers Waikamoi Preserve as a venue for educational hikes for school groups and for "art hikes" to provide inspiration and education to the community. We strive to increase conservation and advocacy for native-dominant ecosystems through an understanding of the importance, threats, and protection efforts of Waikamoi Preserve and the East Maui watershed. The primary audience of public access to Waikamoi Preserve is the local community and others who can increase our effectiveness in stewardship.

Other outreach activities include participation at local community events, such as the East Maui Taro Festival or Maui Ag Fest.

Outreach FY23-FY28

The Nature Conservancy Maui offers a monthly hike to the Waikamoi Boardwalk, and a bimonthly or quarterly volunteer service trip for community members which allows access into areas of the preserve that are normally inaccessible. Public access to Waikamoi Preserve as a venue for public outreach by appropriate agencies will be utilized as a strategy to highlight the importance of protection efforts. Access will depend upon TNC staff or docent availability, current threats or issues impacting restriction of access (e.g., ROD, COVID), and a consistent assessment of the impacts to the Preserve resources.

Other outreach activities include participation at local community events, such as the East Maui Taro Festival or Maui Ag Fest.

Activities

- Participate and provide leadership to the EMWP.
- Support EMWP and MISC in accomplishing fundraising and resource management priorities.
- Provide EMWP and MISC access to Waikamoi to accomplish outreach and volunteer activities on a mutually cooperative basis.
- Support outreach efforts of partners by providing access and staff resources as available.
- Utilize volunteers as available to further conservation goals and bring environmental awareness to the local community.
- Participate in one or two community events per year to encourage constituents to support our work, such as East Maui Taro Festival in Hāna.
- Coordinate and periodically train docents to lead community hikes.

- Lead at least one public monthly hike.
- Lead at least one quarterly volunteer service trip.

Program 5: Infrastructure, Emergency, and Safety

Program Goal: Provide staff with infrastructure, emergency and safety training, and equipment that will aid management activities and equip staff to respond to emergency situations such as fire and rescue.

Program Description: Infrastructure includes the Maui office and baseyard, vehicles, equipment and tools, radio, phone and IT systems, cabins, helipads, roads and trails.

TNC owns and maintains multiple trucks and two ATVs that are used for a variety of management activities but mainly for transport to and from the Waikamoi, EMI Addition, and Kapunakea Preserves. NAPP funds may be used for vehicle maintenance, repairs, and fuel costs.

All staff are trained in Wilderness First Aid and CPR. Other training may include fire suppression and pre-suppression, helicopter safety, hunter's education, and rappelling. Field staff are provided with first aid kits and required to use proper personal protective equipment (PPE) when conducting field work. Waikamoi Preserve's fire plan enables an immediate multi-agency response to wildfires within and adjacent to Waikamoi Preserve.

Infrastructure, Emergency, & Safety Activities

- Update the *TNC Maui Wildland Fire Management Plan* at least every two years.
- 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.
- Purchase equipment as needed to allow immediate response to fire threats
- Respond to emergencies or fire threats
- Conduct road repair on Preserve's access roads.

BUDGET SUMMARY

The table in the next section summarizes the six-year budget for the Waikamoi NAPP project. The total Waikamoi NAPP budget currently represents approximately 35% of the overall operation at the Conservancy's Waikamoi Preserve and adjacent management efforts in the East Maui Watershed. Continued management at our current level will be contingent upon TNC's ability to fundraise for the remaining 65% from other sources.

The Conservancy's Maui operation maintains a full-time base staff of 7 FTE. These staff also periodically work on Lana'i and Molokai. An estimated 2 FTE of Maui base personnel costs for managing Waikamoi Preserve are funded by the Waikamoi NAPP budget. Other part-time, short-term, or year-to-year personnel, in addition to staff overtime, are covered in this budget and will be utilized as project needs warrant. 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.

This budget includes project-related supplies and tools; contract expenses for management practices to conduct fence work, invasive species removal, and helicopter transport; and other miscellaneous project-related costs including vehicle expenses, equipment leases, and costs related to partner capacity building and professional development training. The "Other" category of the budget is needed to cover a portion of insurance, information technology (IT), printing and copying costs.

