



Protecting Forests for Water Supply Sustainability in Kohala, Hawai‘i

Phase 2

WaterSMART Environmental Water Resources Project Grant Application
State of Hawai‘i, Department of Land and Natural Resources Proposal
Project Manager: Emma Yuen, Natural Resources Program Manager Specialist
1151 Punchbowl St. Rm. 325
Honolulu, HI 96813
Emma.Yuen@hawaii.gov
(808) 366-4788



The forests of Kawainui directly supply water for the Hamakua ditch in Kohala, Hawai‘i.

Contents

| | |
|-------------------------------------|----|
| Executive Summary | 2 |
| Project Location | 2 |
| Technical Project Description | 4 |
| Performance Measures | 4 |
| Evaluation Criteria | 5 |
| Project Budget | 17 |

Executive Summary

November 2, 2021

Applicant: State of Hawai‘i, Department of Land and Natural Resources, Division of Forestry and Wildlife (Category A Applicant)

Location: Central Kohala Mountains, County of Hawai‘i, State of Hawai‘i

The Kohala Watershed Partnership, a watershed group including multiple state, county, and private organizations, proposes to protect 800 acres of forested and wetland habitat from feral pigs. Protecting this forest from degradation from pigs will significantly improve the quantity and quality of water supplies in Kohala, a disadvantaged community where current withdrawals are near current or future sustainable yield limits.¹ The project site supplies both surface and ground water sources for municipal and agricultural users, benefits endangered plants, and sequesters carbon. This fence construction project has been vetted as part of the Kohala Watershed Management Plan.





The project’s duration is October 1, 2022 until September 30, 2025. The project is not located on a Federal facility.

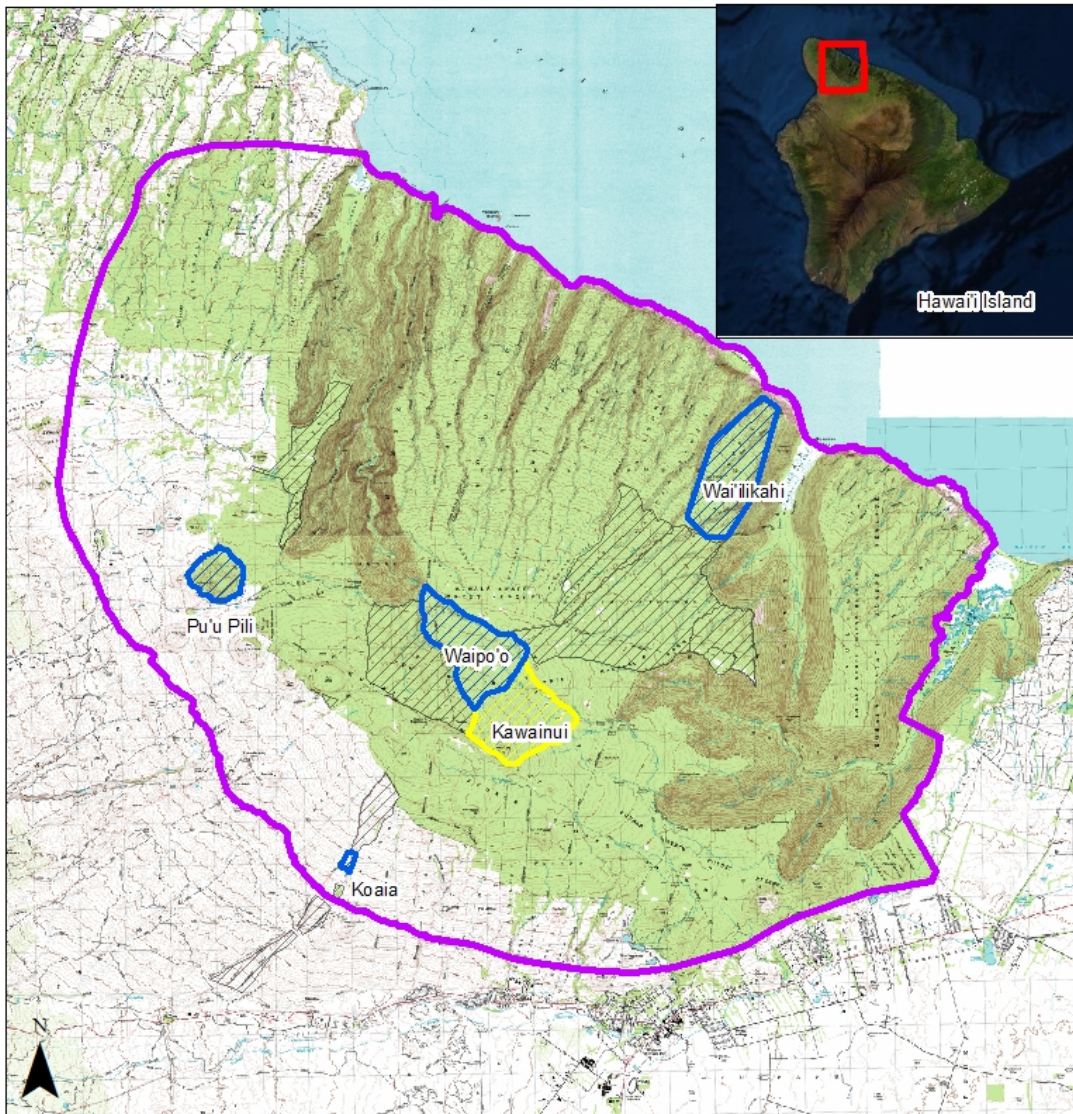
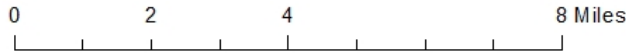
Project Location

The project is located on the island of Hawai‘i (USGS Hydrologic Unit 20010000), in the island’s northern mountain range. The proposed fence is about 3 miles north of the nearest town of Waimea in the high-rainfall mountains that supply the entire region’s water (-155.694 20.087 decimal degrees). The project site is designated critical habitat and includes native Hawaiian wet forest, perennial streams, and wetland habitats (Freshwater Forested/Shrub Wetland habitat-PF03B).²

The background and benefits of this project are similar to the “Phase 1” application also submitted for the FY22 EWRP. The Phase 1 application includes pig removal across four fence units (1,900 acres), as well as watershed coordination and outreach, which provides a solid foundation for the management of the Kohala forests. This Phase 2 application would expand the scope of that project to build an 800-acre fenced unit and remove pigs. During discussions with the Bureau of Reclamation about these projects, it was suggested that they be separated to provide the Bureau more flexibility.

