



## Planning for the Protection of Watershed Forests in West Maui

WaterSMART Cooperative Watershed Management Program Phase I Grant Application  
State of Hawai'i, Department of Land and Natural Resources Proposal  
Project Manager: Emma Yuen, Native Ecosystems Program Manager  
1151 Punchbowl St. Rm. 325  
Honolulu, HI 96814  
[Emma.Yuen@hawaii.gov](mailto:Emma.Yuen@hawaii.gov)  
(808) 366-4788



*Mauna Kahalawai- The “House of Water” – West Maui Mountains. Photo: Air Maui*

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## Executive Summary

January 14, 2021

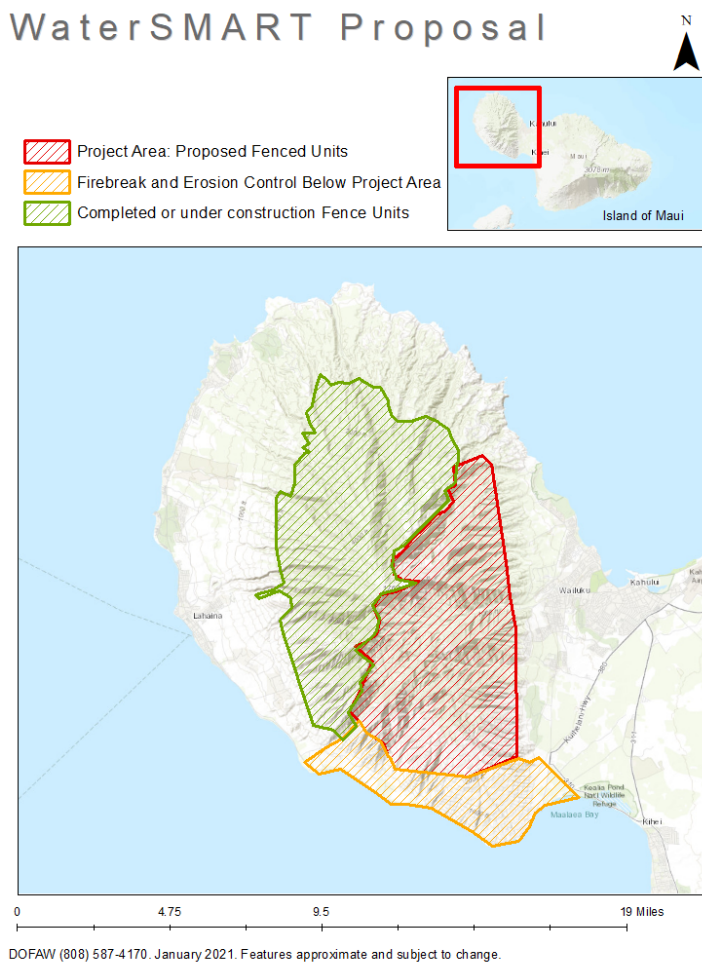
Applicant: State of Hawai‘i, Department of Land and Natural Resources, Division of Forestry and Wildlife

Location: Mauna Kahalawai (West Maui Mountains), County of Maui, State of Hawai‘i

The State of Hawai‘i, Department of Land and Natural Resources will create a detailed native forest protection plan across approximately 20,000 acres on the eastern half of the West Maui Mountains. The Hawaiian name for these mountains is “Kahalawai” meaning “House of Water.” The water from the eastern slopes of the mountain provides a majority of the municipal water supply for the island of Maui, however multiple trends indicate that the aquifer is being depleted,<sup>1</sup> including lowering water levels in wells, increasing chloride contents, and reduced streamflow.<sup>2</sup> Protecting forest watersheds is the most cost effective and efficient way to absorb rainwater and replenish ground water.<sup>3</sup> These forests are threatened by non-native feral pigs, deer and goats, which roam wild and trample and devour vegetation, and spread weeds. The proposed detailed fencing plan will prioritize which tracts of forest are most important to protect from these animals, determine the exact location and feasibility of fence alignments, gain landowner approval, as well as complete environmental compliance to prepare these fences for eventual implementation. Existing partnerships are key to the success of this project. Since 1998, the Mauna Kahalawai Watershed Partnership has united land owners and managers across the mountain with the goal to protect the forests, which, in turn, protects Maui’s fresh water supply.<sup>4</sup> This planning project will benefit from the existing long-standing relationships across multiple landowners and agencies, ensuring that the placement and design of the project are the most effective, and that there will be long-term sustainability to maintain these infrastructure investments.

## Project Location

The project is located on the island of Maui (USGS Hydrologic Unit 20020000), in the island's western mountain range. While the Mauna Kahaalawai Watershed Partnership has completed wide-scale fencing along the western half of the mountain (see green hatched areas in figure below), the approximately 20,000-acre eastern half has largely been unprotected and is the target of this project (see red hatched areas). The eastern half is of particular importance for water supplies as that half provides the municipal water for a majority of Maui. This windward-facing side of the mountain is dissected by a series of spectacular valleys. After conducting GIS analyses of these valleys to identify where potential fencelines could be sited, and where the highest priority places to protect exist, a major effort of this plan will be aerial and on-the-ground visits to these potential locations to ensure their feasibility.



The watershed partnership has been seeking to build a fence that circumnavigates the mountain, providing full protection from all hooved animals, including deer, which requires the

construction of 8' tall fences. These fences target protection of the remaining native forest, which occurs in the higher elevation tracts of the mountain. This project complements work done in the lower portions of the watershed (shown in orange) where a network of firebreaks and other erosion-control projects are already occurring. This proposed plan will be part of a comprehensive effort that manages multiple watersheds from the top of the mountain to the sea.

## Technical project description

### **Applicant Category:** Existing Watershed Group

The Department of Land and Natural Resources (DLNR), Division of Forestry and Wildlife, is applying as a partner of the Mauna Kahalawai Watershed Partnership. This innovative partnership was established in 1998 and consists of 12 major landowners and land managers of Mauna Kahalawai (West Maui mountains). Watershed alliances are voluntary organizations which pool resources and seek 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.

Members of the partnership pool funding for a full-time, 12-person natural resource team led by a watershed coordinator. Collectively, this partnership has been able to fence and protect almost 30,000 acres, and has conducted large invasive plant removal, wildfire prevention, and outplanting projects to improve forest health. The long-term nature of the partnership, as well as its impressive accomplishments, provide a promising basis for its capacity to protect the remaining half of the mountain. These actions are guided by management plans that are approved by all members of the partnership. The first plan was drafted in 1999 and contained conceptual goals and a coarse identification of natural resource priorities. A management plan update was completed in 2013 which provided a summary of the accomplishments, a much more refined identification of natural resource priorities, and a goal to fence and protect the remaining south and east slopes of the mountain. While conceptual agreement exists for this fencing work, this proposal would fund the technical scoping and prioritization of the fencing strategy.

