SAFE HARBOR AGREEMENT
KAMEHAMEHA SCHOOLS
KEAUHOU AND KĪLAUEA FOREST LANDS
HAWAIʻI ISLAND, HAWAIʻI

2022-2023 Annual Report

August 2023

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1. Introduction

The Federal and State Safe Harbor programs encourage proactive conservation efforts by non-Federal landowners while providing them certainty that future property-use restrictions will not be imposed if those efforts attract species listed as threatened or endangered to their property, or result in increased populations of threatened or endangered species already present. In return for voluntary conservation commitments, a Safe Harbor Agreement gives the Permittee incidental take assurances allowing future alteration or modification of the enrolled property back to its original baseline conditions. This cooperative effort provides landowners with a way to manage enrolled lands to support the conservation of listed species while conducting certain other land-use practices. Without this cooperative government/private effort, the enrolled property would be less valuable to the recovery of threatened or endangered species in the future.

The Keauhou, Kaʻū Safe Harbor Agreement (the Agreement) describes how the U.S. Fish and Wildlife Service (Service), the State of Hawaiʻi Department of Land and Natural Resources (DLNR) and Kamehameha Schools (KS) will work together towards the restoration and enhancement of habitat for native plants and animals on certain privately owned lands of KS in the district of Kaʻū on the southeastern slope of Mauna Loa on the island of Hawaiʻi (Enrolled Property) totaling 32,280 acres (see Figure 1). The Agreement promotes recovery of the Federal- and State-endangered ʻAlawī or Hawaiʻi Creeper (*Loxops mana*), Hawaiʻi ʻĀkepa (*Loxops coccineus*), ʻAkiapōlāʻau (*Hemignathus wilsoni*), ʻIʻiwi (*Vestiaria coccinea*), ʻIo or Hawaiian Hawk (*Buteo solitarius*), Nēnē or Hawaiian Goose (*Branta sandvicensis*), ʻAlalā or Hawaiian Crow (*Corvus hawaiiensis*), ʻŌpeʻapeʻa or Hawaiian Hoary Bat (*Lasiurus cinereus semotus*) and twenty-five threatened or endangered plant species (the Covered Species) through habitat restoration and management practices.

Over its 50-year term, it is expected that the Agreement will aid in increasing the current range of the Covered Species, restoring these species to part of their historic ranges, increasing the total population of these species, and reestablishing wild populations of these species, thus contributing to their overall recovery. Additionally, the Agreement will reduce habitat fragmentation by connecting a network of protected and managed state, federal, and private lands within the south central region of Hawaiʻi Island and will also benefit other native species.

KS stewardship of native habitats at Keauhou is conducted in close cooperation with many organizations, most notably the Three Mountain Alliance (TMA).

This report covers year 5 of the Agreement and includes the time period from July 1, 2022 to June 30, 2023 (FY23).

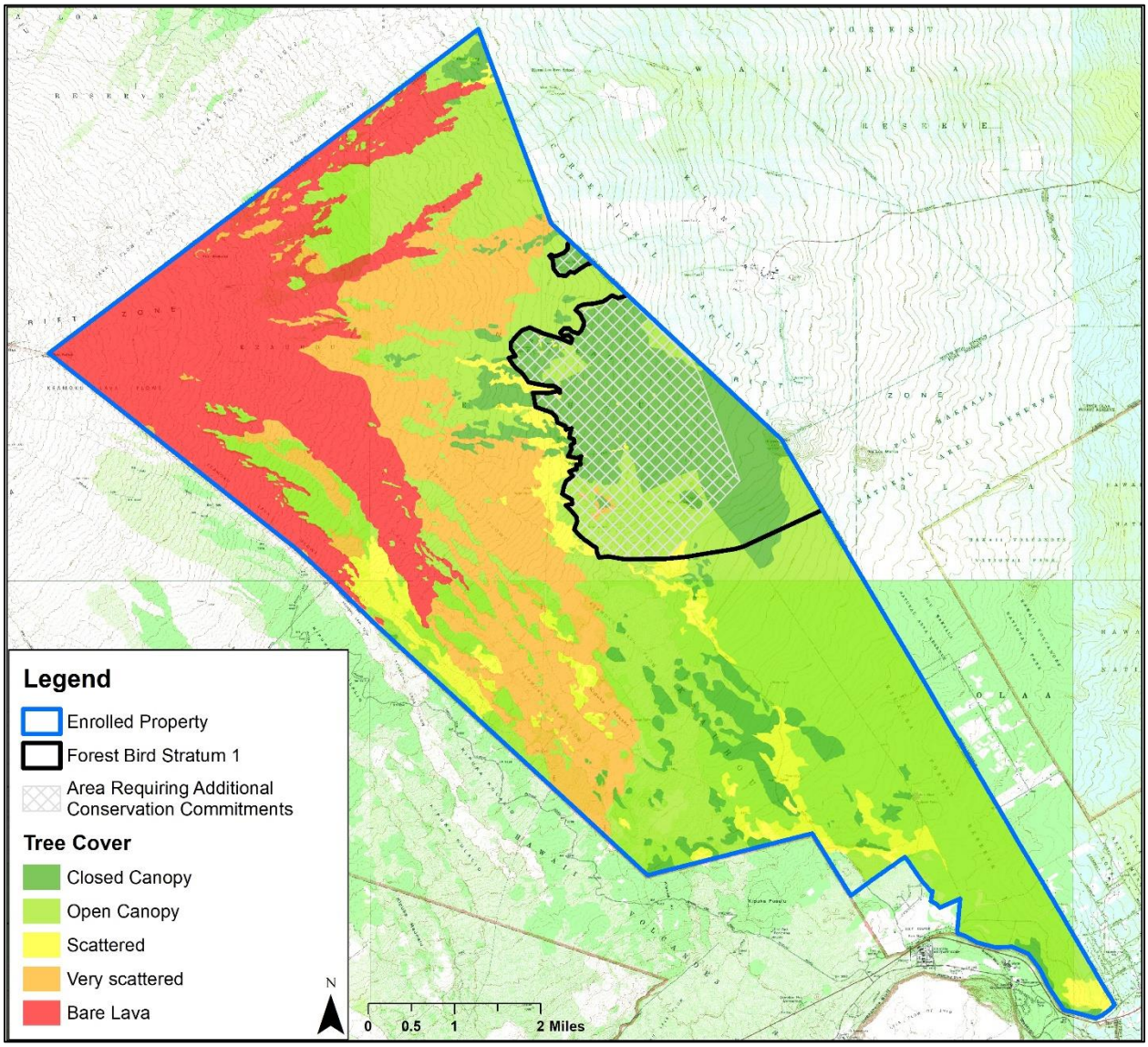


Figure 1. Map of the Enrolled Property

2. Covered Activities

2.1. Predator Control

The control of mammalian predators increases survivorship of native plants and animals. In the Agreement, KS committed to removing feral dogs and to providing access to the ʻAlalā Working Group (AWG) or other designated entity, to conduct predator control efforts for feral cats, mongooses, and rats if ʻAlalā are determined by the working group to be vulnerable to predation on the Enrolled Property in the future.

The DLNR Division of Forestry and Wildlife (DOFAW) continued to manage the three A24 Goodnature traps deployed in FY19 near the State nēnē cabin to control rats and mongooses. With the recapture of the released ʻalalā in Fall 2020, no predator control is currently planned by AWG members.

2.2. Restoration Outplanting

The outplanting of common and rare native species increases biodiversity and native forest cover. In the Agreement, KS committed to plant a minimum of 20,000 seedlings during each 5-year period across the Enrolled Property.

In FY23, 12,057 native plants, including 7,616 koa seedlings were planted on the Enrolled Property, for a total of 74,484 native plants of 38 species planted over the first five years of the Agreement (see Table 1). All restoration outplanting occurred outside of Forest Bird Stratum 1 in FY23. Planting areas were concentrated in the lower portions of the Enrolled Property (see Figure 3). Outplanting was conducted by collaborators and vendors and included 14 staff plantings and 20 educational group plantings for school and community members. A total of 544 volunteers of all ages helped with these reforestation efforts and learned about native plants, forest ecology, and the importance of watershed restoration (see Figure 2).