WaterSMART Kohala Ph. 2 Project: Kawainui

-  Kohala Watershed Partnership
-  WaterSmart Project Areas: Phase 1*
-  WaterSmart Project Areas: Phase 2
-  Existing fenced units**



Emma.Yuen@hawaii.gov
DLNR DOFAW - September 2021

*Phase 1 is requested in a separate grant application.
**These are not part of either grant application, but included to show overall status of watershed protection on Kohala.

1 The Phase 2 Project will protect the 800-acre Kawainui unit (in yellow).

Technical project description

The Department of Land and Natural Resources (DLNR), Division of Forestry and Wildlife, is applying as a partner of the Kohala Watershed Partnership. This innovative partnership was established in 2003 and consists of 11 major landowners and the County of Hawai'i Department of Water Supply. Watershed partnerships are voluntary organizations which pool resources to manage watershed priorities across the entire mountain range, rather than based on landownership boundaries. The partners are united by a Memorandum of Understanding that outlines their shared goals and relationships.

The partnership has an approved management plan that identifies feral pigs as a top threat to the forests in Kohala. This project will remove feral pigs from 800 acres. Fencing these forests from pigs has been a proven strategy to provide long-term protection for these ecosystems.³ Native Hawaiian forests have evolved over millions of years without defenses to hooved animals, losing protections such as thorns and poisons. Hooved animals are the main cause of the loss of native forest statewide.⁴ Less than half of Hawai'i's original forest remains.⁵ Feral pigs eat and trample native plants and endangered ground-nesting birds, uproot soil, spread invasive weeds, and spread diseases such as Rapid 'Ōhi'a Death. This disease has caused the death of over a million 'ōhi'a trees, which are the keystone tree species in native forests.

“By protecting the forests, we are protecting the “sponge” that allows rain, fog drip, and water to be captured and stored to replenish our aquifers and streams.”
- Hawai'i State Water Projects Plan 2020

The Hawai'i Conservation Alliance,⁶ a collaboration of 26 major conservation leaders representing government, cultural, educational and non-profit organizations, has published a position paper identifying fencing and hooved animal removal as the first step toward native Hawaiian forest protection.⁷ This project follows the established steps outlined by that paper to achieve the goal of complete and long-term feral pig exclusion.

Without fences, it is not feasible to continuously reduce animal populations.⁸ Their populations can quickly rebound, even after being reduced by 40%⁹-70%.¹⁰ Specifications for hooved animal removal projects have been approved by the DLNR¹¹ which will guide fence construction, ongoing maintenance, and hooved animal removal. These include building fences that cannot be burrowed under by pigs, trapping and hunting pigs, and installing game cameras and pig activity transects to determine the presence of pigs remaining in the fenced unit.

This project location is strategic because it primarily protects remaining native forest from loss, which is highly cost-effective compared with restoring areas after degradation. Protection – and restoration – of native forest is not possible in the presence of pigs, which roam wild across this mountain range.¹²

Performance Measures

This project will track the miles of fence constructed, and the number of pigs removed from 800 acres. Once pigs are removed from these units, it will be possible to estimate a reduction in

pounds of fecal matter and carcasses that result from this project. Models have been developed that quantify the water recharge and the tons of aboveground carbon (Mg C) that these forests currently store. Native forest protection is also associated with an estimated 358 acre-feet per year of increased water recharge that will be maintained compared to a no action alternative (see Evaluation Criteria section for explanation). This project's success at maintaining these forests can be mapped during the future landcover surveys conducted by the U.S. Geological survey. These would be most strategically conducted after the three-year performance period of this project.

Evaluation Criteria

E.1.1.1. Sub-Criterion A.1—Benefits to Ecological Values

The project increases water supply reliability for both human use and ecological values. This project improves both timing and quantity of water available, improves stream and riparian conditions for the benefit of plant and animal species, fish and wildlife habitat, riparian areas, and ecosystems. This project benefits multiple sectors for ecological, agricultural, and municipal water uses, as well as human health issues from degraded water quality, and carbon sequestration. The State regularly maintains and replaces fences, so the project is anticipated to last longer than 35 years - the anticipated useful life of the fence. However, by keeping forests from converting into barren areas or non-native vegetation, the project also prevents an irreversible loss of a forest that has evolved on the mountain for many millions of years. Thus, this project could be considered to have much longer-term benefits.

The first ecological benefit is stopping pigs from eating and trampling large tracts of montane wet rainforest, including the endangered plant species found in this unit. Pigs also eat ground-nesting seabirds. While seabird nests are not currently known in Kawainui, the forest could be repopulated by endangered seabirds. A population of the highly endangered 'ua'u (Hawaiian petrel, *Pterodroma sandwichensis*) is known from similar habitat approximately 3 miles from the project site, and this cryptic bird species may be prospecting and inhabiting Kawainui undetected.

Secondly, when feral pigs disturb large expanses of forest, they cause erosion and sedimentation which is a top threat to native stream fishes and invertebrates. After the forest degrades into barren pig wallows, its ability to capture cloud water also diminishes, causing less water replenishing streams and groundwater sources, which are needed both for habitat for the native stream ecosystems as well as human uses. Additionally, the barren land infiltrates water slower, and is more prone to flooding. Like pigs, these floods damage native vegetation and wildlife found within streams and stream banks, such as native *Megalagrion* (damselflies) species whose naiad life stage relies on intact streamside vegetation.

In the subsequent section, additional information is provided on how this project results in higher levels of carbon sequestration, as well as improved human health outcomes due to reduced pollution from feral pigs entering waterways and spreading lethal diseases.

E.1.1.2. Sub-Criterion A.2—Quantification of Specific Project Benefits by Project Type

Project Benefits for Drought Resiliency Projects Related to Fish and Wildlife

Protecting forest watersheds is the most cost effective and efficient way to absorb rainwater and replenish ground water.¹³ Numerous studies have indicated that native forests significantly increases water recharge as compared to alien forest, grassland, or barren areas in these high elevation sites.¹⁴ Native Hawaiian forests are highly complex, with canopies, mid-levels, and a well-developed understory and ground cover of ferns and mosses. These are well-adept at capturing fog moisture compared to monotypic alien forests, or grassland, or barren areas. Additionally, the well-vegetated ground cover of native forests increases water infiltration rates, improving recharge compared to barren areas.¹⁵ Further, the most common non-native weed that inhabits this mountain is *Psidium cattleianum*, a small, fast-growing tree that has exhibited the ability to evapotranspire 27%-53% more water than native forests, causing extensive water loss across landscapes.¹⁶ For example, in East Hawai'i invasive plants have already reduced estimated groundwater recharge by 85 million gallons a day.¹⁷ Feral pigs eat the fruits of *P. cattleianum*, and are a main vector that spreads this invasive plant.