### **Eligibility of Applicant**

The State of Hawai'i is a listed eligible applicant. The State of Hawai'i is able to significantly affect the quality and quantity of water in this watershed by improving watershed forest health. The State of Hawai'i is a member in the existing watershed group of the Mauna Kahalawai Watershed Partnership, which is a grassroots, non-regulatory legal entity.

### **Goals**

A central action that can be taken to increase the water supplies of this region is to maintain the remaining native forest on the mountain.<sup>5</sup> 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.<sup>6</sup> 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 a native forests increases water infiltration rates, furthering recharge compared to barren areas which can infiltrate up to 15 times

slower than forests, greatly increasing runoff and erosion.<sup>7</sup> 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.<sup>8</sup> For example, in East Hawai'i invasive plants have already reduced estimated groundwater recharge by 85 million gallons a day.<sup>9</sup> *P. cattleianum* is largely spread by feral pigs.



*Native forest in West Maui captures passing fog and recharges the aquifer.*



*Native forest of West Maui resembles a giant sponge, with mosses, shrubs, and ferns absorbing water.*

Fencing these forests has been a proven strategy to provide long-term protection for these forests.<sup>10</sup> Native Hawaiian forests have evolved 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.<sup>11</sup> Less than half of Hawaii's original forest remains.<sup>12</sup> Not only do hooved animals devour, uproot, and trample forests, they spread invasive weeds and are now known to spread an alarming fungal disease called rapid 'ōhi'a death.<sup>13</sup> This disease has caused the death of over a million 'ōhi'a trees, which are the keystone tree species in native forests.

Without fences, it is not feasible to continuously reduce animal populations.<sup>14</sup> Their populations can quickly rebound, even after being reduced by 40%<sup>15</sup>-70%.<sup>16</sup> Specifications for hooved animal removal projects have been approved by the DLNR<sup>17</sup> which will guide fence construction, ongoing maintenance, and hooved animal removal.

Statewide, approximately 270,000 acres are fenced from hooved animals. The upland northern and western portions of the Kahalawai mountain are fenced and protected, or have fences under construction. This project will create a fencing plan for the remaining slopes of the mountain.



*Feral pigs uproot, eat, and trample native Hawaiian forests statewide. This area was formerly an intact native rainforest, but now has become a pig wallow. Kohala, Hawai'i.*



*This fence line, which runs diagonally across the photo, allows a fenced forest to survive. The unfenced area has been decimated by goats. Makaha, O'ahu.*

## **Approach**

Overall, the project contains three main phases: 1) analyses and prioritization, 2) ground-truthing, and 3) compliance. The first phase involves GIS analyses and a literature review, as well as meetings with stakeholders and the partnership members to prioritize areas for protection. The ground-truthing phase includes the design and engineering of the actual fence lines. The compliance phase includes archeological field surveys as well as developing Right-Of-Entry documents with Wailuku Water Company, the main private landowner within the target area, as well as other landowners, as needed.

These proposed activities fall into the following categories of Task Areas:

### ***Task B – Watershed Restoration Planning:***

- *Conducting mapping and other technical analyses, including obtaining data, performing modeling, or developing goals and benchmarks for the restoration plan.*

This project will analyze GIS data and other sources of natural resource data to identify priorities for protection. A list of those data sources is in section B2.

### ***Task C -Watershed Management Project Design:***

- *Completing site-specific project design and engineering.*

This project will rely on analysis of aerial imagery and topographic data, as well as aerial reconnaissance and ground site visits to determine the design and location of fences. In addition to determining the total length of fence needed, these surveys will also determine what types of fence will be needed (since different fence types are needed for different topographic features and slopes). This project will also design other factors, such as how many stream crossings will be needed, and locations where step overs and gates may be necessary. There will also be other reconnaissance targets – such as viewing areas where hooved animals are likely to congregate and where trapping efforts should be focused, as well as sites where helicopter landing zones and camps could be located.

- *Developing project timelines and milestones.*

This plan will also create timelines and milestones for the fence construction – identifying specific units that will be enclosed in a sequential manner. This will enable the future implementation phase of the project to be divided into manageable sections. This will be helpful for the management of the individual fence units.

- *Researching what type of site-specific environmental compliance will be necessary to implement a project, particularly if the applicant intends to seek Federal funding to implement the project in the future (e.g., under Phase II of this program).*

The main compliance task will be consultation with the State Historic Preservation Division to determine what archeological surveys will be required once the fence lines have been delineated.



A small portion of the budget includes funding for the archeological survey. The other compliance requirements are straightforward for these fences.

## Evaluation criteria

### ***E.1.1. Evaluation Criterion A— Watershed Group Diversity and Geographic Scope***

The partners that represent this application have a wide diversity of interests:

#### Governmental agencies:

*State of Hawaii, Department of Land and Natural Resources* (applicant): The State provides funding – both for the watershed partnership, as well as its own natural resource management staff - to protect forested watersheds, as well as streams and marine resources. The State is also responsible for monitoring and managing the groundwater withdrawals.

*County of Maui, Department of Water Supply*: This agency provides funding for the watershed partnership, monitors water levels, and manages multiple wells and water diversions in the project area.

*U.S. Fish and Wildlife Service*: Over a hundred listed endangered species exist across the mountain, which is largely designated critical habitat for these species. A vast majority of these species are plants, whose main threat is hooved animals. The listed animal species are dependent on a healthy native forest for habitat. This agency provides funding for habitat protection and develops species recovery plans.

*University of Hawai‘i*: Staff of the watershed partnership are hired by the University to provide research and monitoring of on-the-ground management actions. Much of the funds requested will go to the Research Corporation of the University of Hawai‘i to fund the staff time needed to conduct the analyses, stakeholder meetings, surveys, and reporting of this project.

#### Private Partners:

*Wailuku Water Company, LLC*: A majority of the project area is owned by this private company, which supplies water to various municipal and agricultural users. A letter of support from this landowner is attached, indicating their willingness to advance this project. The DLNR will develop a Right-Of-Entry agreement to fence portions of their lands.

*Hanaula Ranch, LLC*: Portions of the project area are also owned by this company. The DLNR will develop a Right-Of-Entry agreement to fence portions of their lands.

Other private entities that are part of the partnership include:

*Kamehameha Schools*: This land estate was established in 1887 by the will of Princess Bernice Pauahi Pahi Bishop, and income from the trust operates an educational program for students. Their mission also includes protecting natural resources, which are inextricably linked to the Hawaiian culture.

*Makila Land Company, L.L.C.:* This company owns conservation, agriculture, cattle ranching, recreation, and residential lands.