Figure 2. TMA staff outplanting ʻōhiʻa

Table 1. Number of seedlings planted by species

Name	Scientific Name	FY19	FY20	FY21	FY22	FY23	Total
Koa	*Acacia koa*	11,596	9,057	7,707	10,251	7,616	46,227
Maile	*Alyxia stellata*	415	138	293	133	67	1,046
Paʻiniu	*Astelia menziesiana*	150	50	10	-	63	273
Pāpala	*Charpentiera obovata*	222	-	-	-	-	222
ʻŌlapa	*Cheirodendron trigynum* subsp. *trigynum*	549	94	1,531	268	532	2,974
Hāpuʻu pulu	*Cibotium glaucum*	11	-	-	-	-	11
ʻŌhā wai	*Clermontia hawaiiensis*	477	-	-	504	8	989
ʻŌhā wai	*Clermontia montis-loa*	254	-	275	2	-	531
ʻŌhā wai	*Clermontia parviflora*	6	-	-	-	-	6
Pilo	*Coprosma ochracea*	1,231	143	-	-	-	1,374
Pilo	*Coprosma rhynchocarpa*	-	-	-	132	182	314
Coprosma sp.	*Coprosma sp.*	260	16	1,001	87	-	1,364
ʻUkiʻuki	*Dianella sandwicensis*	225	-	-	-	-	225
ʻAʻaliʻi	*Dodonaea viscosa*	1,769	25	3,921	561	677	6,953
Naʻenaʻe	*Dubautia linearis*	-	-	-	6	-	6
Kāwaʻu	*Ilex anomala*	7	-	22	-	-	29
Manono	*Kadua sp.*	-	-	-	1	-	1
Kūkaemoa	*Melicope clusiifolia*	10	-	-	116	1	127
ʻŌhiʻa lehua	*Metrosideros polymorpha* var. *polymorpha*	190	6	315	114	702	1,327
Naio	*Myoporum sandwicense*	-	-	-	-	3	3
Kōlea lau nui	*Myrsine lessertiana*	438	48	1,725	553	239	3,003
Kōlea lau liʻi	*Myrsine sandwicensis*	-	-	-	39	-	39
Pōpolo kū mai	*Phytolacca sandwicensis*	1,110	-	-	70	83	1,263
Māmaki	*Pipturus albidus*	361	92	-	5	343	801
Pāpala kēpau	*Pisonia umbellifera*	23	-	-	2	402	427
Hōʻawa	*Pittosporum hawaiiense*	14	4	-	-	-	18
Hōʻawa	*Pittosporum hosmeri*	21	120	98	-	2	241
Hōʻawa	*Pittosporum sp.*	-	-	-	708	67	775
ʻAlaʻala wai nui wahine	*Plectranthus parviflorus*	16	-	-	-	-	16
Loulu	*Pritchardia beccariana*	-	15	-	-	-	15
Kōpiko ʻula	*Psychotria hawaiiensis*	-	-	-	-	100	100
ʻĀkala	*Rubus hawaiensis*	5	10	-	-	-	15
Pāwale	*Rumex giganteus*	-	-	-	105	311	416
Mānele	*Sapindus saponaria*	14	-	-	-	40	54
ʻIliahi	*Santalum sp.*	-	20	-	-	-	20
Naupaka kuahiwi	*Scaevola gaudichaudiana*	-	-	-	34	186	220
Māmane	*Sophora chrysophylla*	921	369	946	340	384	2,960
ʻŌhelo kau lāʻau	*Vaccinium calycinum*	-	-	1	49	49	99
Total Outplantings		**20,295**	**10,207**	**17,844**	**14,080**	**12,057**	**74,484**

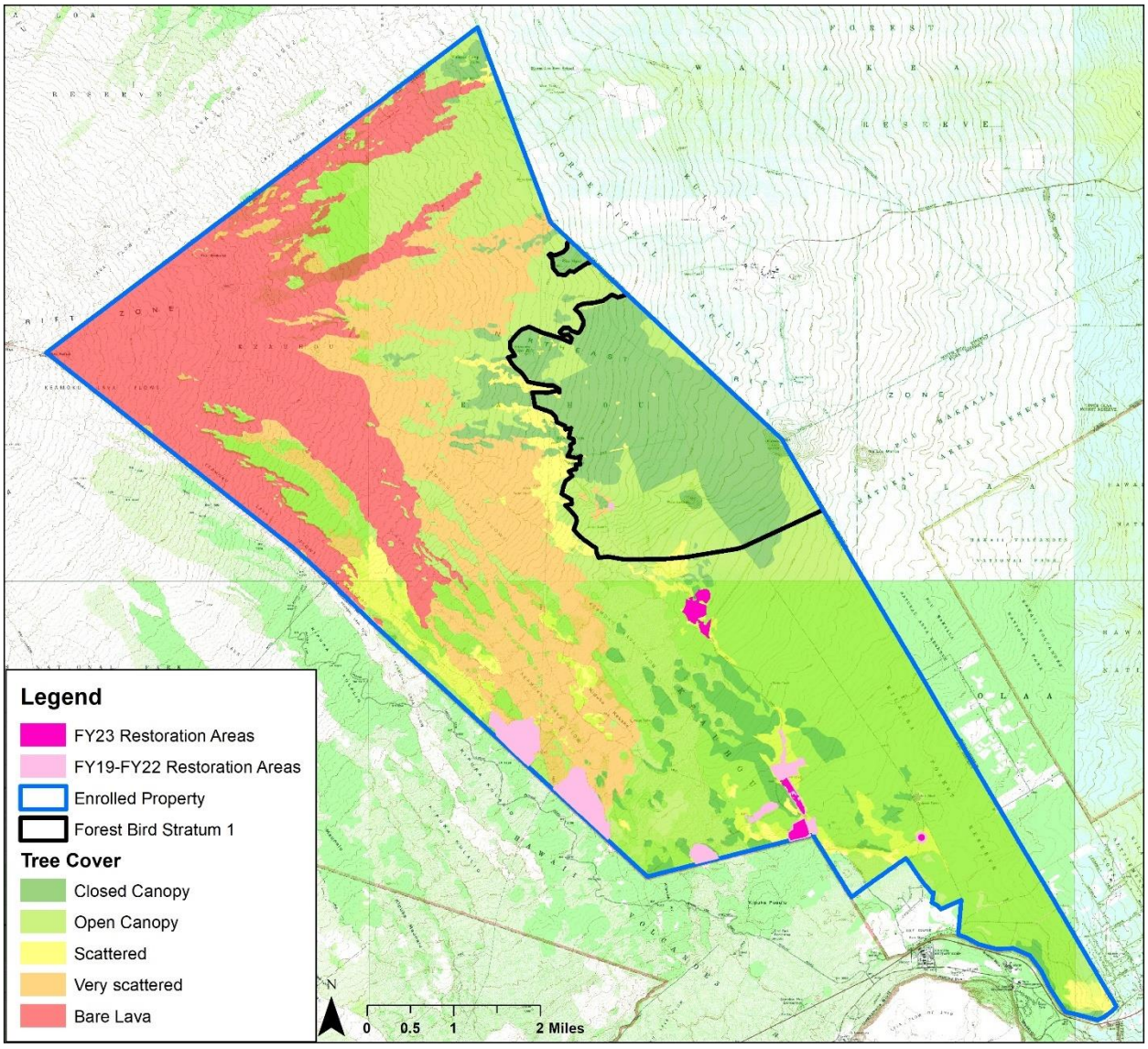


Figure 3. Map of restoration areas

2.3. Silviculture

Koa reforestation and stand improvement creates new forest in formerly logged areas and pasture lands, increases soil water retention capacity, and provides nesting and foraging habitat for Hawaiian forest birds, ʻIo, and ʻŌpeʻapeʻa. In the Agreement, KS committed to establish a minimum of 1,000 acres of new koa stands over its 50-year term.

In FY23, silviculture activities did not occur within Forest Bird Stratum 1. Outside of Forest Bird Stratum 1, 59 acres of new koa stands were planted, for a total of 417 acres of koa planted over the first five years of the Agreement (see Figure 4 and Table 2). Koa was planted at a spacing of 20’ x 20’ (density of 108 trees per acre) to reduce the need for thinning in the future. Other

stand improvement activities included singling of 162 acres within stands planted in FY21 and FY22 to remove competitive branches at the top of each koa seedling, pruning of lower branches from the base to 5-8 ft in height across 131 acres within stands planted in FY20 and FY21 to improve stem form, as well as fertilization of 221 acres of koa planted in FY21, FY22, and FY23.