2 Healthy native forests have dense vegetation that absorbs passing water like a sponge.



3 Pigs are uprooting forests in Kohala, and converted them to muddy, barren areas.

This project will result in 358 acre-feet per year of increased water supplies. Currently, the proposed Kawainui fence unit provide 4.78 million gallons per day (5,354 acre-feet per year) of freshwater recharge.¹⁸ According to a study by the University of Hawai‘i, Economic Research Office commissioned by the Hawai‘i County of Water Supply, if landcovers change as predicted under a “no management” scenario, within 35 years it is predicted that recharge would decrease by 358 acre-feet per year, as the native forest would eventually degrade into landcovers that are inferior at capturing and infiltrating groundwater.¹⁹ Alternatively, with this project maintaining the native forest cover, the lands are anticipated to remain able to recharge at current rates in the future.

With the surface area of the vegetation capturing more cloudwater, the increased recharge will go both to improved water supplies for the forest plants and animals, increased stream flows, as well as increased infiltration to groundwater sources. The groundwater is either tapped by wells for municipal uses or can emerge in lower elevation springs that are critical habitat for unique native species that require spring-fed ecosystems such as native *Lymnaea* snails.²⁰ Portions of the streams that originate in the proposed Kawainui fenced unit are diverted for human uses, however another portion drains into the 12-mile long Wailoa river. This river has been ranked 10 out of 10 for its high native stream animal diversity (50 species documented shown in table below) and was also ranked as a High Quality Stream by the U.S. Fish and Wildlife.²¹

Species List

Native Species

| | |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Crustaceans | Amphipod sp. <i>Atyoida bisulcata</i> <i>Macrobrachium grandimanus</i> <i>Macrobrachium sp.</i> |
| Fish | <i>Awaous guamensis</i> <i>Eleotris sandwicensis</i> Gobiid sp. <i>Kuhlia sandvicensis</i> <i>Kuhlia xenura</i> <i>Lentipes concolor</i> <i>Mugil cephalus</i> <i>Sicyopterus stimpsoni</i> <i>Stenogobius hawaiiensis</i> |
| Snails | <i>Neritina granosa</i> <i>Neritina vespertina</i> <i>Oxychilus cellarius</i> |
| Worms | <i>Myzobdella lugubris</i> unidentified worm |

Native Species

| | |
|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Insects | <i>Anax junius</i> <i>Anax strenuus</i> <i>Chironomus hawaiiensis</i> <i>Chloropid sp.</i> <i>Dasyhelea hawaiiensis</i> <i>Eurynogaster sp.</i> <i>Hyposmocoma sp.</i> <i>Limnoxenus semicylindricus</i> <i>Limonia grimshawi</i> <i>Limonia jacobus</i> <i>Limonia sp.</i> <i>Limonia stygipennis</i> <i>Megalagrion blackburni</i> <i>Megalagrion calliphya</i> <i>Megalagrion hawaiiense</i> <i>Megalagrion sp.</i> <i>Microvelia vagans</i> <i>Orthocladus sp.</i> <i>Procanacae acuminata</i> <i>Procanace constricta</i> <i>Saldula exulans</i> <i>Scatella cilipes</i> <i>Scatella clavipes</i> <i>Scatella hawaiiensis</i> <i>Scatella mauiensis</i> <i>Scatella oahuense</i> <i>Scatella sp.</i> <i>Scatella warreni</i> <i>Sigmataneurum sp.</i> <i>Telmatogeton sp.</i> <i>Telmatogeton torrenticola</i> <i>Tethina variseta</i> |
|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

4 Native wildlife of the Wailoa River.

Project Benefits for Watershed Management Projects

The project will result in long-term improvements to water quantity and quality by decreasing sediment and nutrient pollution. Studies have shown approximately 20-70% of the ground in a Hawaiian rainforest converted to bare soil due to pig digging.^{22,23,24,25,26} Potentially hundreds of acres within the 800-acre unit are being exposed by pigs. Bare ground in Hawai'i is exponentially more erosive than forests. When these areas recover after feral pig exclusion, the response is likely to change from annual erosion rates removing up to 0.5 mm of soil per year, versus undisturbed forested areas which have 0.01-0.05mm per year.²⁷

The U.S. Geological Survey has conducted a long-term study²⁸ of the south slope of Moloka‘i, revealing that sediment is eroding 100 times faster than historical rates before the hoofed animals had impacted the landscape. Additionally, after hoofed animals were significantly reduced, vegetation cover rebounded from 0% to 70% within 5 years. Preliminary results demonstrated a 10-fold reduction in erosion in that period.²⁹

As indicated above, this project reduces drought impacts, however it also reduces the likelihood of flooding. A main metric to measure flood risk is the rate a certain type of landcover infiltrates precipitation. Studies have demonstrated that native forests can infiltrate 4 times faster than grassland, and 15 times faster than bare ground.³⁰ Another comprehensive statewide study concluded that native forests that are fenced and free of hoofed animals have 25.5% faster infiltration rates than adjacent unfenced forests.³¹ Thus, feral pigs are already having a significant impact on infiltration rates in the existing forest, and if the forest continues to be converted to bare ground, the impacts will be magnified.

While the Kawainui unit has not had a hydrological analysis conducted, hydrologists have analyzed other Hawaiian watersheds to determine the impact of forest loss on flooding. In the Kawela watershed of Moloka‘i, models predict that if the forested landcover converted to shrubs, shrublands went to grasslands, and grasslands became barren, the top ten peak floods will increase in volume by 42.6%.³²

While some native stream animals are well-adapted to high water, some native insects are particularly negatively affected by floods because they lay their eggs in streamside vegetation or rocks which become dislodged during floods.³³ Additionally, the increased sedimentation caused by flooding events is a threat to most native aquatic animals, as well as marine ecosystems.³⁴ This project, which occurs in the headwaters of Wailoa stream, will reduce flooding and sedimentation for approximately 12 miles of river.