*Maui Land & Pineapple Company, Inc.:* This company owns conservation lands, and hires a natural resource crew to manage Pu‘u Kukui - the largest private nature preserve in the State. In their lowland areas, they operate agricultural lands and resorts.

*The Nature Conservancy of Hawai‘i:* This non-profit manages a nature preserve on the western half of the partnership, and owns and manages the conservation easement for the Pu‘u Kukui Preserve. The Nature Conservancy is also active in marine monitoring and protection projects, including the working in the coral reefs that the target watersheds drain into.

Other smaller landowners in the partnership include the General Finance Group, Inc., Ka‘anapali Land Management Corporation, and the Kahoma Land Company, L.L.C.

All of these partners collaborate to plan for management of these lands, which includes most of the remaining undeveloped lands of conservation value in Mauna Kahalawai.

While not official members of the partnership, this proposal will also involve other stakeholders:

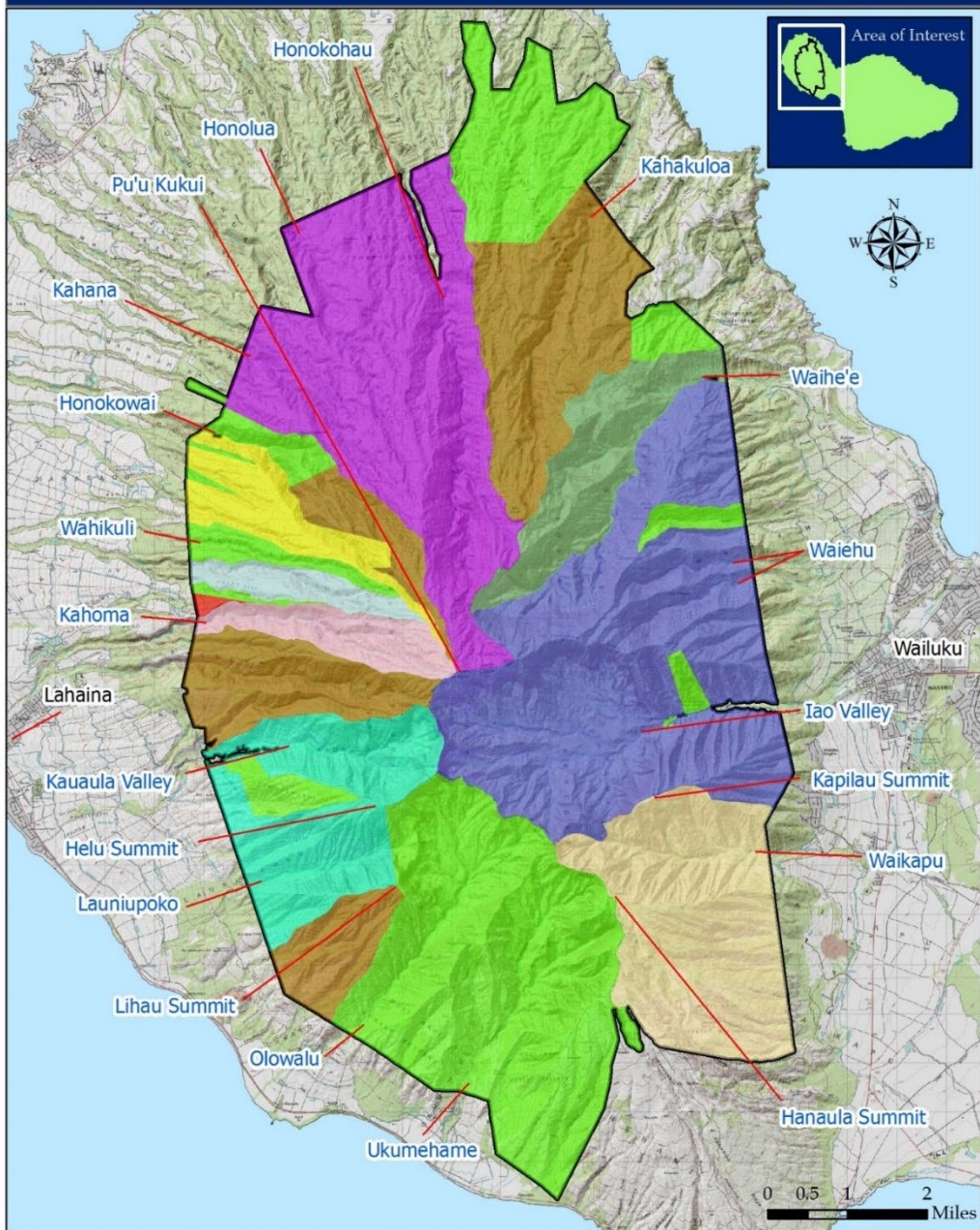
*State of Hawai‘i, Department of Health:* Operates water quality monitoring stations, which will provide background data to prioritize water bodies, as well as show potential changes to turbidity from the protection efforts of fencing in future phases of this project.

*Maui Nui Marine Resources Council:* This non-profit conducts multiple erosion and marine pollutant reduction projects in the lower sections of the watersheds that this proposal targets for protection. This organization also conducts a water quality monitoring program that collaborates with governmental organizations to create standardized, regularly scheduled monitoring. This will inform the baseline for this project, and future tests will determine whether the water quality improves after hooved animals are removed.

*Central Maui Soil & Water Conservation District:* The Soil & Water Conservation Districts work with agricultural producers to develop conservation plans. Their work in the agricultural lowlands will reduce erosion and complement the priority erosion prevention work in the uplands which is the target of this project. These agricultural producers will also benefit from a healthier forest that provides a more secure water supply.

The partners involved in this proposal will benefit the full extent of multiple watersheds, including those that manage upland conservation areas, lowland residential, urban, and agricultural areas, as well as the marine areas.

# Mauna Kahalawai Watershed Partnership



Map Created by: Jill Labram, MKWP, August 2020

- Dept. of Water Supply (Maui County)
  - Hanaula Ranch, LLC
  - Kaanapali Land Mgmt. Corp./The Nature Conservancy
  - Kahoma Land Company, LLC
  - Kahoma Land Holdings, LLC
  - Kamehameha Schools
  - Makila Land Company, LLC
  - Maui Land & Pineapple Co., Inc.
  - State of Hawaii - Natural Area Reserves
  - State of Hawaii - Forest Reserves
  - Waikapu Water Company, LLC
- Associate Partners**  
 US Fish and Wildlife Service

***E.1.2. Evaluation Criterion B — Addressing Critical Watershed Needs***  
***B1. Critical Watershed Needs or Issues.***



*A view of the project area looking east. A major task of this project will be to identify feasible routes in this incredibly rugged terrain. Photo: Mauna Kahalawai Watershed Partnership.*

The proposed project is highly strategic for watershed protection and addresses the top priority issue for many needs including ecological resiliency, water shortages, flooding, water supplies, endangered species, conflicts over water supply, as well as human health issues from degraded water quality.