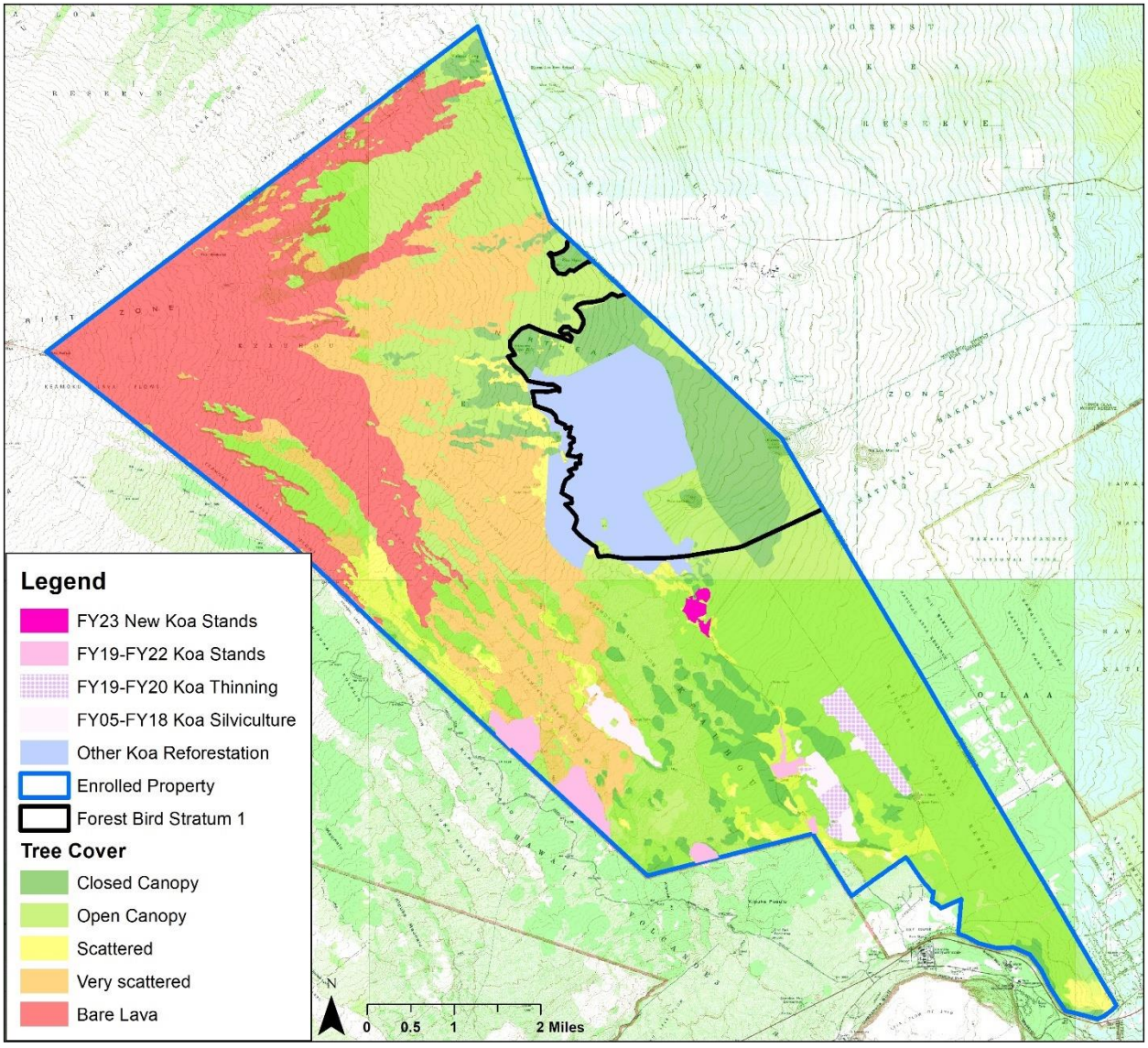


Figure 4. Map of koa silviculture

Table 2. Acres of koa silviculture

Action	FY19	FY20	FY21	FY22	FY23	Total
New Stands Planted	135	62	70	91	59	417
Thinning	105	165	-	-	-	270

Figure 5. Pruning lower branches of young koa to improve stem form

2.4. Fences and Ungulate Control

Fences provide protection to native habitats by keeping animals such as pigs, goats, and sheep out of sensitive areas. In the Agreement, KS committed to actively manage the Enrolled Property as an ungulate-free area inside fenced conservation management units (~29,000 acres) throughout its duration. Fences required to maintain zero tolerance for feral ungulates on KS lands are maintained to ensure woody vegetation around fences are cleared and fences are regularly inspected for damage from tree falls and ungulate ingress. Fence sections will be replaced as their condition deteriorates during the life of the Agreement.

In FY23, all Keauhou fencelines (approximately 39.6 miles) were inspected at least semi-annually, with most fences inspected 3-4 times per year (see Figure 6). Fence inspection frequency is based on fence location, fence condition, potential risk to fence damage, and animal pressure. Units adjacent to areas with ungulates, which are subject to continuous animal pressure are checked monthly when possible. Additionally, fence sections in thickly forested areas and therefore subject to tree falls, are checked at least monthly. Minor repairs and routine maintenance such as adding pins or skirt and repairing damage from treefalls were conducted as needed.

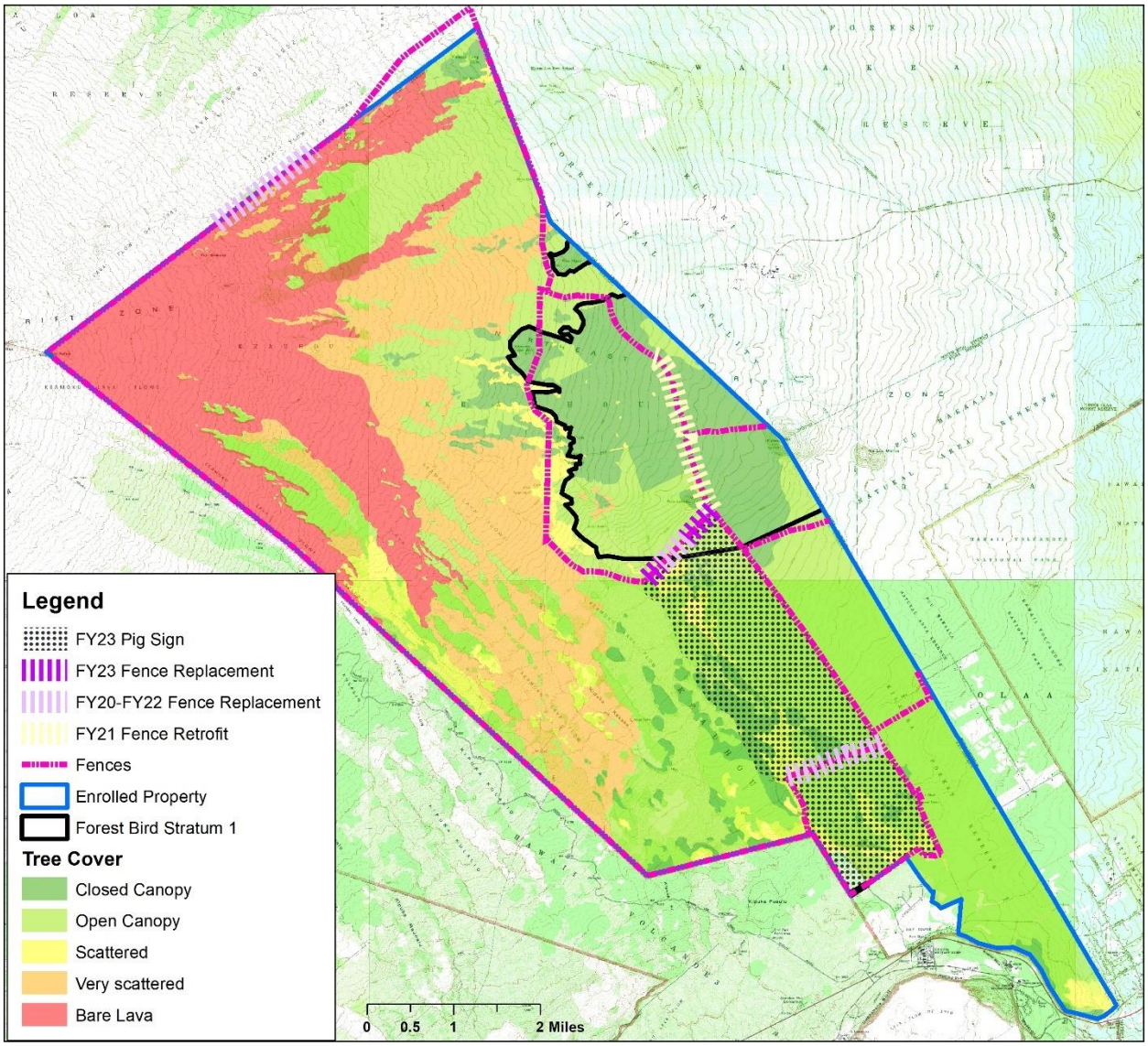


Figure 6. Map of fences maintained and units with pig sign

Additional fence work to prevent further ingress into Keauhou included replacement of the Puʻu Lālāʻau makai fenceline which separates the Puʻu Lālāʻau unit from the area in lower Keauhou where pig ingress is occurring (see Figure 7). The current 9-49" wire is deteriorating and is being replaced with the smaller mesh 13-48" hogwire that is standard size used to prevent potential ingress of small piglets. About 1,150 m of fence was replaced in FY23.

Figure 7. Replacement of makai section of Puʻu Lālāʻau fence

Ungulate presence within fenced conservation management units was monitored. In upper Keauhou, for the eigth consecutive year, no fresh or intermediate ungulate sign was observed along annually monitored transects that traverse forested kipukas.

Pig ingress first observed in Lower Keauhou in FY20, continues to be a problem. Pig sign is regularly observed in the area between the main road the the Palakea fenceline from the border with the new lower fence unit up to Puʻu Lālāʻau (see Figure 6). Despite fence repair and replacement and increased control efforts over the past two years, including trapping (six corral traps, one moveable box trap, and a pig brig) and hunting, pig numbers continue to increase in this area. A total of 125 pigs were removed from this area in FY23, with an estimated 150 pigs remaining (see Table 3). A strategy has been developed to return this unit back to near-zero levels within two years (by the end of FY25) and additional ungulate management has been contracted. This strategy will include additional corral traps, regular hunts, and increased fence inspection/maintenance. In addition, TMA has secured State CIP

funding through DOFAW to install 4,600 m of new fencing along Powerline Road, which will split the large Keauhou fenced unit into two smaller units

Ungulate control efforts in the newly fenced unit (FY21) in the Lower Ranch included scouts and trapping. Three traps (2 corral and one moveable box trap) were set up in this unit and are checked daily. A total of 59 pigs were removed from the unit, with an estimated 50 pigs remaining (see Table 3). Monitoring surveys in FY23 observed low levels of pig sign.