As mentioned earlier, this project will also protect four rare plant species from feral pigs which could eat, uproot, or trample individuals:




| Species | Status |
|-----------------------------------|------------------------------|
| <i>Clermontia drepanomorpha</i> | Endangered, Critical Habitat |
| <i>Stenogyne cranwelliae</i> | Candidate |
| <i>Trematolobelia grandifolia</i> | Species of Concern |
| <i>Phyllostegia warshaueri</i> | Endangered, Critical Habitat |

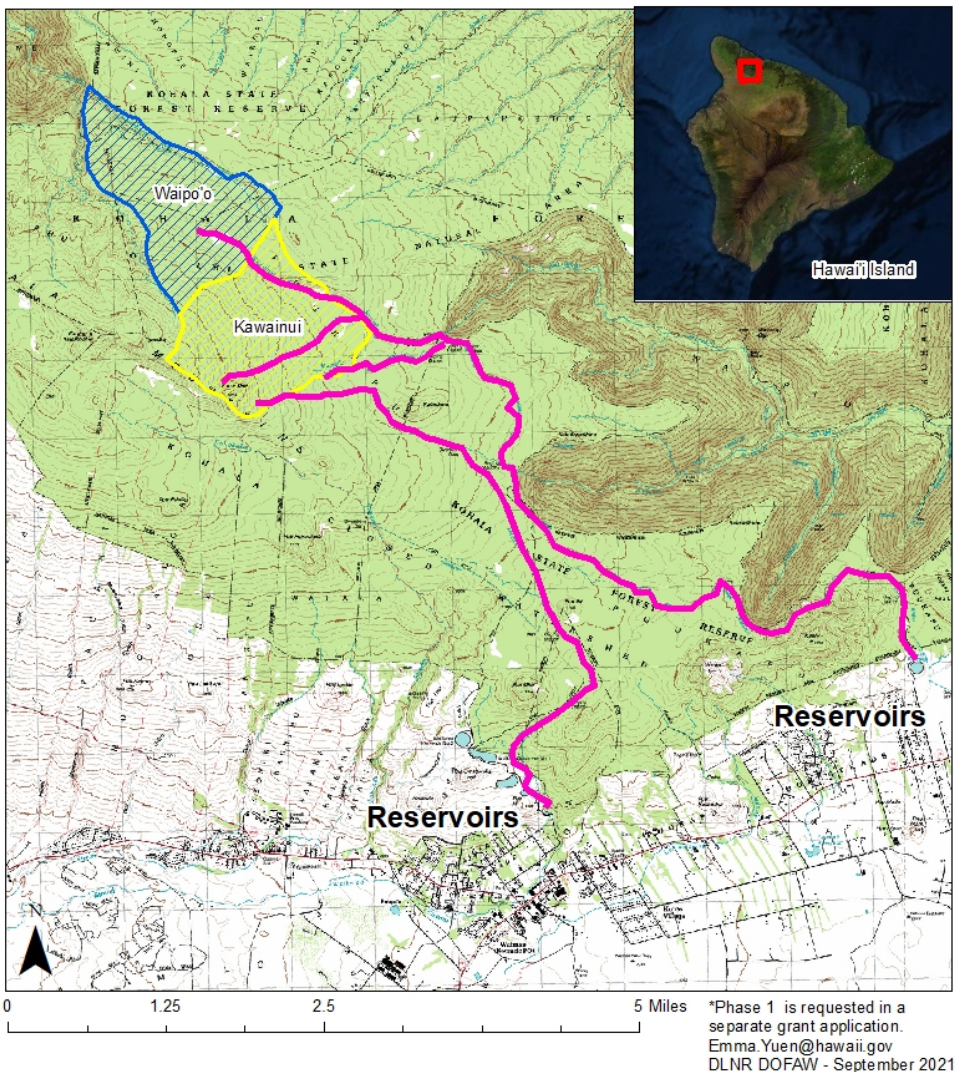
The recovery plans developed for the endangered species identify feral pigs as a top priority threat, and prescribe fencing and pig removal as a major management need that could support the future delisting of these populations. The total amount of habitat that will benefit is 800 acres, which comprises 17% of the designated critical habitat for *Clermontia drepanomorpha*, and 8% of the critical habitat designated for *Phyllostegia warshaueri*.³⁵

Project benefits for multi-benefits projects

The surface and ground water recharge benefits will serve the municipal and agricultural users of Kohala. Much of Kohala’s municipal water comes from this project area, including the main town of Waimea. This target aquifer also services agricultural uses critical for Hawai‘i’s current and future economic self-sufficiency and food sustainability. A network ditches from this area drains from these watersheds and feeds municipal uses and agricultural lowlands below. As the leeward Kohala region is predicted in all climate scenarios to become hotter and drier,³⁶ this vital agricultural region will depend even more heavily on the availability of water coming from the mountain forests.

Reservoirs Supplied by Waipo'o and Kawainui Fence Units

-  Waterways to Reservoirs from Fence Units
-  WaterSmart Project Areas: Phase 1*
-  WaterSmart Project Areas: Phase 2



In addition to causing forest loss, pigs also spread lethal diseases, such as non-tuberculous mycobacterial (NTM) lung disease and leptospirosis.³⁷ Hawai'i has the highest prevalence of age-adjusted NTM lung disease mortality in the U.S.³⁸ Pig wastes also spread fecal bacteria (enterococcus).³⁹ As this area is one of the few places in Hawai'i that uses surface waters for municipal uses, it is particularly important to reduce contaminants.

Pig population estimates range widely.⁴⁰ The Kawainui unit could contain between 8-156 pigs.⁴¹ The average wild pig produces 10 pounds of manure per day which are producing approximately 80-1,560 pounds of manure daily. To put this into perspective, this is equivalent to roughly 80-1,560 humans polluting the watershed with untreated feces on a per-weight basis.

Finally, these forests have spiritual and material importance to the Hawaiian culture.⁴² This project feeds the Wailoa river, which supplies the community of Waipi'o valley with water. This valley supports the largest community of taro farmers in Hawai'i island. Taro is the most important food in native Hawaiian culture and farming requires terraces irrigated from canals that divert water from streams. Ample water is critical to continue this agricultural practice and livelihood, but too much water can destroy the taro fields as well as the irreplaceable rock terraces that are still in use today. Ancient Hawaiians understood the importance of forests for their source of water – as evidenced by the saying “hahai nō ka ua i ka ulu la‘au” (the rain follows the forest). This project will help perpetuate the close connection between the forests and the native culture of Hawai'i.

E.1.2. Evaluation Criterion B—Collaborative Project Planning

The proposed project was developed as part of a collaborative process by a watershed group, as defined in section 6001 of the Cooperative Watershed Management Act.