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. Although the Conservancy's overhead (Indirect Cost Rate or ICR) is currently 22.73% (the annual rate changes each year per negotiations with DOI), the NAPP program will currently pay only 16%, leaving the remainder (6.73%) as unrecovered ICR. TNC considers the 6.73% as unrecovered ICR and may use portions of this as match as needed.

Budgetary Considerations: The Waikamoi NAPP project has seen a reduction in funding of 35% over the past 15 years. The FY2013-FY2018 NAPP contract represented a 9% decrease from the previous contract, and subsequent further budgets cuts - ranging from 5-10% - were put in place by DLNR some years. With this reduction in funds over the years, we have had to scale back and/or cut various programs like community outreach, predator control, and resource and threat monitoring programs.

The objectives outlined in this plan include deliverables that will fall outside the scope of NAPP funding for which we will have to privately fundraise; we hope to complete these deliverables by leveraging DLNR NAPP funding to acquire additional grants and private funds. We will report on progress on all accomplishments in Waikamoi Preserve and on adjacent lands regardless of funding source. If NAPP reduces the annual funding amount, we will have to adjust our deliverables.

Budget Summary

	FY 2023	2024	2025	2026	2027	2028	TOTAL
Labor and Fringe	327,022	336,832	346,937	357,345	368,066	379,108	2,115,310
Contractual	193,727	193,727	193,727	193,727	193,727	193,727	1,162,362
Travel	4,995	4,995	4,995	4,995	4,995	4,995	29,970
Supplies	19,000	19,000	19,000	19,000	19,000	19,000	114,000
Other							
Subtotal	544,743	554,554	564,659	575,067	585,787	596,829	3,421,639
Overhead @ current negotiated rate	87,159	88,729	90,345	92,010	93,726	95,492	547,461
TOTAL	631,902	643,282	655,004	667,077	679,513	692,322	3,969,100
Year 1							
Budget	631,902	643,282	655,004	667,077	679,513	692,322	3,969,100
Match (1/3 of total)	210,638	214,427	218,335	222,359	226,504	230,774	1,323,037
TOTAL NAPP REQUEST (2/3)	421,268	428,855	436,669	444,718	453,009	461,548	2,646,067

Appendices

Appendix 1. Native Natural Communities Of Waikamoi Preserve

NATURAL COMMUNITY NAME	GLOBAL RANK
Lowland	
Uluhe (<i>Dicranopteris linearis</i>) Lowland Wet Shrubland	G4
Montane	
‘Ākala (<i>Rubus hawaiiensis</i>) Montane Wet Shrubland #	G3
Carex Montane Wet Grassland #	G3
Koa/‘Ōhi’a (<i>Acacia koa</i> / <i>Metrosideros polymorpha</i>) Montane Wet Forest #	G3
Mixed Fern/Mixed Shrub Montane Wet Shrubland #	G3
‘Ōhi’a /Hāpu’u (<i>Metrosideros polymorpha</i> / <i>Cibotium</i> spp.) Montane Wet Forest	G3
‘Ōhi’a (<i>Metrosideros polymorpha</i>)/Mixed Shrub Montane Wet Forest #	G3
‘Ōhi’a /‘Ōlapa (<i>Metrosideros polymorpha</i> / <i>Cheirodendron</i> spp.) Montane Wet Forest	G3
‘Ōhi’a /Uluhe (<i>Metrosideros polymorpha</i> / <i>Dicranopteris</i>) Montane Wet Forest #	G3
Subalpine	
<i>Deschampsia nubigena</i> Subalpine Mesic Grassland* #	G2
Māmane (<i>Sophora chrysophylla</i>) Subalpine Dry Forest*	G2
‘Ōhi’a (<i>Metrosideros polymorpha</i>) Subalpine Mesic Forest #	G3
Pūkiawe (<i>Styphelia tameiameia</i>) Mixed Subalpine Dry Shrubland	G3
Multizonal	
Pioneer Vegetation on Lava Flow	G3
Subterranean Communities	
Uncharacterized Montane Lava Tube*	GU
Uncharacterized Subalpine Lava Tube*	G1G2
Aquatic Communities	
Hawaiian Intermittent Stream	G4

* Rare natural community # Also known from Hanawī NAR

Key to Global Ranks as defined by Heritage Program:

G2 = Imperiled globally (typically 6-20 current occurrences).