Collaboration with DOFAW Natural Area Reserves System (NARS) staff continued in an effort to locate lone a pig in the Puʻu Kipu unit where pig sign was first detected in FY20. Game cameras and traps remain set in this unit.

Table 3. Pigs removed from Lower Keauhou and Lower Ranch units

Unit	FY19		FY20		FY21		FY22		FY23		Total
	Trap	Hunt	Trap	Hunt	Trap	Hunt	Trap	Hunt	Trap	Hunt	
Lower Keauhou	-	-	1	2	-	-	34	10	90	35	171
Lower Ranch*	-	-	-	-	-	-	26	4	29	0	59

*The Lower Ranch unit was completed in FY21

2.5. Weed Monitoring and Control

Weed control and suppression supports the increase and diversity of native plant populations. In the Agreement, KS committed to suppress four species of priority weeds (faya (*Morella faya*), ginger (*Hedychium gardnerianum*), strawberry guava (*Psidium cattleianum*), and Himalayan raspberry (*Rubus ellipticus*)) below 10% on the Enrolled Property within conservation fences, provided that adjacent landowners' management includes continued weed control. Regular weed surveys inform prioritization of weed suppression efforts and evaluation of the efficacy of current efforts. Weed survey schedules are informed by historical target species density levels, target species biology, and human traffic levels.

In FY23, KS suppressed weed species across 2,396 acres on the Enrolled Property (see Figure 8). Suppression activities occurred on 2,182 acres within Forest Bird Stratum 1 and 1,065 acres on the remainder of the Enrolled Property. In addition to the four priority weed species, targets of suppression efforts included blackberry (*Rubus argutus*), banana poka (*Passiflora tarminiana*), and Japanese anemone (*Anemone hupehensis* var. *japonica*).

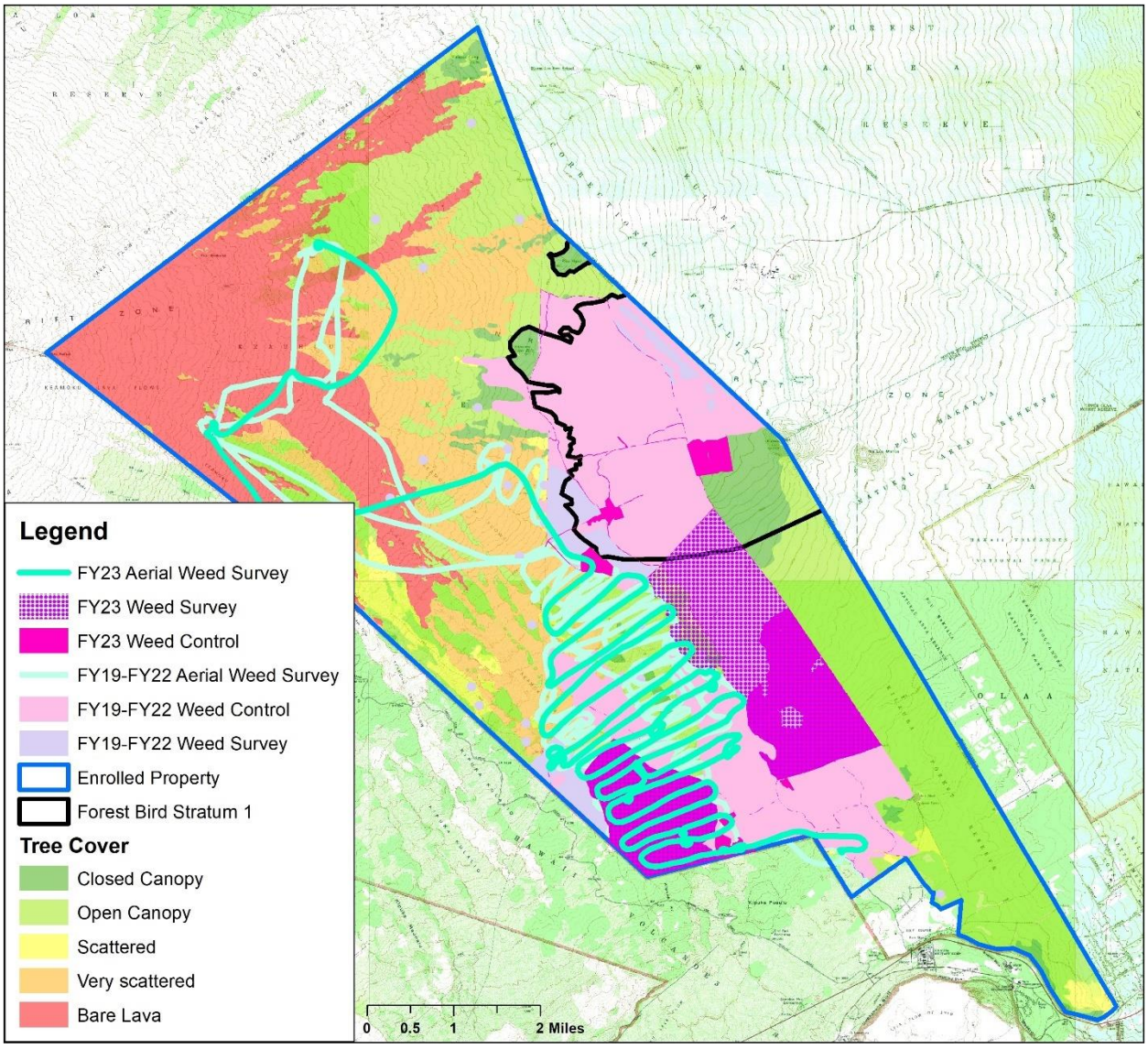


Figure 8. Map of weed monitoring and control

Overall, survey efforts from FY23 indicate that populations of the four priority weed species remain well below 10% cover on the Enrolled Property within conservation fences.

KS assessed 3,254 acres for target weed species via ground surveys. In addition to prioritizing areas for weed control, these assessments located a population of suspected Andean raspberry (*Rubus glaucus*) (see Figure 9), as well as a single Australian tree fern (*Cyathea cooperi*) in lower Keauhou along the Palakea fenceline. This was the first time Andean raspberry was detected at Keauhou. This species is naturalized on Maui and has previously been observed near Wright Road.

Figure 9. Andean raspberry (*Rubus glaucus*) in lower Keauhou along Palakea fenceline

2.6. Fire Threat Management

Fire risk reduction and fire preparedness reduce the incidence and severity of fire impacts to native ecosystems. In the Agreement, KS committed to maintain primary access routes and a similar storage capacity (225,000 gallons) and distribution of water as existed at the start of the Agreement, although actual locations of water sources may change over time.