The Kohala Watershed Partnership is a watershed group that:

- is a grassroots, non-regulatory entity that addresses water availability and quality issues within the relevant watershed,
- is capable of promoting the sustainable use of water resources in the watershed,
- makes decisions on a consensus basis, and
- represents a diverse group of stakeholders, including livestock grazing, land development, philanthropic trusts, recreation, native Hawaiian assistance, irrigated agriculture, the environment, municipal water supplies, private property owners, state and local governments, and disadvantaged communities.

The 20-year plan addresses water quantity issues, water quality issues, and/or issues related to ecosystem health or the health of species and habitat within the watershed:

The overall goal of the plan is to maintain a healthy watershed and all its related ecosystem values and functions (e.g. ecological, economic, sociocultural). As such, management actions are directed at the major threats facing Kohala's watershed: feral ungulates (hooved animals such as pigs and cattle) and other non-native animals (such as rats and non-native aquatic species), invasive plant species (such as banana poka and kahili ginger), wildfire, and incompatible human activities. Primary management goals are: 1) protection of water resources; 2) prevention of new introductions and control of

existing invasive plant species; 3) control of non-native animal populations; 4) native habitat and species protection; 5) wildfire management; and 6) management and promotion of compatible public uses. Major management actions related to these goals are fencing, feral animal removal, invasive species control, outplanting and restoration, monitoring and surveys, research, and infrastructure support and maintenance (including development of new access trails).

Kohala Watershed Management Plan

One of the main purposes of the plan is to increase the reliability of water supply for ecological values, as well as human uses. The plan prioritizes a 13,000-acre zone where the highest-yield areas exist for fencing and hooved animal removal, which includes the 800-acre Kawainui fence unit.

The plan was developed collaboratively and with input from a diversity of interests, and was approved by consensus by partners. Partners include:

State of Hawai‘i, Department of Land and Natural Resources (applicant): The State is the landowner of this project and also provides funding to protect forested watersheds, as well as streams and marine resources. The State is also responsible for monitoring and managing the groundwater withdrawals.

Department of Hawaiian Home Lands: This agency provides homestead lots for native Hawaiians, which will benefit from the increased water availability and quality provided by this project.

County of Hawai‘i, Department of Water Supply: This agency monitors water levels, and manages multiple wells and water diversions in the project area.

Other private partners that contributed and approved the Kohala Watershed Management Plan include:

Laupahoehoe Nui, LLC, Parker Ranch, Inc, Ponoholo Ranch, Ltc, Surety Kohala Corp, Queen Emma Foundation, Kahua Ranch, LLC, Kamehameha Schools, and The Nature Conservancy of Hawai‘i. These entities represent major agricultural and conservation-focused landowners that comprise a large part of the partnerships’ land area, and are community leaders and major economic drivers in the region.

The management plan received extensive community input and involvement. Thirty entities were consulted with during the development of the plan, and community open houses were provided for input in three locations across Kohala. The plan also was sent to local hunters, hikers, volunteers, and native Hawaiian traditional practitioners.

The proposed activities of hooved animal removal in this region complements the following collaborative plans:

1. State of Hawai‘i Sustainable Hawai‘i Initiative: This goal, announced by Governor Ige in 2016 to the World Conservation Congress, includes a goal to protect 30% of priority

watershed forests by 2030. This measure is tracked by the acreage of native forests fenced from hooved animals.⁴³

2. Fish and Wildlife Service Recovery Plans: The recovery plans for multiple endangered species that exist in the project area prioritize hooved animal removal.⁴⁴
3. Hawai‘i State Water Resource Protection Plan: this plan prioritizes native forest protection for water recharge.⁴⁵
4. Hawai‘i Drought Plan: This plan prioritizes hooved animal removal and native forest protection for securing water supplies.⁴⁶
5. Hawai‘i Forest Action Plan: This plan prioritizes hooved animal removal and native forest protection for securing water supplies and many other benefits.⁴⁷
6. Hawai‘i State Wildlife Action Plan: This plan identifies multiple endangered species that exist in the project area and prioritizes hooved animal removal.⁴⁸
7. Hawai‘i County Island Water Use & Development Plan: This plan prioritizes watershed forest protection and associated actions to maintain water supplies.⁴⁹
8. Department of Health, Non Point Source Management Plan: This plan prioritizes hooved animal removal to reduce sedimentation and pollution of animal wastes into waterways.⁵⁰

E.1.3. Evaluation Criterion C—Stakeholder Support

As mentioned previously, a wide array of stakeholders were involved and supported the watershed management plan.

Letters of support are attached from partnership members as well as elected officials. The same letters provide support for both the Phase 1 and 2 grant applications, which have similar goals but different locations in Kohala.

The Department of Water Supply of the County of Hawai‘i has supported the project by identifying Kohala as an important area that needs additional water recharge, and funded a study that quantifies the future of water recharge by analyzing anticipated landcover changes.⁵¹ This study provided the basis for the quantification of the water recharge benefits listed in the *Project Benefits* section. The data shows the most important areas within the watershed to maintain as forests for optimal water recharge.

This project is also supported by land managers from agricultural, environmental, and native Hawaiian assistance organizations. All these entities serve to benefit from improved forest health and increased water recharge.

Diverse stakeholders supported the management plan. However, a few hunters opposed the plan as it would reduce areas available to hunt pigs. This opposition was mainly targeted at proposed fence units that are closer to existing roads and trails, rather than the unit proposed in this application, which is extremely difficult to access on foot. The Kohala Center is taking the lead to conduct outreach on the more accessible fence units, and will be holding small group meetings with hunters, as well as with those that may support fencing. They will also be developing outreach materials such as webpage and social media posts. Outreach also involves connecting those who oppose the project with community members who can communicate their support, often from a perspective of aloha ‘āina (love of the land). This outreach shares traditional native

Hawaiian values of respect for the upland forests (referred to as the “wao ‘akua” or “realm of the Gods”) and reverence and spiritual significance for individual types of plants, birds, and other forest inhabitants.

E.1.4. Evaluation Criterion D—Readiness to Proceed

This straightforward, shovel-ready project does not require any engineering or design work, and the approvals and plans have already been finalized. The project sites are all on State land where land access is granted.

No additional permits or approvals are anticipated to be needed to implement this project. The applicant has contacted the Bureau of Reclamation’s Lower Colorado Field Basin office to confirm that the regulatory compliance for the project would be straightforward and able to be done quickly.⁵² The state environmental and historical review processes have already been completed through the publishing of an environmental assessment for the Kohala Watershed Management Plan. A finding of no significant impact was completed for all these activities, which may be able to satisfy NEPA requirements as well. As part of that environmental assessment, consultation with the State Historical Preservation Division occurred pursuant to Chapter 6E, Hawaii Revised Statutes Historical Preservation Review. This may be referenced in a Section 106 consultation.