The project includes some of the highest rainfall sections of the mountain, as well as an entire groundwater management area, where threats of water scarcity have led to State designation that further restricts permitting water withdrawals.<sup>18</sup> Underscoring the urgency and scarcity of water is the decades of litigation and controversy regarding the allocation of these permits.<sup>19</sup> The legal and regulatory battles over water allocation are only set to intensify as climate change is predicted to bring hotter and drier conditions to this region.<sup>20</sup>

Most of Maui's municipal water comes from this project area, including the main town of Maui - Kahului. This target aquifer also services agricultural uses critical for Maui's current and future economic self-sufficiency and food sustainability. A network of irrigation ditches from this area drains from these watersheds and feeds agricultural lowlands below. As the central plain of Maui is predicted in all climate scenarios to become hotter and drier,<sup>21</sup> this vital agricultural region will depend even more heavily on the availability of water coming from the mountains.

This project location is also strategic because it includes almost the entire remaining extent of unprotected native forest in the mountain. Protecting remaining native forest from loss is highly cost-effective compared with restoring areas after degradation. Protection – and restoration – of native forest is not possible in the presence of hooved animals such as goats, and pigs, which roam wild across this mountain range.<sup>22</sup>

Many additional benefits will occur due to the location of this project. This area contains dozens of Federally listed endangered plant and animal species, some of which are only found in this region. The Fish and Wildlife Service has drafted Recovery Plans for many of these endangered species, which consistently rank hooved animal removal as a top priority for the delisting of these species. Just in the past month, a new species of flowering plant was described in the southwest region of this mountain – and only a single individual plant is known to exist in the wild.<sup>23</sup>



*Cyanea heluensis* is a new species described in 2020 known only from the Kahalawai mountains. Only a single plant is known.

Healthy watersheds in this region are also important for preventing widespread erosion, which damages important coral reefs downstream. The coastal areas that receive the runoff from these watersheds have been prioritized by the National Fish and Wildlife Foundation as well as the National Oceanic and Atmospheric Administration as focal areas for reef protection and restoration.<sup>24</sup> Land-based sources of sediment pollution have been prioritized and the main threat to these reefs.<sup>25</sup> When coral reefs decline, so does the main economic driver of Maui: tourism. Marine tourism is estimated to account for \$800 million per year for the State's economy.<sup>26</sup>

The same sedimentation that damages coral reef health also is a threat to human health. Statewide, 85% of waterbodies sampled by the Department of Health are classified as impaired, and turbidity was by far the largest cause of the substandard sampling results.<sup>27</sup> Erosion from barren slopes is a main cause of turbidity. In addition to causing forest loss, the feral hooved animals targeted in this proposal also spread lethal diseases, such as non-tuberculous mycobacterial (NTM) lung disease and leptospirosis.<sup>28</sup> Hawaii has the highest prevalence of age-

adjusted NTM lung disease mortality in the U.S.<sup>29</sup> Pig wastes also spread fecal bacteria (enterococcus).<sup>30</sup> While the State Department of Health has not yet set Total Daily Maximum Load limits for these waters, it is anticipated that the streams within the project area could eventually have TMDLs set due to their consistently impaired status. Thus, the Department of Health has listed multiple streams within this project area as priorities for TMDL designation.<sup>31</sup>



*The same bay, before and after a flood. Large portions of the runoff comes from barren areas caused by hooved animals. Honolulu, West Maui (Kahalawai).*








Finally, these forests are revered for their spiritual and material importance to the Hawaiian culture.<sup>32</sup> Ancient Hawaiians understood well that their source of water depended on the forest – as evidenced by the saying “hahai nō ka ua I ka ulu la’au” (the rain follows the forest).

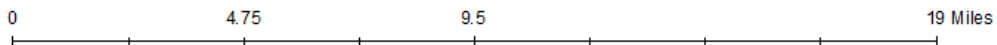
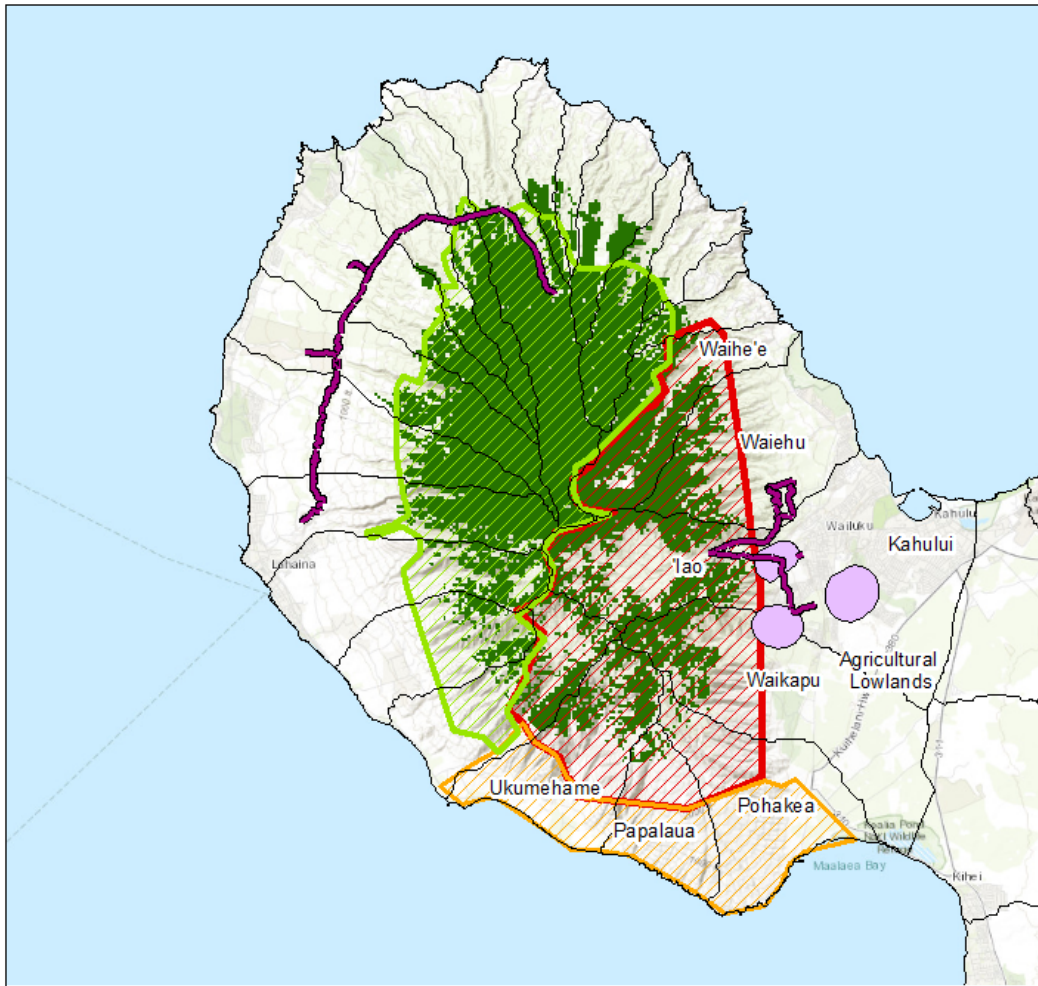