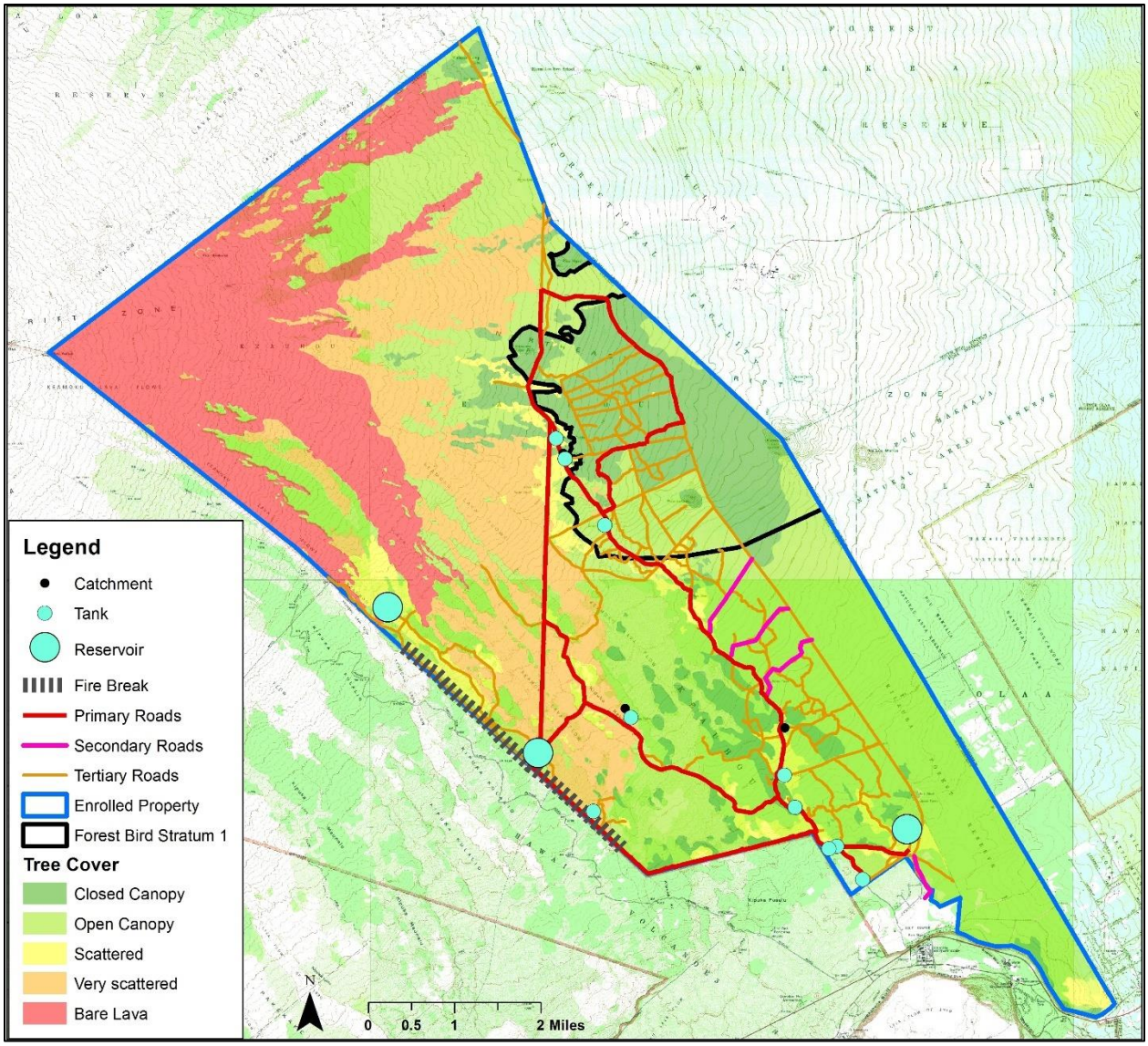


Figure 11. Map of water sources and access routes maintained

In FY23, KS inspected and maintained all water sources (4 catchments, 12 tanks, and 3 reservoirs), access routes (27.5 miles of primary and 3.5 miles of secondary roads), and the fire break that was installed in FY19 (see Figure 11). Maintenance of water sources included spraying vegetation on and around catchment and tank areas, as well as removing debris from gutters. Maintenance of access routes included removal of fallen trees and encroaching vegetation. Passability was also maintained on approximately 68 miles of tertiary roadways. Maintenance of the firebreak included semiannual spraying of vegetation.

2.7. Response to Rapid ʻŌhiʻa Death

Rapid ʻŌhiʻa Death (ROD) is caused by two fungi, (*Ceratocystis lukuohia* and *Ceratocystis huliohia*). These fungi kill ʻōhiʻa by growing into the tree's vascular system and blocking water movement to its crown. Both fungi have been confirmed present in ʻōhiʻa forests across Hawaiʻi Island and Kauaʻi, with confirmed positive cases also present on Maui and Oʻahu.

Figure 12. BIISC sampling a symptomatic tree at Keauhou

ROD was first confirmed at Keauhou in June 2017 near the 2012 wildfire area in lower Keauhou. Over the past five years, both confirmed cases and symptomatic trees have primarily been found in lower Keauhou in areas outside of conservation fences. While several individual symptomatic trees have been identified in upper Keauhou and Kīlauea Forest, no areas of extensive dieback have been observed in upper Keauhou (see Figure 13). In FY23, the number of trees appearing to be symptomatic continued to increase across lower Keauhou (see Figure 13). TMA and BIISC crews sampled suspect ROD trees in Lower Keauhou in July 2022, October 2022, January 2023, and March 2023 (see Figure 12). Each time, nine to eleven trees were sampled, but only one of the 35 trees tested positive for ROD. A pathologist from the U.S. Forest Service joined TMA and BIISC staff in April to further investigate the dieback, and sampled five recently dead trees. Results are pending.

KS staff regularly attend meetings of the statewide ROD Working Group to keep updated on current research and management recommendations and work with TMA and BIISC to map and sample suspect trees. In addition, KS has provided access to the Enrolled Property to U.S. Forest Service researchers monitoring the presence, patterns, and impacts of ROD and U.H. Hilo researchers studying the extent to which ROD affects native Hawaiian forest birds dependent on ʻōhiʻa forests.

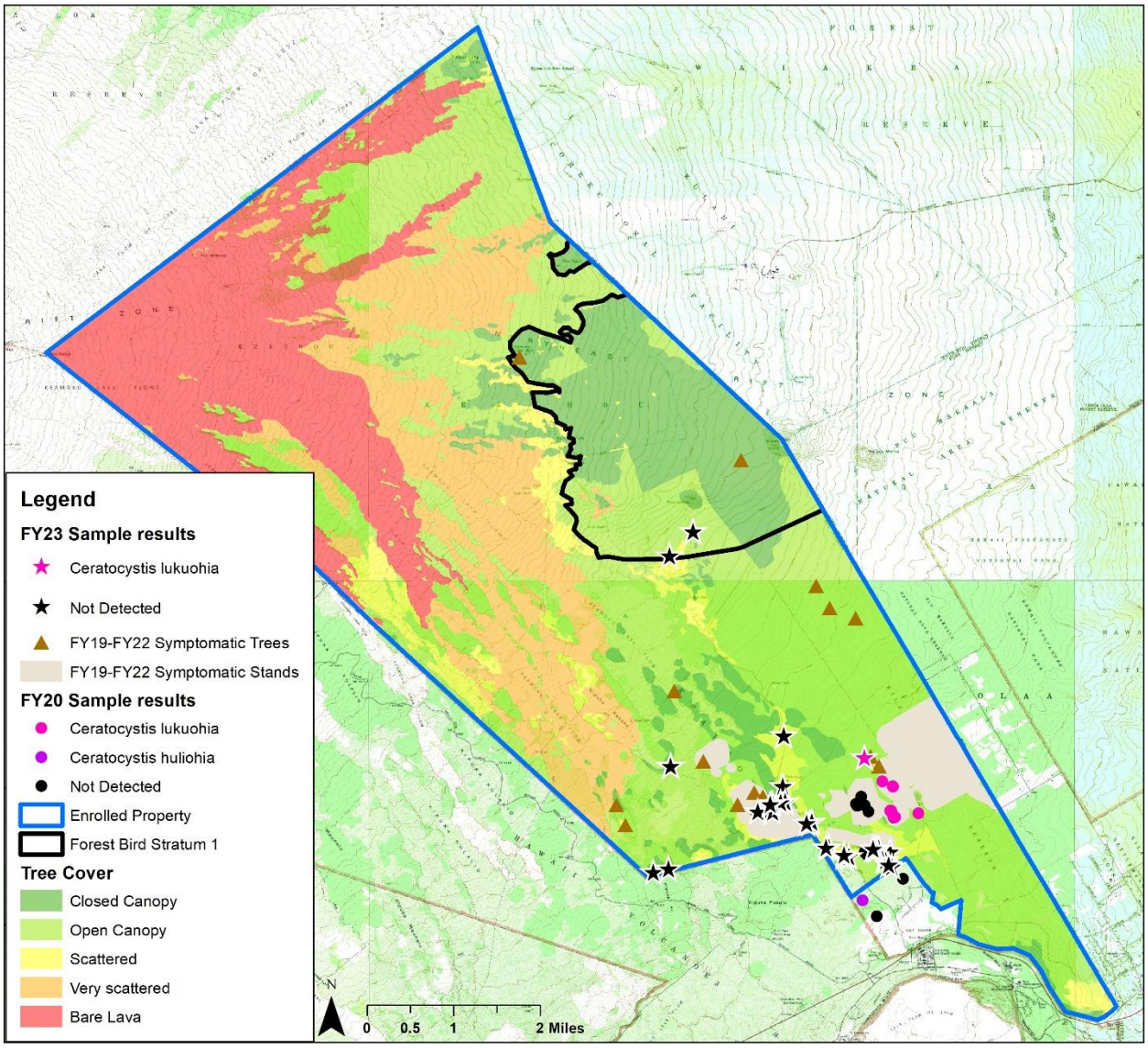


Figure 13. Map of confirmed ROD locations and symptomatic trees (including BIISC data)

3. Monitoring of Covered Species

3.1. Endangered Forest Birds

Figure 14. ʻAkiapōlāʻau at Keauhou

Four species of forest birds are covered under the Agreement, the ʻAkiapōlāʻau, ʻAlawī, ʻĀkepa, and ʻIʻiwi. Baseline monitoring for forest birds involves canopy assessment every 10 years and species occupancy annually. Occupancy is determined via point-transect sampling and is planned annually for the seven transects situated primarily in Forest Bird Stratum 1. Every 5 years, an additional 12 transects (19 total) will be surveyed for forest birds outside of Forest Bird Stratum 1 to ascertain the presence of the covered forest bird species. Occupancy surveys are conducted by USFWS and DLNR (the Agencies) or associated cooperating parties agreeable to KS. In the event that these organizations are not able to conduct the occupancy surveys, KS will be responsible for completing them at a minimum frequency of once every 5 years.