The implementation plan is shown in the chart below.

State DLNR Matching Funds

| Major Tasks | Sub Objective | Milestones | Start Date | End Date |
|--------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------|-------------------|-----------------|
| Purchase materials for the 800-acre Kawainui Unit | n/a | Materials purchased | 10/1/2022 | 12/1/2022 |
| Purchase supplies for feral pig removal | n/a | Materials purchased | 10/1/2024 | 9/30/2025 |
| Purchase helicopter transport for coordinator and field crew to access Kawainui Unit | Transit to remote locations via helicopter at \$745 per hour | n/a | 10/1/2024 | 9/30/2025 |
| Labor (Civil Service Staff) | Reconnaissance of unit, contract formation and oversight, field crew supervision, assist with feral pig removal | Fenceline surveyed, logistics completed for all aspects of project | 10/1/2022 | 9/30/2025 |

Bureau of Reclamation Request

| | | | | |
|-----------------------------------------------------------|---------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|-----------|-----------|
| Fund contractor to complete the 800-acre Kawainui Unit | Build 4 miles of fence | Fence completion; feral pigs cannot enter into unit | 10/1/2022 | 9/30/2024 |
| Fund labor to remove feral pigs in 800-acre Kawainui Unit | Monitor feral pig populations in transects. Deploy traps; conduct ground hunts. | All feral pigs within fence unit are removed. Pig activity transects record no fresh pig sign. | 10/1/2024 | 9/30/2025 |
| Record management actions in database | Submit data on animals dispatched, and fence repairs conducted. | n/a | 10/1/2022 | 9/30/2025 |



5 The diverse 'ōhi'a forests of Kohala.

E.1.5. Evaluation Criterion E—Performance Measures

The project will monitor the progress and effectiveness of the project in multiple ways. The goal to protect 800 acres from feral pigs will be tracked by regularly scheduled feral pig activity monitoring transects and game cameras which are an established technique to locate and quantify levels of feral pigs remaining in a fenced unit. The State DLNR will also fund staff to routinely check fences to ensure they are still effectively blocking pigs, and have not been damaged by storms or fallen trees. This monitoring and maintenance will continue after the grant is finished, funded by State operating budgets.

The project will also be able to track improvement in water quality by reporting on how many pigs are removed from the Kawainui unit. This will allow the State to estimate the reduction in pounds of fecal matter and carcasses that result from this project.

State staff conduct vegetation transects on a regularly scheduled basis to determine the extent of the native forest and invasive plant threats. This area will be included in those transects if fenced.

Finally, the U.S. Geological Survey creates landcover and vegetation maps across Hawai'i. If new surveys are conducted in the future, the State will be able to determine success towards maintaining the native forest. This data will be compared with the modeled loss of native forest if the land remains unprotected.

E.1.6. Evaluation Criterion F—Presidential and Department of the Interior Priorities

1. Climate Change

Protecting forests alleviates a wide range of threats from climate change predicted to cause hotter⁵³ and drier⁵⁴ conditions, and rising sea levels^{55,56} that infiltrate fresh water systems.⁵⁷ Forests will be even more critical for collecting fog drip with less overall rainfall.⁵⁸

Drought avoidance is particularly important in this region, which is ranked as the highest risk for agricultural drought, and a medium risk for water supply drought risk, under current and climate change scenarios.⁵⁹

This project will reduce greenhouse gas emissions by preventing deforestation. The Kawainui unit currently stores 198,593 tons of carbon (Mg C). This data is derived from the U.S. Forest Service and U.S. Geological Service⁶⁰ maps of the carbon sequestration values for the Hawaiian islands. If future landcover mapping exercises are conducted for these areas, their values can be compared to ensure that the aboveground carbon remains in these areas in the future. If the forests degrade further by hooved animals and are replaced by invasive weeds, grasses, or barren areas, that existing stored carbon will be partially lost. On Hawai'i Island, some of the highest standing densities of carbon can be found in old-growth 'Ōhi'a forests.⁶¹ 'Ōhi'a forests, the dominant type of the remaining native forests, contain anywhere from 19 to 162 tons of carbon per acre; depending on climate and soil variables.⁶² Destruction of native forests by hooved animals can reduce or practically eliminate stored carbon.⁶³ When invasive plants, such as *P. cattleianum* invade and eventually replace these forests, aboveground biomass can drop by 19-38%.⁶⁴ As mentioned previously, landcover models predict that the native 'Ōhi'a forest will transition to an invaded forest largely comprised of *P. cattleianum* and bare ground within 35 years if left unprotected from pigs.

The proposed project will contribute to climate change resiliency in other ways. Endangered Hawaiian plants are highly vulnerable to climate change as their habitats are specialized, small, and often fragmented.⁶⁵ Protecting existing habitat from loss is one of the main ways to mitigate threats from climate change on these species.⁶⁶ Controlling the spread of invasive, habitat-modifying species like feral pigs is particularly important as the climate becomes even more conducive to the spread of invasive plants, insects⁶⁷ and diseases.^{68,69}

2. Disadvantaged or Underserved Communities:

The entire Kohala region of the island qualifies as a “disadvantaged community,” per the state censuses which reports that the region has less than 100 percent of the statewide annual median household income for the state.⁷⁰

The proposed project serves an underserved community as 69% of residents in Hawai‘i county are non-white,⁷¹ and Hawai‘i is the most diverse state in the nation.⁷² As mentioned above, this project will bring increased community benefits for water supply, as well as economic benefits (creating green conservation jobs, as well as expanded agricultural opportunities). Further, it will improve public health by eliminating water-borne diseases spread by feral pigs.

Hawaii’s native Hawaiian population particularly benefits from this project. While Hawai‘i does not have any recognized tribes, the Hawaiian Homes Commission Act of 1920 set aside approximately 200,000 acres of land to establish a permanent homeland for native Hawaiians. The project area directly serves the Hawaiian Homes communities of Pu‘u Kapu.⁷³ The project also improves the quality of other Hawaiian Homes properties, which include the reservoirs and wetlands that collect the water from the project area. As mentioned previously, the stream that flows from this area services a community whose main livelihood and cultural identity is tied to the ancient practice of taro cultivation, which is directly impacted by water availability and timing.

Project Budget

FUNDING PLAN

The State matching funds proposed for this project are all secured and allocated by the State Legislature as part of the budget bill passed as Act 88, Session Laws of Hawai‘i 2021. These funds are available during the project period.