*The project area has difficult and steep terrain. Locating feasible fence routes will require site visits and helicopter transport. Waihe'e Valley, West Maui (Kahalawai).*

# WaterSMART Proposal



-  Agricultural Irrigation Systems
-  Major Municipal Wells
-  Watersheds
-  Project Area: Proposed Fenced Units
-  Firebreak and Erosion Control Below Project Area
-  Completed or under construction Fence Units
-  Native Forest Extent



DOFAW (808) 587-4170. January 2021. Features approximate and subject to change.

*The proposed fences will enclose the remaining unprotected native forests of the mountains that supply water for Maui's main municipal wells and agricultural water systems. This will benefit many watersheds –Waihe'e, Waiehu, 'Iao, Waikapu, Pohakea, Papalaua, and Ukumehame.*

## **B2. Developing Strategies to Address Critical Watershed Needs or Issues**

### **Task B -Watershed Restoration Planning**

The watershed partnership will develop a fencing plan which will address critical watershed issues. The process begins with identifying the highest priority areas, which will consider the following inputs from data and stakeholders, in order to prioritize issues:

1. Water recharge: the U.S. Geological Survey has provided spatial data on recharge areas, which are created using an equation considering rainfall, evapotranspiration, runoff, landcovers, and other factors.<sup>33</sup>
2. Water quality: Data of impaired water bodies from the Department of Health and other partners such as Maui Nui Marine Resource Council, as well as priority reefs identified by the National Oceanic and Atmospheric Administration and the National Fish and Wildlife Foundation will be considered.
3. Native forest and endangered species habitats: This project will consider data from comprehensive landcover assessments identifying where native forest exists, as well as endangered species locations from U.S. Fish and Wildlife Service, the University of Hawai'i, Bishop Museum, and the DLNR. Site visits will also be used to confirm these resource values.
4. Feasibility/Cost Effectiveness: A major effort of the project, which will be explained further in "Task C," will be to identify which areas are feasible. This will largely be conducted via site visits. Cost effectiveness will be measured by acres protected vs miles of fence needs for each unit, as well as other factors such as terrain and remoteness that will also influence cost estimates. DLNR will provide data on costs for materials and labor so that budgets can be proposed.

These considerations will be gathered through compiling GIS data, conducting literature research, interviewing experts in government, research organizations, and non-profit partners, as well as site visits with expert fencers and natural resource managers. After this process, these factors will be compiled into a report which will prioritize the various potential fencing locations. This report will be then presented to the members of the watershed partnership for their review and recommendations.

No conflicts are anticipated, as the Watershed Partnership has already received the conceptual approval from this protection effort during the 2013 management plan update. If there are conflicts, the landowner of whichever parcel is the subject of controversy will have the final decision-making authority. Conflicts will also be minimized by the execution of Right-Of-Entry agreements that formalize long-term relationships with landowners whose properties will be affected.

This proposed plan builds on previous efforts. As mentioned prior, the Watershed Partnership has undergone multiple plans, however they do not provide the prioritization and feasibility studies that are needed. These plans have demonstrated the past accomplishments of the partnership in protecting approximately half of the mountain uplands, and provide a track record of success. These plans have also already established that hooved animal removal in the uplands is the first step towards protection of water resources and other major values. This



conclusion has also been reached by many other organizations managing Hawaii's natural resources. The Hawai'i Conservation Alliance,<sup>34</sup> a collaboration of 26 major conservation leaders representing government, cultural, educational and non-profit organizations, has published a white paper identifying hooved animal removal as the first step toward native Hawaiian forest protection.<sup>35</sup>

### **Task C -Watershed Management Project Design**

This task comprises the main focus of this plan: comprehensively designing a fencing and hooved animal removal project.

The project area contains rugged terrain of convoluted valleys, with multiple streams. Each stream crossing represents a challenge for the fence design as flash floods often threaten to blow apart these fences. Instead, expert fencers try to find areas with waterfalls, deep pools, or other natural barriers that can be used to exclude hooved animals. Finding these natural barriers is a main task that will dictate where the fence will be feasible to construct. The staff will analyze geospatial aerial imagery data and topographic maps to identify where barriers will exist, and then visit those potential sites via field trips and overflights.

This project will also involve expert fencers who will design the stream crossings and other technical aspects of fencing in the difficult terrain.

Staff will also need to locate ridges and contour areas that provide a feasible place to construct and maintain fences. These will also be scoped via imagery, topographic maps, and site visits. As natural resource managers visit these potential fence lines, they will be conducting botanical surveys to ensure no rare or endangered species will be impacted by construction, and to re-locate the fence line if these resources are found.

This plan will also create timelines and milestones for the fence construction – identifying specific units that will be enclosed in a sequential manner. This will enable the future implementation phase of the project to be divided. This will be helpful for the hooved animal removal of the individual fence units.

Once the fence plan has been drafted, the DLNR will conduct environmental compliance. This involves consulting with the State Historic Preservation Division which will determine whether archeological site inspections will be needed. It is anticipated that there will be inspections required, so an item in the budget includes funds for contracting a qualified archeologist to conduct those inspections. If a large portion of the project requires those inspections, additional funding beyond what is in the budget may be required, and the DLNR will fundraise for those inspections.

The DLNR will also apply for approval for the other required compliance requirements, such as gaining a Conservation District Use Permit (pursuant to Chapter 183C, Hawai'i Revised Statutes), and completing an environmental review to satisfy Ch. 343, Hawai'i Revised Statutes. No Federal funding has been identified, however if a Federal agency provides funding for the future implementation phase of fence construction, the DLNR has experience working with multiple agencies to complete Federal compliance.

