



## Application Submittal Checklist

*The following items are required for submittal of the grant application. Please verify and check off that the items have been included in the application packet.*

- 1) Certificate of Good Standing (If the Applicant is an Organization)
- 2) Declaration Statement
- 3) Verify that grant shall be used for a public purpose
- 4) Background and Summary
- 5) Service Summary and Outcomes
- 6) Budget
  - a) Budget request by source of funds ([Link](#))
  - b) Personnel salaries and wages ([Link](#))
  - c) Equipment and motor vehicles ([Link](#))
  - d) Capital project details ([Link](#))
  - e) Government contracts, grants, and grants in aid ([Link](#))
- 7) Experience and Capability
- 8) Personnel: Project Organization and Staffing



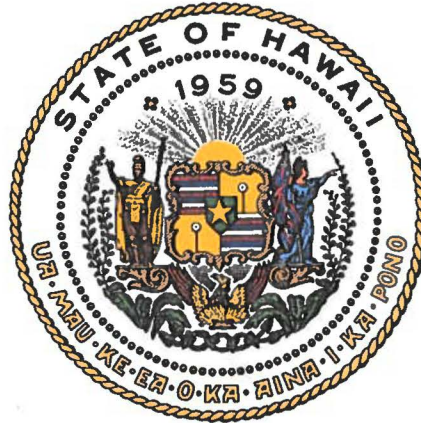
AUTHORIZED SIGNATURE

RHIANNON CHANDLER-IAO, EXECUTIVE DIRECTOR

PRINT NAME AND TITLE

1/17/20

DATE



## Department of Commerce and Consumer Affairs

### CERTIFICATE OF GOOD STANDING

I, the undersigned Director of Commerce and Consumer Affairs of the State of Hawaii, do hereby certify that

**O'AHU WATERKEEPER**

was incorporated under the laws of Hawaii on 10/17/2017 ;  
that it is an existing nonprofit corporation; and that,  
as far as the records of this Department reveal, has complied  
with all of the provisions of the Hawaii Nonprofit Corporations  
Act, regulating domestic nonprofit corporations.

IN WITNESS WHEREOF, I have hereunto set  
my hand and affixed the seal of the  
Department of Commerce and Consumer  
Affairs, at Honolulu, Hawaii.

Dated: January 16, 2020

Director of Commerce and Consumer Affairs



**DECLARATION STATEMENT OF  
APPLICANTS FOR GRANTS PURSUANT TO  
CHAPTER 42F, HAWAII REVISIED STATUTES**

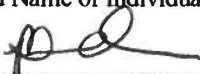
The undersigned authorized representative of the applicant certifies the following:

- 1) The applicant meets and will comply with all of the following standards for the award of grants pursuant to Section 42F-103, Hawaii Revised Statutes:
  - a) Is licensed or accredited, in accordance with federal, state, or county statutes, rules, or ordinances, to conduct the activities or provide the services for which a grant is awarded;
  - b) Complies with all applicable federal and state laws prohibiting discrimination against any person on the basis of race, color, national origin, religion, creed, sex, age, sexual orientation, or disability;
  - c) Agrees not to use state funds for entertainment or lobbying activities; and
  - d) Allows the state agency to which funds for the grant were appropriated for expenditure, legislative committees and their staff, and the auditor full access to their records, reports, files, and other related documents and information for purposes of monitoring, measuring the effectiveness, and ensuring the proper expenditure of the grant.
- 2) If the applicant is an organization, the applicant meets the following requirements pursuant to Section 42F-103, Hawaii Revised Statutes:
  - a) Is incorporated under the laws of the State; and
  - b) Has bylaws or policies that describe the manner in which the activities or services for which a grant is awarded shall be conducted or provided.
- 3) If the applicant is a non-profit organization, it meets the following requirements pursuant to Section 42F-103, Hawaii Revised Statutes:
  - a) Is determined and designated to be a non-profit organization by the Internal Revenue Service; and
  - b) Has a governing board whose members have no material conflict of interest and serve without compensation.

Pursuant to Section 42F-103, Hawaii Revised Statutes, for grants used for the acquisition of land, when the organization discontinues the activities or services on the land acquired for which the grant was awarded and disposes of the land in fee simple or by lease, the organization shall negotiate with the expending agency for a lump sum or installment repayment to the State of the amount of the grant used for the acquisition of the land.

Further, the undersigned authorized representative certifies that this statement is true and correct to the best of the applicant's knowledge.

O'ahu Waterkeeper dba Waiwai Ola Waterkeepers Hawaiian Islands  
(Typed Name of Individual or Organization)

  
(Signathre)

1/17/20  
(Date)

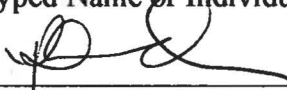
Rhiannon Chandler-Iao  
(Typed Name)

Executive Director  
(Title)

**3. Public Purpose**

Waiwai Ola Waterkeepers Hawaiian Islands attests that this Grant in Adi Request for Operations will be used for a public purpose pursuant to Section 42F-102 of the Hawaii Revised Statutes. If awarded funding, Waterkeepers will work in partnership with youth and community groups to improve water quality by conducting environmentally beneficial aquaculture activities in selected watersheds on Kaua'i, O'ahu Maui, Molokai, Lanai, and Hawai'i Island. Youth teams (WOW Youth) dedicated to water will be assembled on each of the islands to expand awareness about land-based impacts to water quality.