BUDGET PROPOSAL

State DLNR Matching Funds

| Budget Item Description | \$/Unit | Quantity | Quantity Type | Cost |
|-------------------------------------------------------|--------------|----------|---------------|----------------------|
| Salaries and Wages | | | | |
| Labor (Civil Service Staff) | \$ 57,420.00 | 1.25 | yearly salary | \$ 71,775.00 |
| Fringe Benefits | | | | |
| Fringe benefits (Civil service rate is 62% of salary) | \$ 35,600.40 | 1.25 | yearly fringe | \$ 44,500.50 |
| Contractual | | | | |
| Purchase helicopter transport to access Kawainui | \$ 745.00 | 61 | hours | \$ 45,445.00 |
| Supplies | | | | |
| Purchase fence materials for the Kawainui fence | \$ 34,999.75 | 4 | miles | \$ 139,999.00 |
| Purchase supplies for feral pig removal | \$ 15.96 | 1608 | trap | \$ 25,663.68 |
| Total matching funds for project | | | | \$ 327,383.18 |

Bureau of Reclamation Request

| Budget Item Description | \$/Unit | Quantity | Quantity Type | Cost |
|------------------------------------------------|--------------|------------|---------------|------------------------|
| Contractual | | | | |
| Fund contractor to complete the Kawainui fence | \$145,000.00 | 4 | miles | \$ 580,000.00 |
| Fund labor to remove feral pigs in Kawainui | \$ 28,559.00 | 9 | months | \$ 257,031.00 |
| Total Direct Costs | | | | \$ 837,031.00 |
| Indirect Costs | | | | |
| Indirect charge | 11.32% | \$ 837,031 | direct costs | \$ 94,751.91 |
| Total Bureau of Reclamation Request | | | | \$ 931,782.91 |
| TOTAL ESTIMATED PROJECT COSTS | | | | \$ 1,259,166.09 |

BUDGET NARRATIVE

State DLNR Matching funds

Salaries - An estimated 15 months (1.25 years) of a Natural Resources Management Specialist IV over the course of the grant period will be dedicated to overseeing this project. This includes the labor associated with scoping the fence line route and drafting and finalizing contracting documents (1 month), coordinating with the fence contractor and inspecting work (1 month),

assisting with the ungulate removal logistics and participating in the fieldwork for ungulate removal (12 months), and coordinating procurement and compliance with reporting requirements (1 month). An estimated 40 hours will be spent on compliance with reporting requirements.

Fringe Benefits

The fringe rate of State Civil Service salaries is set at 62%.

Contractual

Helicopter time – helicopter transport will be required for staff to access the project sites. Currently, the State’s negotiated helicopter rate per hour is \$745/hour, which is based on the lowest price received in a competitive bidding process. This cost is anticipated to be incurred throughout the entire project period. This will be essential for the project as certain areas are so steep and rugged that they cannot be accessed on foot.

Materials and Supplies

Feral pig traps – Traps are needed for pig removal, prices are based on previous low bids from competitive procurement processes.

Fence Materials - Fence materials per mile include: 16 rolls wire, 800 T-posts, 172 deadmen posts, 72 Y-posts, 5 rolls 8 deer wire, 1.7 rolls 9 gage smooth wire, 4,285 clips, 43 lbs hog rings, and 7 high five panels. These costs are based on the lowest price received in a competitive bidding process.

Bureau of Reclamation Request

Contractual

Fence labor - Fund contractor to complete the 800-acre Kawainui Unit: This estimate is based on competitive lowest bids for similar projects of remote backcountry pig fence.

RCUH labor - The contractor is the Research Corporation of the University of Hawai’i (RCUH). The State has a cooperative agreement with RCUH to provide services that support both organizations’ missions as both organizations are State entities. RCUH will employ field crew to remove feral pigs in the Kawainui unit, which includes setting and checking traps, ground hunts, and surveying transects and game cameras to determine where pigs exist. The costs are for 9 months of time for four technicians and a 1 field supervisor which is the estimated time needed to complete the ungulate removal. The costs per position per year are below.

| Costs Per Year | Technician | Field Supervisor |
|-----------------|-------------|------------------|
| Salary | \$42,723.00 | \$47,956.00 |
| Fringe (35%) | \$14,953.05 | \$16,784.60 |
| RCUH Overhead | \$9,228.17 | \$10,358.50 |
| Total per year | \$66,904.22 | \$75,099.10 |
| Total per month | \$5,575.35 | \$6,258.26 |

The cost for four technicians and a supervisor is \$28,559.67/month.

Indirect Costs

Federal Request

The State of Hawai'i, Department of Land and Natural Resources, is proposing a NICRA of 11.32% for FY22.

| Total Project Cost Table | |
|-----------------------------------------------------------|------------------------|
| Source | Amount |
| Costs to be reimbursed with the requested Federal funding | \$ 931,782.91 |
| Costs to be paid by the applicant | \$ 327,383.18 |
| Value of third-party contributions | N/A |
| TOTAL PROJECT COST | \$ 1,259,166.09 |

| Summary of Non-Federal and Federal Funding Sources | |
|-----------------------------------------------------------|---------------|
| Funding Sources | Amount |
| Non-Federal Entities | \$ 327,383.18 |
| Non-Federal Subtotal | \$ 327,383.18 |
| Requested Reclamation Funding | \$ 931,782.91 |

Environmental and Cultural Resources Compliance and Required Permits or Approvals

As stated previously, the State environmental and cultural resources compliance processes have been completed and can be referenced when determining the Federal compliance. No additional permits or approvals are required.

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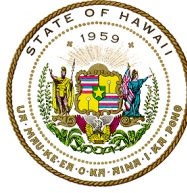
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The Senate

STATE CAPITOL
HONOLULU, HAWAII 96813

October 28, 2021

Bureau of Reclamation
Financial Assistance Operations
P.O. Box 25007, MS 84-27815
Denver, CO 80225

To Whom It May Concern,

I support the “Protecting Forests for Water Supply Sustainability in Kohala, Hawai’i” grant application.

Funding this project would expand the capacity to work across landowner boundaries to protect the watershed forests that my constituents rely upon.

The State has provided funds for watershed fencing in these areas, which will serve as grant match. Fences have been shown to dramatically reduce the spread of Rapid ‘Ohi’a Death, a major disease that threatens Hawaii’s most common tree. In a recent study, suspected ROD tree densities in neighboring areas containing pigs were two to 69 times greater than those found in fenced, pig-free zones.

The project area supplies ditches that are used for Waimea’s municipal and agricultural water supplies. Protecting the forest also is proven to dramatically increase freshwater supplies because the forests collect cloudwater moisture, and improve infiltration rates. The community of Waimea depends on these water sources, which are predicted to become increasingly drought-stricken in future decades.