***Evaluation Criterion C— Implementation and Results***

**C1—Project Implementation**

A scope of work for this project is outlined below:

**TABLE 1. FEDERAL FUND REQUEST – SCOPE OF WORK, COST, TIMELINES**

<b>Major Tasks</b>	<b>Sub Objective</b>	<b>Milestones</b>	<b>Start Date</b>	<b>End Date</b>	<b>Hours</b>	<b>Cost</b>
1. Cost Analysis	Review recent contracts statewide for fence construction and material costs.	Estimated costs included in the plan	10/1/2021	12/1/2021	40	\$ 1,956.34
2. Project Prioritization	Conduct GIS analysis of which fence units are highest priority based on various factors listed in section B2.	Maps and report of priorities completed for plan	10/1/2021	6/1/2022	80	\$ 3,912.69
3. Conduct meetings to gain input from stakeholders and experts on the most important management actions.	Fence construction discussions will occur with the members of the Mauna Kahalawai Watershed Partnership.	Multiple meetings with partnership to provide updates and gain recommendations as project is developed	10/1/2021	9/30/2023	80	\$ 3,912.69
4. Conduct on-the-ground scoping to design and fence lines	Visit areas identifying by GIS analysis to confirm they are feasible, flag locations, and conduct surveys to confirm no endangered species will be impacted.	An estimated 18 miles of potential fence line will be scoped	6/1/2022	7/1/2023	1,327	\$ 64,901.74

5. Coordinate landowner approvals	Draft, negotiate, and arrange for signatures of a legal instrument providing fence construction access.	Executed Right-Of-Entry with Wailuku Water Company and other landowners to allow fence construction	1/1/2023	9/30/2023	5	\$ 244.54
6. Develop and communicate project timelines and milestones	Write a report that compiles recommendations, prioritization, and reconnaissance findings.	Finalize an addendum to the watershed partnership's management plan that includes specific fence lines	1/1/2023	9/30/2023	40	\$ 1,956.34
7. Aerial surveys and transport	Visit remote locations via helicopter. 5 hours at \$1,025 per hour	Site visits completed	6/1/2022	7/1/2023	5	\$ 5,125.00
8. Contract archaeologists	Conduct literature reviews and field inspections of proposed fence lines.	Archeological report submitted to the State Historical Preservation Division to comply with requirements	1/1/2023	9/30/2023	n/a	\$ 10,000.00
9. Indirect charge	8.57% of direct costs	n/a	n/a	n/a	n/a	\$ 7,885.20
					TOTAL	\$ 99,894.55

*The costs and hours of the first 6 items of Table 1 total approximately 4% of the salary, fringe, and related personnel costs for 12 staff over the course of 2 years.*

**TABLE 2. APPLICANT CONTRIBUTION – SCOPE OF WORK, TIMELINES**

Major Tasks	Sub Objective	Milestones	Start Date	End Date	Hours
Finalize Right-of-Entry agreements	Liaison with Attorney General to finalize signatures	Executed Right-Of-Entry with private landowners to allow fence construction	1/1/2023	9/30/2023	10

Reporting	Compile accomplishment data	Reports submitted by deadlines	10/1/2021	9/30/2023	20
Managing archeological contract	Develop scope of work and oversee progress	Archaeological field inspection report completed	1/1/2023	9/30/2023	20
Managing other procurement	Developing purchase orders	Executed Purchase Orders and final invoices paid	10/1/2021	9/30/2023	31
Providing technical support	Attending meetings and providing recommendations	Documents contain DLNR data and recommendations	10/1/2021	9/30/2023	50
					131 Hours

*The Project Manager is a State of Hawai‘i civil service employee and is not seeking Federal funding from this grant. Table 2 demonstrates the additional contribution that the applicant will provide to complete this project.*

## **C2—Building on Relevant Federal, State, or Regional Planning Efforts**

The proposed activities of planning for the fencing and hooved animal removal in this region complements the following goals:

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.<sup>36</sup>
2. Fish and Wildlife Service Recovery Plans: the recovery plans for multiple endangered species that exist in the project area prioritize hooved animal removal.<sup>37</sup>
3. Hawai‘i State Water Resource Protection Plan: this plan prioritizes native forest protection for water recharge.<sup>38</sup>
4. Ocean Resources Management Plan: this plan prioritized hooved animal removal and native forest protection for erosion reduction targets.<sup>39</sup>
5. Hawai‘i Drought Plan: This plan prioritizes hooved animal removal and native forest protection for securing water supplies.<sup>40</sup>
6. Hawai‘i Forest Action Plan: This plan prioritizes hooved animal removal and native forest protection for securing water supplies and many other benefits.<sup>41</sup>
7. Hawai‘i State Wildlife Action Plan: This plan identifies multiple endangered species that exist in the project area and prioritizes hooved animal removal.<sup>42</sup>
8. County of Maui Island Water Use & Development Plan: This plan prioritizes watershed forest protection and associated actions to maintain water supplies.<sup>43</sup>
9. Department of Health, Non Point Source Management Plan: This plan prioritizes hooved animal removal to reduce sedimentation and pollution of animal wastes into waterways.<sup>44</sup>

## ***Evaluation Criterion D— Department of the Interior and Bureau of Reclamation Priorities***

*Utilize science to identify best practices to manage land and water resources and adapt to changes in the environment;*

This project will draw on scientific data derived from the U.S. Geological Survey (recharge and landcover), Department of Health (water quality monitoring), and the U.S. Fish and Wildlife Service (rare species location and biology) to identify priorities and best practices.

*Review DOI water storage, transportation, and distribution systems to identify opportunities to resolve conflicts and expand capacity;*

This project will draw on scientific data derived from the U.S. Geological Survey (recharge and landcover), to design a project that will significantly improve the watershed health and secure water supplies. This will benefit the many conflicting constituents who seek the water supplied by the mountain forests.

*Foster relationships with conservation organizations advocating for balanced stewardship and use of public lands;*

This project will include multiple organizations that promote both forest conservation as well as improvement of marine waters. Improving water quality will make ocean recreation safer and more enjoyable.

*Restoring trust with local communities*

*Expand the lines of communication with Governors, state natural resource offices, Fish and Wildlife offices, water authorities, county commissioners, Tribes, and local communities.*

The plans will be reviewed during meetings and other communication with State natural resource offices, the U.S. Fish and Wildlife Service, and the County Department of Water Supply. It also will be reviewed by non-profit groups such as The Nature Conservancy of Hawai‘i and other landowners in the partnership.

*Modernizing our infrastructure*

*Remove impediments to infrastructure development and facilitate private sector efforts to construct infrastructure projects serving American needs;*

This plan will remove a major impediment to infrastructure development, which is the lack of specific plans and cost data. With this proposed plan, the infrastructure will be “shovel ready” which will help fundraising efforts for the implementation of the fences.

*Bureau of Reclamation Priorities*

*Increase Water Supplies, Storage, and Reliability under WIIN and other Authorities to Benefit Farms, Families, Businesses, and Fish and Wildlife*

This project is a main strategy to improve water supplies and reliability, which will be used to benefit agricultural, industrial, and municipal uses, as well as improve habitat for fish and other wildlife that rely on these streams and forests.

*Streamline Regulatory Processes and Remove Unnecessary Burdens to Provide More Water and Power Supply Reliability*

This project provides funding for archeological surveys, which streamline the regulatory process for this water-producing project.