Forest bird surveys were conducted in late February 2023 (see Appendix 1). Due to inclement weather (heavy rain), two additional days in March and April were needed to finish the survey. The surveys were coordinated by TMA and supported by various agency and community volunteers. Observers used the variable circular plot method to record detections of all birds seen and heard. A total of 159 stations along seven transects were surveyed primarily within Forest Bird Stratum 1. 150 stations were located on KS lands and 9 were located on adjacent State lands. Even with the added survey days, five stations (four on KS lands and 1 on State land) were unable to be surveyed. All four species of forest birds covered by the Agreement were detected (see Figure 15 and Table 3). Data were entered into an MS Access database using the Avian Monitoring Entry Form. Proofed data were passed on to the U.S. Geological Survey for inclusion in the Hawaiʻi Forest Bird Interagency Database and possible future analysis of population trends.

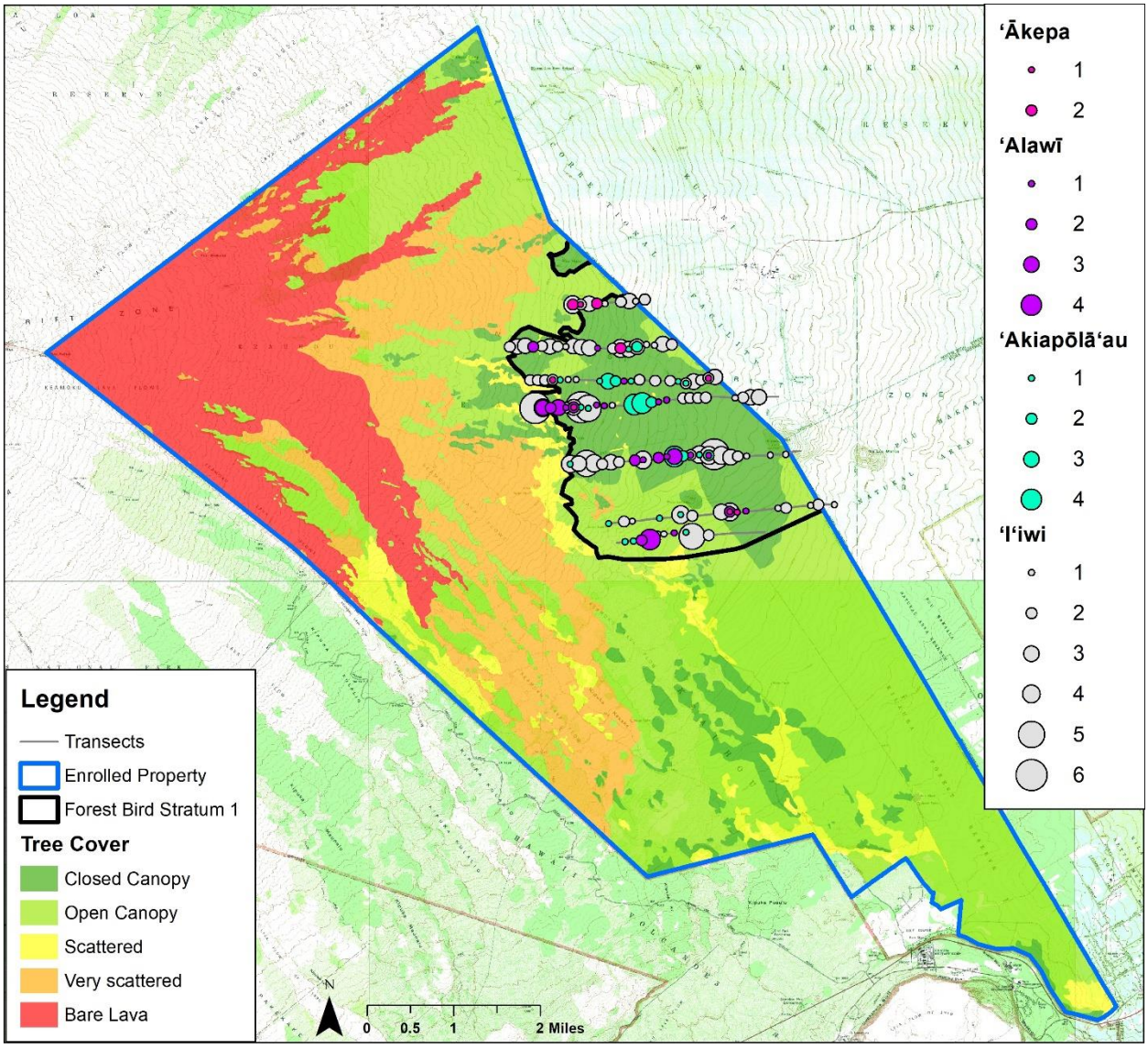


Figure 15. Map of FY23 forest bird detections

Table 3. Covered bird species detections

Name	FY19		FY20		FY21		FY22		FY23	
	#Detected	Stations Occupied	#Detected	Stations Occupied	#Detected	Stations Occupied	#Detected	Stations Occupied	#Detected	Stations Occupied
ʻIʻiwi	181	93/150	256	120/164	274	134/335	245	107/164	246	104/159
ʻAkiapōlāʻau	40	30/150	27	19/164	34	23/335	25	22/164	49	31/159
ʻĀkepa	1	1/150	4	4/164	5	3/335	7	6/164	12	9/159
ʻAlawī	21	15/150	35	27/164	26	19/335	29	24/164	41	25/159
ʻIo	4	4/150	2	2/164	10	9/335	1	1/164	0	0/159

3.2. ʻAlalā

Due to high mortality of ʻAlalā released at Puʻu Makaʻala Natural Area Reserve, the AWG recaptured the remaining released birds in the fall of 2020 and brought them back into captivity to reassess the release site and causes of mortality. At this time, there are no released birds in the wild.

3.3. ʻIo

Baseline monitoring for ʻIo involves canopy assessment every 10 years and species occupancy every 5 years. Occupancy is determined via circular variable plot count methodology and will be conducted by the Agencies or associated cooperating parties agreeable to KS. Canopy assessment will be completed by FY28 and occupancy surveys were completed in FY23.

An ʻio species occupancy survey was conducted by TMA, DOFAW, and KBCC staff in late June 2023, following the methods used in the Safe Harbor baseline surveys (see Appendix 2). Ten stations were surveyed by playing recordings of adult ʻio from a game caller. Playback lasted a total of 10 minutes and consisted of one minute recordings played at the first, fourth, and eighth minute with silence in between. Playback was paused if weather temporarily impacted observers' ability to detect ʻio and was stopped if an ʻio responded to the station. Observers recorded the age, sex, and color morph based on the observable morphology (plumage and soft-tissue characteristics, relative body size), as well as the time of the observation, distance and bearing to the hawk, and type of detection (visual or auditory). Additionally, weather and the percentage of observers' view obstructed by surrounding vegetation and topography—environmental conditions that may have hindered detections—were recorded. The same data were also recorded at any points where ʻio were opportunistically observed.

One ʻio was recorded at a survey station (station 2, observation C on map) during the survey on June 23, 2023. An unbanded adult flew in during playback, perched near the vehicle and speaker, and began preening. Playback was halted when the bird flew in. Based on its size, observers suspected the individual to be male but were not confident. It was also suspected that this was the same bird previously observed between stations 1 and 2 (observations A and C) based on timing and the direction of the hawk's approach and departure, however it is possible that one or both were a different individual.

3.4. Nēnē

Baseline conditions for Nēnē were determined by the number of breeding pairs present on the Enrolled Property. Surveys during Nēnē breeding season (October-March) are conducted by DOFAW staff on an annual basis and provide information on population estimates, nesting success, and fledging success.

DOFAW staff conducted Nēnē activity and nesting surveys once a month during Nēnē breeding season. Visual ground surveys were conducted at each site once a month, between the hours of 7:00 am to 3:30 pm, from October 2022 through March 2023 (see Table 4). Most activity occured near the reserviors located at the Nēnē Cabin and Powerline Road. Most nēnē observed at Keauhou were originally banded at the Waikōloa Golf Course as fledglings, while most nēnē observed on the neighboring ranches were originally banded in the Volcano area.

Nēnē pairs were observed from October to February, with the highest number of pairs (4 pairs) observed in October and December. An abandoned nēnē nest containing one whole egg and several eggshell shards were discovered near the Nēnē Cabin Reservoir in February (see Figure 19). Per DOFAW staff, the eggshell shards did not look like the remains of a hatched egg. No other nests were observed this year (see Appendix 4).

Figure 19. Abandoned nēnē nest near the Nēnē Cabin Reservoir

Two Downed Wildlife Forms were submitted to the wildlife agences (see Appendix 5):

On October 4, 2022, a nēnē carcass was discovered approximately 20 meters northeast of the Nēnē Cabin Reservoir, beneath pukiawe shrubs. The carcass was completely desiccated and likely died several months earlier.

On February 14, 2023, an abandoned nēnē nest containing one whole egg and several eggshell shards was discovered approximately 35 meters west of the Nēnē Cabin Reservoir.