This project will also provide many additional benefits, including supporting “green” jobs in our rural areas, carbon sequestration, and protection of the unique endangered species and rare ecosystems that exist only in the Kohala mountains.

I am pleased to offer my strong support for this important project.

Sincerely,

Senator Lorraine R. Inouye

Hawaii State Senate District 4 - Hilo, Hamakua, Kohala, Waimea, Waikoloa, Kona
Majority Whip; Chair, Committee on Water and Land; Vice Chair, Committee on Transportation



HOUSE OF REPRESENTATIVES
STATE OF HAWAII
STATE CAPITOL, ROOM 316
415 SOUTH BERETANIA STREET
HONOLULU, HAWAII 96813

October 29, 2021

Bureau of Reclamation
Financial Assistance Operations
P.O. Box 25007, MS 84-27815
Denver, CO 80225

To Whom It May Concern,

I am writing in strong support of the grant application titled, "Protecting Forests for Water Supply Sustainability in Kohala, Hawai'i."

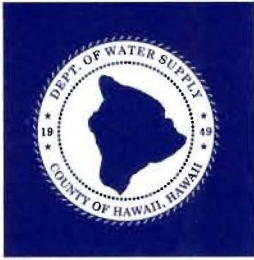
As the State Representative for House District 7, I represent the region of North and South Kohala and North Kona on Hawai'i Island. This project seeks to protect the upland forests in my district, which will improve water recharge and the resiliency of this area to climate change. Protecting these forests also improves carbon sequestration, and provides habitat for many unique and rare plants and wildlife.

Protecting these areas and providing coordination of the watershed partnership is a priority of the Kohala Watershed Partnership Management Plan. This plan was reviewed by the public and approved unanimously by all the members of the watershed partnership. This project will improve collaboration between the partners and jump-start the capacity for the partnership to take on additional projects in Kohala.

Thank you very much for your consideration of this important project.

Sincerely,

Representative David. A. Tarnas
Hawai'i State House of Representatives



DEPARTMENT OF WATER SUPPLY • COUNTY OF HAWAI'I

345 KEKŪANAŌ'A STREET, SUITE 20 • HILO, HAWAI'I 96720
TELEPHONE (808) 961-8050 • FAX (808) 961-8657

November 18, 2021

Bureau of Reclamation
Financial Assistance Operations
P.O. Box 25007, MS 84-27815
Denver, CO 80225

Dear Bureau of Reclamation:

The County of Hawai'i, Department of Water Supply (DWS), supports the "Protecting Forests for Water Supply Sustainability in Kohala, Hawai'i" grant application.

DWS has prioritized the Kohala region as an area where current withdrawals are near current or future sustainable yield limits. DWS has collaborated with the University of Hawai'i, Economic Research Organization, to model the highest priority forests within this region to protect from conversion. This model estimates the amount of fresh water recharge occurring and which areas are most likely to convert to non-native vegetation or barren areas.

This project area is in some of the highest-ranking areas for cost effectiveness, per the model. Almost all the native forests in this area are projected to disappear within the next 35 years if no action is taken to reduce threats. Once these forests are lost, they are impossible to restore back to their original composition, which is a highly efficient water-collecting structure.

Please support this project to improve water supplies in Kohala. We appreciate your consideration; and if there are any questions, please do not hesitate to contact us at (808) 961-8050.

Sincerely yours,

Keith K. Okamoto, P.E.
Manager-Chief Engineer

smc

. . . Water, Our Most Precious Resource . . . Ka Wai A Kāne . . .

The Department of Water Supply is an Equal Opportunity provider and employer.

DAVID Y. IGE
GOVERNOR
STATE OF HAWAII

JOSH GREEN
LT. GOVERNOR
STATE OF HAWAII



WILLIAM J. AILA, JR.
CHAIRMAN
HAWAIIAN HOMES COMMISSION

TYLER I. GOMES
DEPUTY TO THE CHAIRMAN

STATE OF HAWAII
DEPARTMENT OF HAWAIIAN HOME LANDS

P O BOX 1879
HONOLULU, HAWAII 96805

November 19, 2021

Bureau of Reclamation
Financial Assistance Operations
P.O. Box 25007, MS 84-27815
Denver, CO 80225

SUBJECT: Letter of Support for – Protecting Forests for Water Supply Sustainability in Kohala, Hawai'i

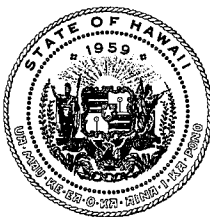
The State of Hawaii, Department of Hawaiian Home Lands (DHHL) supports this grant application by the Department of Land and Natural Resources (DLNR) to provide long-term watershed protection through fencing and feral pig removal, as well as support partnership coordination, outreach, and planning across Kohala Watershed Partnership (KWP) lands. This project directly benefits the Hawaiian Home Land Trust and beneficiary communities in the Waimea Nui area that rely on KWP lands as an important source of their municipal water.

As a KWP Partner, DHHL supports landscape scale watershed and native forest ecosystem protection and management across partnership lands and will directly benefit from increased water quantity and quality in wetland and estuary ecosystems on DHHL lands in Waimanu Valley.

Aloha

William J. Aila, Jr., Chairman
Hawaiian Homes Commission

DAVID Y. IGE
GOVERNOR OF HAWAII



STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
DIVISION OF FORESTRY AND WILDLIFE
1151 PUNCHBOWL STREET, ROOM 325
HONOLULU, HAWAII 96813

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

ROBERT K. MASUDA
FIRST DEPUTY

M. KALEO MANUEL
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAIHOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

November 3, 2021

Bureau of Reclamation
Submitted electronically via Grants.gov

SUBJECT: Official Resolution: Protecting Forests for Water Supply Sustainability in Kohala, Hawai'i Phase 2

This letter certifies that this application has been approved to be submitted on behalf of the Division of Forestry and Wildlife, Department of Land and Natural Resources, State of Hawai'i. As the applicant, the Division of Forestry and Wildlife will work with Reclamation to meet established deadlines for enter into a grant or cooperative agreement. Matching funds proposed have been secured for this project through allocations of State capital improvement project funds and general funds.

For further questions, please contact Emma Yuen, Natural Resources Management Program Specialist at Emma.Yuen@hawaii.gov or (808) 366-4788.

Sincerely,

A handwritten signature in black ink, appearing to read "David G. Smith".

David G. Smith, Administrator
Division of Forestry and Wildlife