G3 = Restricted range (typically 21-100 current occurrences).

G4 = Apparently secure globally (> 100 occurrences).

GU = Natural community rank uncertain (rank uncertain, provisionally considered rare).

Appendix 2. Summary of Supported Research In Waikamoi Preserve FY18-22

Research Topic	Research Team	Year
<i>Chemical communication & evolution of Tetragnatha</i>	Seira Ashley Adams, UC Berkley	FY2018
Phylogeny & biogeography of <i>Rutaceae</i>	Marc Appelhans, Goettingen University	FY2018
Ecology of 'ope'ape'a	Dave Johnson, HT Harvey & Ass.	FY2018
Quantifying impacts of plants on freshwater availability...	Alan Mair, USGS	FY2018
Genomic diversity of <i>Oreogrammitis</i> and <i>Adenophorus</i>	Nipuni Sirimalwatta, UH Mānoa	FY2018
Niche specialization of native drosophilids	Didem Sarikaya, Harvard University	FY2013-FY2014
Morphological, behavior and developmental plasticity in Hawaiian spiders <i>Tetragnatha</i> , <i>Theridion</i> , and <i>Argyrodes</i>	Rosemary Gillespie, UC Berkley	FY2013-FY2018
PEPP support	Hank Oppenheimer, Plant Extinction Prevention	FY2013 - current
Kiwikiu or Maui parrotbill (<i>Psuedonestor xanthophrys</i>) distribution and density study	Maui Forest Bird Recovery Project	FY2013 - current
Mosquito surveys	Maui Forest Bird Recovery Project	FY2013 - current
Economic valuation of conservation in E. Maui	UHERO	FY2018
Native Hawaiian bark beetles	Conrad Gillett UH Mānoa	FY2018
Phylogenetics of <i>Vaccinium</i>	Anna Becker U. of Florida	FY2018
Pueo prey abundance	Laura Luther UH Mānoa	FY2014-FY2015
<i>Pteridophyte</i> and <i>Lycophyte</i> biodiversity research	Carrie Tribble, UC Berkley	FY2019
Follow up on previous 'ākohekohe research	Alex Wang DLNR	FY2019
Acoustic monitoring for endangered forest birds AI/ML	Erika Kekiwi UH Hilo	FY2021
Color variations in endemic <i>Megalagrion</i>	Idelle Cooper, Michigan State University	FY2014-FY2017
Hawaiian land snail surveys	Dr. Norine Yeung, Bishop Museum	FY2018

Addendum

This long-range management plan also supports activities in other preserves that contribute to the overall ecosystem health and species conservation for Maui Nui. This includes quarterly fence checks in Kānepu‘u, Kapunakea and the Mahi Pono/EMI lands adjacent to the Waikamoi Preserve, ungulate removal as needed, invasive weed control including aerial surveys and engagement with other partners and researchers, as well as involvement in the Mauna Kahalawai and East Maui Watershed Partnerships.

Deliverables by Preserve

Preserve	Meters Fence Maintained	Acres Surveyed for Weeds (ground & aerial)	Ungulate Control (traps)	Meters Transect Monitored	Outreach	Research	Yearly NAPP Request
Waikamoi	22,933	2,745 1,300 (air)	339	6,500 (ungulate only)	24	10	\$200,200
EMI/Mahi Pono Waikamoi Addition	5,805	4,655	986	1,500 (ungulate only)	0	3	\$90,468
Kapunakea	4,356	100	692	12,918 (weed & ungulate)	0	5	\$110,600
Kānepu‘u	6,496	7	Hunting as needed	0	0	1	\$20,000
Totals	39,590	7,507 (ground) 1,300 (air)	2,017	20,918	24	19	\$421,268