*Leverage Science and Technology to Improve Water Supply*

This project will use various scientific studies produced by Federal and State agencies to prioritize project locations for water supply improvements.

*Address Ongoing Drought*

The project location is currently in a period of extreme drought.<sup>45</sup> These conditions are anticipated to be exacerbated by climate change. Drought is already limiting the amount of agricultural uses in this region. This project will improve water supplies.

*Improve Water Supplies for Tribal and Rural Communities*

Groups representing native Hawaiian, and their ability to conduct traditional and customary practices, have organized to stake claims for more water in the region. These have resulted in decades of legal battles over water withdrawals and diversions. This project would increase water supplies for all users, including rural communities dominated by native Hawaiian residents.

## Project Budget

### Budget Proposal

**TABLE 3. FEDERAL FUND REQUEST – BUDGET PROPOSAL**

Budget Item Description	Computation		Quantity Type	Total cost
	\$/Unit	Quantity		
Salaries and Wages	Salary per year	% of time on grant	Years	
Program Manager - Christopher Brosius	\$ 101,590	4%	2	\$ 8,127.20
Natural Resources Operations Manager	\$ 76,227	4%	2	\$ 6,098.16
Program Associate	\$ 68,700	4%	2	\$ 5,496.00
Natural Resource Management (NRM) Specialist	\$ 67,711	4%	2	\$ 5,416.88
NRM Technician	\$ 59,233	4%	2	\$ 4,738.64
NRM Specialist	\$ 55,863	4%	2	\$ 4,469.04
Field Assistant II	\$ 52,021	4%	2	\$ 4,161.68
Field Assistant II	\$ 47,880	4%	2	\$ 3,830.40
Field Assistant II	\$ 38,099	4%	2	\$ 3,047.92
Field Assistant I	\$ 35,946	4%	2	\$ 2,875.68
Field Assistant I	\$ 34,398	4%	2	\$ 2,751.84

Field Assistant I	\$	34,398	4%	2	\$	2,751.84
<b>Fringe Benefits</b>						
Full-Time Employees	% of salary		30%	n/a	\$	16,129.58
<b>Other Salary Costs</b>						
RCUH Indirect Charge	% of salary and fringe		10%	n/a	\$	6,989.49
<b>Contractual/Construction</b>						
Helicopter services	\$	1,025	5	hours	\$	5,125.00
Archeological Services	\$	5,000	2	miles	\$	10,000.00
<b>Total Direct Costs</b>					\$	92,009.35
<b>Indirect Costs</b>						
NICRA	8.57%			direct charges	\$	7,885.20
<b>Total Estimated Project Costs</b>					\$	99,894.55

**TABLE 4. OVERALL PROJECT BUDGET**

Total Project Cost Table	
Source	Amount
Costs to be reimbursed with the requested Federal funding	\$ 99,894.55
Costs to be paid by the applicant	\$0.00
Value of third-party contributions	\$0.00
<b>TOTAL PROJECT COST</b>	<b>\$ 99,894.55</b>

## Budget Narrative

### Salaries and Fringe

#### *Federal Request*

A projected 4% of 12 staff's time over the course of two years will be spent on the tasks outlined in Table 1. Table 3 lists the per-staff salaries and positions. This represents a total of approximately 1,572 hours total (or approximately 131 hours per person). This will fund the watershed partnership staff, who are employees of the Research Corporation of Hawai'i (RCUH). The fringe rate is approximately 30%. RCUH also charges an indirect cost of approximately 10% on salaries and fringe. The total to be spent on salaries and fringe is \$76,884.35. It is anticipated that this cost will be encumbered on 10/1/2021 and be invoiced monthly in even intervals until the project ends 2 years later on 9/30/2023. This expenditure will benefit the project by providing the labor to implement the deliverables listed in Table 1.

**TABLE 5. STAFF TASKS**

Staff	Task Item (Refer to Table 1)
Program Manager - Christopher Brosius	1, 2, 3, 4, 5, 6
Natural Resources Operations Manager	2, 4, 6
Program Associate	3
Natural Resource Management (NRM) Specialist	2, 4, 6
NRM Technician	4, 6
NRM Specialist	4, 6
Field Assistant II	4, 6
Field Assistant II	4, 6
Field Assistant II	4, 6
Field Assistant I	4, 6
Field Assistant I	4, 6
Field Assistant I	4, 6

*Additional tasks will be completed by the Project Manager, as shown in Table 2.*

**Contractual**

*Federal Request*

Helicopter time – helicopter transport will be required for staff to access the project sites and conduct aerial surveys of potential fence lines. Currently, the State’s negotiated helicopter rate per hour is \$1,025. This cost is anticipated to be incurred throughout the reconnaissance phase of the project beginning 6/1/22 and ending 7/1/2023. This will be essential for the project as certain areas are so steep and rugged that they cannot be accessed on foot.

Archaeological services – An anticipated 2 miles of fence line will require surveys due to potential historical sites. Previous jobs have cost approximately \$5,000 per mile surveyed. However, this cost is highly variable based on accessibility. Additionally, the final fence alignment and consultation with the State Historical Preservation Division may result in additional unforeseen areas requiring survey.

**Environmental and Regulatory Compliance Costs**

*Federal Request*

The proposal only includes site visits so is not anticipated to require complex or time-consuming compliance with Federal regulations.

**Indirect Costs**

*Federal Request*

The State of Hawai’i, Department of Land and Natural Resources, has a NICRA of 8.57% for FY21.



## Environmental and Cultural Resources Compliance

The project will occur in offices/meeting settings, and site visits will consist of hiking through remote locations and helicopter overflights.

The proposed project will not impact the surrounding environment, and will not have any earth-disturbing work or other impacts.

There is designated critical habitat for multiple species, however these species will not be affected by any activities of the proposed project.

No wetlands or navigable waters as defined by CWA “Waters of the United States” are within this proposal.

No water delivery system will be constructed.

No irrigation systems will be modified.

This project does not include any modifications to irrigation districts.

No known archeological sites are in the proposed project area, and no additional compliance is necessary for this planning project as it will not result in any ground-disturbing activities. The project does contain an element to conduct archeological surveys in preparation for the implementation phase of the fence construction. That implementation phase is not part of this grant application.

## Required Permits or Approvals, Letters of Support, and Official Resolution

No permits or approvals are anticipated to be needed to implement this planning project. The applicant has contacted the Bureau of Reclamation’s Lower Colorado Field Basin office to confirm that the regulatory compliance for the planning proposed in this project (meetings, GIS analysis, and site visits) would be straightforward and able to be done quickly.<sup>46</sup>

Letters of support and official resolution are attached below.