Table 4. Nēnē detections during monthly surveys

FY	Month	Keauhou, Kaʻū	ʻŌhiʻa Ranch	4 Boys Ranch	Volcano Winery	Total
FY19	Oct 2018	4	0	0	0	4
	Nov 2018	6	2	0	0	8
	Dec 2018	2	0	0	0	2
	Jan 2019	2	3	3 (flyover)	0	8
	Feb 2019	1	5	0	0	6
	March 2019	1	9	0	0	10
FY20	Oct 2019	1	9	2	0	12
	Nov 2019	7	9	5	0	21
	Dec 2019	4	2	3	0	9
	Jan 2020	14 (1 active nest)	0	0	0	14
	Feb 2020	7 (1 active nest)	0	0	0	7
	March 2020	2	*	*	0	-
	April 2020	-	6	0	-	-
FY21	Oct 2020	17	0	11	0	27
	Nov 2020	8	4	3	0	15
	Dec 2020	1	6	2	0	9
	Jan 2021	11	0	0	0	11
	Feb 2021	*	*	*	*	-
	March 2021	1[1]	2	2	0	5
	April 2021	7	2	0	0	9
FY22	Oct 2021	6	9	2	0	17
	Nov 2021	8	0	2	0	10
	Dec 2021	1[1]	2	0	0	3
	Jan 2022	7[2]	0	2	0	9
	Feb 2022	0	0	0	0	0
	March 2022	5	0	0	0	5
FY23	Oct 2022	13[1] (2 pairs)	7 (1 pair)	2 (1 pair)	0	22 (4)
	Nov 2022	7 (2 pairs)	0	0	0	7 (2)
	Dec 2022	8 (4 pairs)	0	0	0	8 (4)
	Jan 2023	2 (1 pair)	2	0	0	4 (1)
	Feb 2023	10[2] (3 pairs)	0	0	0	10 (3)
	March 2023	0	2	0	0	3

*Postponed to April due to COVID-19 related scheduling conflicts and/or staff shortage

[1] Downed wildlife- dead nēnē

[2] Downed wildlife- dropped/abandoned egg

3.5. ʻŌpeʻapeʻa

Baseline monitoring for ʻŌpeʻapeʻa involves canopy assessment every 10 years and species occupancy every 5 years. Occupancy is determined via acoustic monitoring and will be conducted by the Agencies or associated cooperating parties agreeable to KS. Canopy assessment will be completed by FY28 and occupancy surveys were scheduled to occur in FY23.

As the agencies were not able to conduct ʻōpeʻapeʻa occupancy surveys in FY23, KS will be conducting occupancy surveys in FY24, in association with TMA. Survey methods were developed in consultation with USGS PIERC. Bat monitors will be set up at the same high and low elevation sites used for the USGS baseline surveys ca. 2010, with three detectors per site. Detectors will be deployed for 7-10 days per month from September 2023 to May 2024.

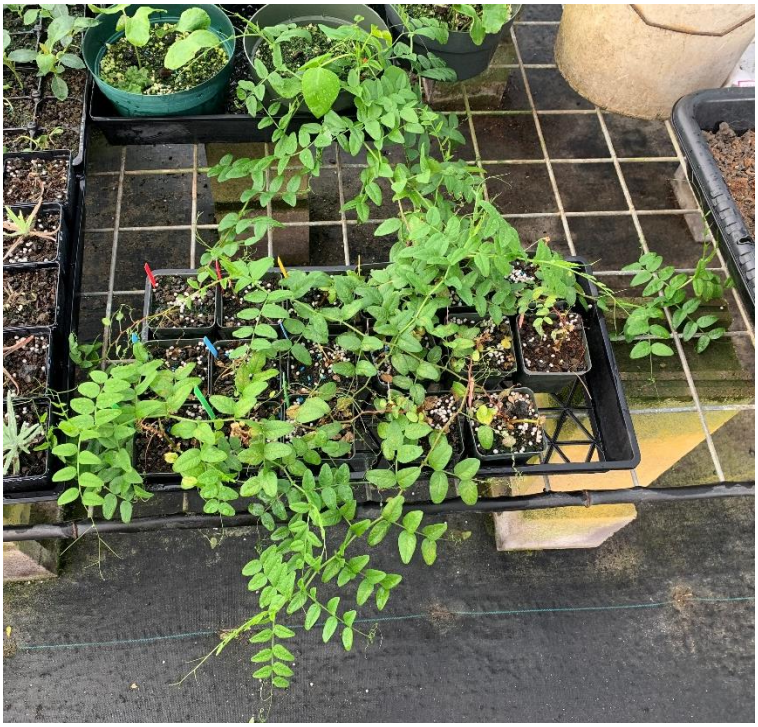
3.6. Endangered Plant Species

Baseline monitoring for threatened and endangered plant species follow protocols established or approved by the Plant Extinction Prevention Program (PEPP). Plant surveys for PEPP species founders (those with 50 or less remaining plants in the wild) and any natural regeneration are conducted annually by PEPP/DOFAW. Non-PEPP species will be surveyed every 2 years and outplants every 5 years by the Agencies or other cooperating parties agreeable to KS. In the event that these organizations are not able to conduct these surveys, KS will be responsible for completing them at a minimum frequency of once every 5 years. The last comprehensive survey of covered plant species was conducted by KS in FY20.

Figure 19. *Vicia menziesii* seeds collected from Keauhou

KS contracted PEPP to conduct a comprehensive survey of all known threatened and endangered plant species on the Enrolled Property that was completed in FY20. In FY21 and FY22, KS conducted a supplemental survey of the Area Requiring Additional Conservation Commitments (ARACC). Overall, surveys conducted over the first 5 years of the agreement show a downward trend for most covered plant species. Three of the eight covered plant species show a decline in the number of population units (*Cyanea stictophylla*, *C. lindseyana*, and *Cyanea shipmanii*), one shows a decline in both the number of population units and individuals (*V. menziesii*), and two are no longer present on the property (*Phyllostegia racemosa* and *Plantago hawaiiensis*). Only three covered plant species show an increase in both population units and individuals (*A. peruvianam* var. *insulare*, *Clermontia peleana*, and *Phyllostegia velutina*). Most of the mortality appears to be due to poor survival of outplants and possible lifespan considerations. For the two species no longer present on the property, baseline numbers were particularly low. The baseline for *P. racemosa* consisted of 4 outplanted individuals and the baseline for *P. hawaiiensis* consisted of a single founder. Going forward, KS will target outplantings for both species and additional survey for *P. hawaiiensis*. These surveys also resulted in detection of two new endangered species (*Exocarpus menziesii* and *Sanicula sandwicensis*) that were not previously known from the Enrolled Property and one rare but unlisted species (*Phyllostegia macrophylla*), which is currently the only extant wild individual known.

In FY23, KS secured a State Rare Plant Permit, which has allowed KS to survey, monitor, collect, and implement threat controls to rare plant populations on KS lands, in collaboration with DOFAW. Under this permit, KS and DOFAW collected cuttings from seven additional *V. menziesii* founders. To date, cuttings from 12 of 20 Vicia individuals have been taken and deposited at the Volcano Rare Plant Facility (VRPF). As of July 2023, material representing 6 founders have successfully rooted; some with multiple replicates. Additional Vicia cuttings are also on the facility's mist bench and additional founder representation is expected. Cuttings from the remaining 8 founders were not taken due to



small plant size and limited plant material. Continued and increased monitoring, as well as, additional collections are planned for Vicia in FY 24.

Also of note, the first Vicia seeds were collected and accessioned (see Figure X). Of 125 total seeds, 75 were deposited to VRPF for immediate sowing and propagation. Germination rate has been slow and few have sprouted. The remaining 50 seeds were stored at Lyon Arboretum. No viability tests have been conducted yet.

As of April 2022, multiple cuttings were rooted, with some having new growth (see Figure 18). Given the success of these cuttings, KS will collect cuttings from additional *V. menziesii* populations in FY23 and will continue working with DOFAW on planned *V. menziesi*i recovery efforts, including increased monitoring of wild plants, securing propagule collections, and establishing reintroduced populations across the species' historic range. KS will also continue discussions with DOFAW to expand the planned collaboration to include recovery actions for all covered plant species, with a focus on propagule collections and outplanting.

4. Avoidance and Minimization

In FY19, KS developed a Safe Harbor Agreement Training specific to Keauhou, Kaʻū in association with TMA and PEPP. The training was designed to enable those leading activities at Keauhou, Kaʻū to:

1. Understand basic endangered species law in relation to the Agreement,
2. Identify covered species and their habitats at Keauhou, Kaʻū, and
3. Understand and be able to consistently apply the avoidance and minimization measures contained in the Agreement.

In FY22, a training was held on July 22, 2022 with two participants trained. A total of 51 individuals from eight organizations have been trained over the past five years. Training will continue to be offered on an as needed basis. In addition, improved field reference guides are being developed for trained individuals.

5. Changed or Unforeseen Circumstances

5.1. Kona Low

In mid December 2022, a strong Kona low produced heavy rainfall and damaging winds across the Hawaiian Islands. The strong southerly winds, blowing opposite the direction of regular wind patterns, caused numerous tree falls, but was not a damaging as the slower moving Kona low from December 2021, which caused extensive damage to fencelines and the V. menziesii population at the summit of Puʻu Kipu.