Waikamoi Preserve (Original, 5,230 Acres) BUDGET, FY2023-FY2028

	FY 2023	2024	2025	2026	2027	2028	TOTAL
Labor and Fringe	176,884	182,191	187,657	193,286	199,085	205,057	1,144,160
Contractual	70,000	70,000	70,000	70,000	70,000	70,000	420,000
Travel	1,995	1,995	1,995	1,995	1,995	1,995	11,970
Supplies	10,000	10,000	10,000	10,000	10,000	10,000	60,000
Other							
Subtotal	258,879	264,186	269,652	275,281	281,080	287,052	1,636,130
Overhead @ current negotiated rate	41,421	42,270	43,144	44,045	44,973	45,928	261,781
TOTAL	300,300	306,456	312,795	319,326	326,053	332,981	1,897,911
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Total
Waikamoi budget	300,300	306,456	312,795	319,326	326,053	332,981	1,897,911
Match (1/3 of total)							
	100,100	102,152	104,265	106,442	108,684	110,994	632,637
TOTAL NAPP REQUEST (2/3)							
	200,200	204,304	208,531	212,884	217,368	221,987	1,265,274

EMI Waikamoi Addition (3,721 acres) Budget, FY2023- FY2028

	FY 2023	2024	2025	2026	2027	2028	TOTAL
Labor and Fringe	63,184	65,080	67,032	69,043	71,115	73,248	408,702
Contractual	50,000	50,000	50,000	50,000	50,000	50,000	300,000
Travel	800	800	800	800	800	800	4,800
Supplies	3,000	3,000	3,000	3,000	3,000	3,000	18,000
Other							0
Subtotal	116,984	118,880	120,832	122,843	124,915	127,048	731,502
Overhead @ current negotiated rate	18,718	19,021	19,333	19,655	19,986	20,328	117,041
TOTAL	135,702	137,901	140,166	142,498	144,901	147,376	848,544
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Total
EMI/Wai budget	135,702	137,901	140,166	142,498	144,901	147,376	848,544
Match (1/3 of total)							
	45,234	45,967	46,722	47,499	48,300	49,125	282,847
TOTAL NAPP REQUEST (2/3)							
	90,468	91,934	93,444	94,999	96,601	98,251	565,697

Kapunakea (1,264 acres) Budget, FY2023-FY2028

	FY 2023	2024	2025	2026	2027	2028	TOTAL
Labor and Fringe	77,817	80,152	82,556	85,033	87,584	90,212	503,404
Contractual	60,000	60,000	60,000	60,000	60,000	60,000	360,000
Travel	1,200	1,200	1,200	1,200	1,200	1,200	7,200
Supplies	4,000	4,000	4,000	4,000	4,000	4,000	24,000
Other							
Subtotal	143,017	145,352	147,756	150,233	152,784	155,412	894,554
Overhead @ current negotiated rate	22,883	23,256	23,641	24,037	24,445	24,866	143,128
TOTAL	165,900	168,608	171,397	174,270	177,230	180,277	1,037,682
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Total
Kapunakea budget	165,900	168,608	171,397	174,270	177,230	180,277	1,037,682
Match (1/3 of total)	55,300	56,203	57,132	58,090	59,076	60,092	345,893
TOTAL NAPP REQUEST (2/3)	110,600	112,405	114,265	116,180	118,153	120,185	691,788

Kanepu'u (590 acres) Budget, FY2023-FY2028

	FY 2023	2024	2025	2026	2027	2028	TOTAL
Labor and Fringe	9,136	9,410	9,692	9,983	10,282	10,590	50,093
Contractual	13,726	13,726	13,726	13,726	13,727	13,727	82,358
Travel	1,000	1,000	1,000	1,000	1,000	1,000	6,000
Supplies	2,000	2,000	2,000	2,000	2,000	2,000	12,000
Other							0
Subtotal	25,862	26,136	26,418	26,709	27,009	27,317	159,451
Overhead @ current negotiated rate	4,138	4,182	4,227	4,273	4,321	4,371	25,512
TOTAL	30,000	30,318	30,645	30,983	31,330	31,688	184,964
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Total
Kanepu'u budget	30,000	30,318	30,645	30,983	31,330	31,688	184,964
Match (1/3 of total)	10,000	10,106	10,215	10,328	10,443	10,563	61,655
TOTAL NAPP REQUEST (2/3)	20,000	20,212	20,430	20,655	20,887	20,125	122,309