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- <sup>16</sup> Dzieciolowski, R. M., C. M. H. Clarke, C. M. Frampton. 1992. Reproductive Characteristics of Feral Hogs in New Zealand. *Acta Theriologica* 37:259-270.
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- <sup>18</sup> See <https://dlnr.hawaii.gov/cwrm/groundwater/gwma/>
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<https://www.mauinews.com/news/local-news/2019/10/hundreds-rally-for-water-rights-as-case-draws-to-close/>
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- <sup>46</sup> Phone communication with Ken Isakson on January 13, 2021, Lower Colorado Basin Office of the Bureau of Reclamation.

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  
KAHOOLAWE ISLAND RESERVE COMMISSION  
LAND  
STATE PARKS

Jan 12, 2021

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

SUBJECT: Official Resolution: Planning for the Protection of Watershed Forests in West Maui

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 entering into a grant or cooperative agreement.

For further questions, please contact Emma Yuen, Native Ecosystem Program Manager at [Emma.Yuen@hawaii.gov](mailto:Emma.Yuen@hawaii.gov) or (808) 366-4788.

Sincerely,

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

David G. Smith, Administrator  
Division of Forestry and Wildlife



**WAILUKU WATER CO.**

**WAIKAPU IAO WAIHEHU WAIHEE**

*Na Wai Eha*

January 13, 2021

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

**SUBJECT: Letter of Support for “Planning for the Protection of Watershed Forests in West Maui”, Island of Maui Hawaii**

I’m writing to offer my support for this grant application, which will develop a plan for large-scale protection across tens of thousands of acres in West Maui. This planning effort is a critical step in a long process that began with the development of the Mauna Kahalawai Watershed Partnership. This partnership of landowners, land managers, and agencies have collaborated for years to protect this mountain range, which provide fresh water for west and central Maui. Much work has been accomplished, but there is much more to be done. This plan would allow the partnership to enter into a new and exciting phase and target new areas that critically need protection.

As the landowner representing a large portion of the proposed project area, I would like to indicate my full support for this initiative. Thank you for considering this important request.

Should you need any additional information please feel free to contact me.

Sincerely,

Avery B. Chumbley  
President



Mauna Kahalawai  
Watershed Partnership

P.O. Box 13240

Lahaina, Hawai'i 96761

Phone: (808) 661-6600

Fax: (808) 661-6604

maunakahalawai.org

#### Watershed Partners

County of Maui

Hanaula Ranch, LLC

Ka'anapali Land  
Company, LLC

Kahoma Land, LLC

Kahoma Land  
Holdings, LLC

Kamehameha Schools

Makila Land Co., LLC

Maui County  
Department of Water  
Supply

Maui Land & Pineapple  
Company Inc.

State of Hawaii  
Department of Land &  
Natural Resources

The Nature  
Conservancy

U.S. Fish & Wildlife  
Service

Wailuku Water Co., LLC

# Mauna Kahalawai Watershed Partnership

January 13, 2021

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

**SUBJECT:** Letter of Support for "Planning for the Protection of Watershed Forests in West Maui"

On behalf of the Mauna Kahalawai Watershed Partnership (MKWP), I would like to offer my full support for this grant application. MKWP was established in 1998 and consists of 12 major landowners and land managers of the upland areas of Mauna Kahalawai (West Maui mountains). These partners are united by a common commitment for the long-term protection and preservation of the watershed, which is critical for supplying much of the fresh water available on Maui.

The watershed partnership has been guided by various plans, beginning in 1999. An updated plan was finalized in 2013 and includes future management goals, objectives, and costs for over 47,000 acres.

This grant proposal would allow the watershed partnership to enter into a new phase of planning and project readiness by prioritizing, siting, and designing fence lines which further the conceptual vision of the 1999 and 2013 plans. While these plans provided a general vision for the protection goals for various areas, much more planning work is needed to fully prepare for these new fencing projects prior to construction.

The past efforts to establish this partnership, develop relationships between landowners, managers, and funders, and create a shared strategy for the protection of Mauna Kahalawai provides a strong foundation for the success of this project. Additionally, the work done by the partnership over the two decades, including the protection of almost half of the upland watershed forests on the north, west, and southwest portions of the mountain, demonstrate the ability of the partnership to successfully implement and sustain large-scale fenced protected areas.

Thank you for your review of this proposal, and please contact me if you have any questions at [brosius@westmauiwatershed.org](mailto:brosius@westmauiwatershed.org).

Sincerely,

Chris Brosius  
Program Manager  
Mauna Kahalawai Watershed Partnership



**Central Maui Soil & Water Conservation District  
77 Hookele St., Suite 202, Kahului, HI 96732**

January 15, 2021

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

To whom it may concern,

On behalf of the Central Maui Soil & Water Conservation District, I am writing to support the Department of Land and Natural Resources' grant proposal for "Planning for the Protection of Watershed Forests in West Maui."

This grant will fund the first step – planning – of a critical project to protect a large portion of the remaining forests of Mauna Kahalawai. Protecting the upland forests from hooved animals will significantly reduce a major source of erosion and animal wastes that pollute the reefs of West Maui.

The project will complement the the Soil & Water Conservation Districts efforts to remove sources of erosion, where loss of former native forests and shrublands, and conversion to fire-prone invasive grasslands create large sources of sediment. Additionally, our organization supports water quality monitoring, improved construction practices, and many other projects that reduce pollutants into these waters. This will lead to a more comprehensive protection of the watersheds from the top of the mountain to the ocean.

Thank you for considering this proposal, which will lead to greater protections for Maui's marine resources.

Sincerely,

  
Mike Silva  
Chairman

MAUI  NUI  
**MARINE RESOURCE COUNCIL**

January 15, 2021

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

To whom it may concern,

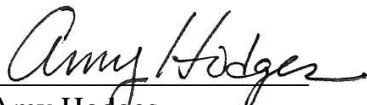
On behalf of the Maui Nui Marine Resource Council, I am writing to support the Department of Land and Natural Resources' grant proposal for "Planning for the Protection of Watershed Forests in West Maui."

This grant will fund the first step – planning – of a critical project to protect a large portion of the remaining forests of Mauna Kahalawai. Protecting the upland forests from hooved animals will significantly reduce a major source of erosion and animal wastes that pollute the reefs of West Maui.

The project will complement the Maui Nui Marine Resource Councils' efforts to remove other sources of erosion down slope, where loss of the former native forests and shrublands, and conversion to fire-prone invasive grasslands has created large sources of sediment. Additionally, our organization supports water quality monitoring, improved construction practices, and many other projects that reduce pollutants into these waters. This will lead to a more comprehensive protection of the watersheds from the top of the mountain to the ocean.

Thank you for considering this proposal, which will lead to greater protections for Maui's marine resources.

Sincerely,



Amy Hodges  
Programs and Operations Manager  
Maui Nui Marine Resource Council