6. Amendment of the Agreement

The Agreement allows for baseline revision in certain cases, including outplant mortality within the first two years of the Agreement and *force majure* events. KS first presented a baseline revision request to wildlife agency staff during a meeting on May 1, 2020 and submitted a draft written request on June 10, 2021. In FY22, DOFAW staff notified KS that as the written report on the comprehensive survey of outplants had not been submitted to DOFAW by the 2nd anniversary of the agreement (June 22, 2020), the Attorney General had determined that DOFAW would be unable to follow the specific baseline revision process described in Section 5 of the Agreement:

> "Because of the documented poor survival of outplants of some species, the long-term uncertainty of survival for outplants not regenerating naturally, and lifespan considerations, the baseline for outplants may be modified administratively with

approval by the agencies and the ESRC. Revision would only occur based on a comprehensive survey of all outplants currently in the baseline for a species, documenting the number of individuals still alive and dead. The new baseline would be the baseline in Table 4 minus the dead individuals that died of natural causes. Acceptance of the baseline revision will only occur upon submission of a report documenting the survey methods and results submitted to the agencies within the first two years of the Agreement."

This is despite the fact that KS conducted a comprehensive survey of all outplants during the first two years of the agreement, completed a report documenting the survey methods and results, and presented the results of the comprehensive survey to the wildlife agency staff during a meeting on May 1, 2020. The wildlife agencies were fully aware that KS intended to request baseline revision due to outplant mortality, as the inclusion of young outplants in the baseline had been a sticking point during Agreement negotiations and KS had repeatedly informed the wildlife agencies that it was conducting a comprehensive survey of all outplants in order to revise the baseline. At no time, including during the meeting on May 1, 2020, was KS informed that the report must be submitted to the wildlife agencies by June 22, 2020 in order to follow the baseline revision process outlined in the Agreement.

KS will therefore be proposing an amendment to the Agreement. The amendment will include:

1. Revision of covered plant species baselines to account for outplant mortality during the first two years of the agreement.
2. Inclusion of two new covered plant species: *Exocarpus menziesii* and *Sanicula sandwicensis*.

The amendment will not include revision of baseline for ʻio and ʻōpeʻapeʻa habitat due to the 2018 wildfire. While this was a *force majure* event, KS silviculture and restoration activities in this area are showing success, and the wildfire is not expected to have a long term impacts on ʻio and ʻōpeʻapeʻa habitat.

7. Agency Visits and Reporting

No meetings were held with USFWS and DLNR staff in FY23. A presentation of the FY22 annual report to the Endangerd Species Recovery Committee (ESRC) was held. This meeting took place on:

- January 11, 2023- ESRC Annual Review Meeting, virtual meeting

APPENDIX 1

2022 KEAUHOU-KĪLAUEA FOREST BIRD SURVEYS- SUMMARY OF DETECTIONS

APPENDIX 2
FY23 ʻIO SURVEY REPORT

APPENDIX 3
FY23 NĒNĒ SURVEY REPORT

APPENDIX 4
FY23 DOWNED WILDLIFE FOREMS

APPENDIX 5

FY23 BASELINE TABLES

Wildlife

Species	Baseline	Current	Last Surveyed	Monitoring
ʻAkiapōlāʻau (*Hemignathus wilsoni*)	Approximately 4,162 acres of habitat in the Forest Bird Stratum 1 baseline area	Present on Enrolled Property	**FY23 Occupancy (KS and wildlife agency staff)** *(canopy assessment will be conducted in FY28)*	Canopy assessment every 10 years; Species occupancy annually
ʻAlawī Hawaiʻi Creeper (*Loxops mana*)				
ʻĀkepa Hawaiʻi ʻĀkepa (*Loxops coccineus*)				
ʻIʻiwi (*Vestiaria coccinea*)				
ʻAlalā Hawaiian Crow (*Corvus hawaiiensis*)	Zero individuals	Zero individuals	n/a	None required
Nēnē Hawaiian Goose (*Branta sandvicensis*)	Zero pairs	Four pairs	**FY23 (DOFAW)**	Annual survey of breeding pairs (DOFAW)
ʻIo Hawaiian Hawk (*Buteo solitarius*)	Approximately 18,517 acres on the Enrolled Property; 4,530 acres of closed and 13,987 acres of open canopy tree cover habitat	Present on Enrolled Property	**FY23 Occupancy (KS and DOFAW)** *(canopy assessment will be conducted in FY28)*	Canopy assessment every 10 years; Species occupancy every 5 years
ʻŌpeʻapeʻa Hawaiian Hoary Bat (*Lasiurus cinereus semotus*)		Present on Enrolled Property	*(occupancy survey will be conducted in FY24 and canopy assessment in FY28)*	

Plants

Species	Baseline (wild/ outplant)	Current (wild/ outplant)	Last Surveyed	Monitoring
Asplenium peruvianum var. *insulare*	128 (128/0)	226* (226/0)	FY19, with additional survey in FY21 and FY22 (KS)	Survey non-PEPP species every 2 years (agencies); survey outplants every 5 years (agencies)
ʻOhā wai *Clermontia lindseyana*	24 (5/19)	22 (13/9)	FY19, with additional survey in FY21 (KS)	Survey non-PEPP species every 2 years (agencies); survey outplants every 5 years (agencies)
Hāhā *Cyanea shipmanii*	463 (0/463)	282 (1/281)	FY19 (KS)	Annual survey of PEPP founders and natural regeneration (PEPP); Survey outplants every 5 years (agencies)
Hāhā *Cyanea stictophylla*	104 (0/104)	100 (0/100)	FY19 (KS)	Annual survey of PEPP founders and natural regeneration (PEPP); Survey outplants every 5 years (agencies)
Kīponapona *Phyllostegia racemosa*	4 (0/4)	0 (0/0)	FY19 (KS)	Annual survey of PEPP founders and natural regeneration (PEPP); Survey outplants every 5 years (agencies)
Phyllostegia velutina	38 (29/9)	60* (60/0)	FY19, with additional survey in FY21 (KS)	Survey non-PEPP species every 2 years (agencies); survey outplants every 5 years (agencies)
Plantago hawaiensis	1 (1/0)	0 (0/0)	FY19 (KS)	Annual survey of PEPP founders and natural regeneration (PEPP); Survey outplants every 5 years (agencies)
Vicia menziesii	27 (27/0)	20 (20/0)	FY19, with additional survey in FY21, FY22, and **FY23 (KS and DOFAW)**	Annual survey of PEPP founders and natural regeneration (PEPP); Survey outplants every 5 years (agencies)
ʻĀhinahina *Argyroxiphium kauense*	0	0	n/a	Survey non-PEPP species every 2 years (agencies); survey outplants every 5 years (agencies)
ʻŌha *Clermontia peleana*	0	2,000 (0/2,000)	n/a **outplant survey overdue*	Annual survey of PEPP founders and natural regeneration (PEPP); Survey outplants every 5 years (agencies)
ʻAkū *Cyanea tritomantha*	0	0	n/a	Survey non-PEPP species every 2 years (agencies); survey outplants every 5 years (agencies)

Haʻiwlae *Cyrtandra giffardii*	0	0	n/a	Survey non-PEPP species every 2 years (agencies); survey outplants every 5 years (agencies)
Haʻiwale *Cyrtandra tintinnabula*	0	0	n/a	Survey non-PEPP species every 2 years (agencies); survey outplants every 5 years (agencies)
Hau kuahiwi *Hibiscadelphus giffardianus*	0	0	n/a	Annual survey of PEPP founders and natural regeneration (PEPP); Survey outplants every 5 years (agencies)
ʻOhe *Joinvillea ascendens*	0	0	n/a	Survey non-PEPP species every 2 years (agencies); survey outplants every 5 years (agencies)
Alani *Melicope zahlbruckneri*	0	0	n/a	Annual survey of PEPP founders and natural regeneration (PEPP); Survey outplants every 5 years (agencies)
Neraudia ovata	0	0	n/a	Survey non-PEPP species every 2 years (agencies); survey outplants every 5 years (agencies)
ʻAiea *Nothocestrum breviflorum*	0	0	n/a	Survey non-PEPP species every 2 years (agencies); survey outplants every 5 years (agencies)
Phyllostegia floribunda	0	0	n/a	Annual survey of PEPP founders and natural regeneration (PEPP); Survey outplants every 5 years (agencies)
Phyllostegia parviflora	0	0	n/a	Annual survey of PEPP founders and natural regeneration (PEPP); Survey outplants every 5 years (agencies)
Makou *Ranunculus hawaiiensis*	0	0	n/a	Annual survey of PEPP founders and natural regeneration (PEPP); Survey outplants every 5 years (agencies)
ʻĀnunu *Sicyos alba*	0	0	n/a	Annual survey of PEPP founders and natural regeneration (PEPP); Survey outplants every 5 years (agencies)
ʻĀnunu *Sicyos macrophyllus*	0	0	n/a	Annual survey of PEPP founders and natural regeneration (PEPP); Survey outplants every 5 years (agencies)
Silene hawaiiensis	0	0	n/a	Survey non-PEPP species every 2 years (agencies); survey outplants every 5 years (agencies)
Stenogyne angustifolia	0	0	n/a	Survey non-PEPP species every 2 years (agencies); survey outplants every 5 years (agencies)