O'ahu Waterkeeper dba Waiwai Ola Waterkeepers Hawaiian Islands  
(Typed Name of Individual or Organization)

  
(Signature) 1/17/20  
(Date)

Rhiannon Chandler-'Iao  
(Typed Name) Executive Director  
(Title)

## Application for Grants

*If any item is not applicable to the request, the applicant should enter "not applicable".*

### **I. Certification – Please attach immediately after cover page**

#### **1. Certificate of Good Standing (If the Applicant is an Organization)**

If the applicant is an organization, the applicant shall submit one (1) copy of a certificate of good standing from the Director of Commerce and Consumer Affairs that is dated no earlier than December 1, 2019.

#### **2. Declaration Statement**

The applicant shall submit a declaration statement affirming its compliance with Section 42F-103, Hawaii Revised Statutes. ([Link](#))

#### **3. Public Purpose**

The applicant shall specify whether the grant will be used for a public purpose pursuant to Section 42F-102, Hawaii Revised Statutes. ([Link](#))

### **II. Background and Summary**

This section shall clearly and concisely summarize and highlight the contents of the request in such a way as to provide the State Legislature with a broad understanding of the request. Please include the following:

#### **1. A brief description of the applicant's background;**

Under the direction of Board President Robert F. Kennedy Jr., Waterkeeper Alliance is a global movement to protect water resources, currently uniting more than 340 Waterkeeper Organizations and Affiliates in over 40 countries around the world. Our collective mission is fishable, swimmable, drinkable waters. In 2017, the first Waterkeeper organization in Hawai‘i, O‘ahu Waterkeeper, was created to address Hawai‘i’s many present and future water resource challenges. In 2018, the new organization expanded to take a statewide focus and the organization was renamed O‘ahu Waterkeeper dba Waiwai Ola Waterkeepers Hawaiian Islands (“WOWHI” or “Waterkeepers”). Today, Waterkeepers work in communities around the state to address water quality through public education, community involvement, and re-establishing native oysters to improve the health of nearshore waters.

Every day, polluted runoff and pathogens contaminate our fresh and marine water resources and threaten public health. Many popular beaches across the islands, including Waikiki Beach and Ala Moana Beach Park, have been closed due to high bacteria levels that increase the risk of illnesses. The Hawai‘i State Department of Health (“DOH”) frequently

issues “brown water” warnings at streams throughout the Hawaiian islands. In nearshore waters, fish populations and corals are declining rapidly due in part to runoff of urban, agricultural, and wastewater pollutants. These issues threaten our natural and cultural resources and jeopardize the long-term health of our tourism, marine recreation, and commercial fishing economies.

In response to these pressing challenges, our new Waterkeeper organization was formed by a dynamic board composed of retired professionals from the U.S. Environmental Protection Agency and the State of Hawai‘i Department of Health, joined by current educators and community leaders. These individuals have extensive experience working in Hawai‘i’s unique cultural, biological, and economic landscape. The Board is supported by a robust program committee composed of scientists, attorneys, business leaders, and natural resources managers, as well as local divers, paddlers, and water users from Hawai‘i Island, Maui, Moloka‘i, O‘ahu, and Kaua‘i.

The first Waterkeeper project in Hawai‘i, led by O‘ahu Waterkeeper, was the restoration of thousands of native oysters to improve water quality and clarity at locations around O‘ahu. Since 2018, Waterkeepers has worked in partnership with the University of Hawai‘i at Hilo’s Pacific Aquaculture and Coastal Resources Center (“PACRC”) to produce multiple species of bivalves for water quality remediation. Native oysters are filter feeders that remove harmful pollutants including sediment, bacteria, heavy metals, PCBs, oil, microplastics, sunscreen chemicals, and nutrients from the water column. The restoration project is modeled after several successful partnerships with Waterkeeper organizations on the East Coast involving the restoration of native oysters for bioremediation, including the Billion Oyster Project in New York Harbor.

Waterkeepers uses native oysters because of their unique cultural value and in hopes of replenishing and restoring these species to the local ecosystem. Native bivalves were once abundant and were a part of many ancient Hawaiian chants, songs, and legends. Sadly, their numbers have declined steadily over the last century. To date, we have successfully out-planted more than 10,000 native oysters at four locations on O‘ahu including Pearl Harbor, Ala Wai Boat Harbor, Kāne‘ohe Marine Corps Base, and the Kapālama Basin which flows into Ke‘ehi Lagoon. Robert F. Kennedy, Jr., President of Waterkeeper Alliance, personally placed a cage of oysters in Pearl Harbor in June of 2019 to celebrate the first-ever project designed to re-establish native oysters to that area.

We are currently building on the momentum surrounding our native oyster restoration projects to engage the community, and especially the youth, in watershed education. The oysters provide a unique opportunity to elevate awareness around complex environmental issues including stormwater, wastewater, water quality, fishing safety, and climate change. This grant will expand existing restoration efforts Statewide and enable the creation of progressive water conservation focused Waiwai Ola Waterkeepers Youth Teams (“WOW Youth”) and related educational materials to achieve community-wide awareness about water quality problems and solutions. Additionally, the research and development activities with aquaculture species will directly contribute to growth of sustainable aquaculture in Hawai‘i to increase economic benefits and jobs.

2. The goals and objectives related to the request;

Hawai'i has over ninety water bodies that are considered impaired by the Environmental Protection Agency (Hawai'i State Department of Health, 2017). State and County agencies with oversight are struggling to make progress to address the major causes. Streams, coral reef ecosystems, marine fisheries, and other aquatic habitats are all impacted by poor water quality from land-based sources of pollution.

The goal of this initiative is to improve water quality in impaired water bodies across the state through environmentally beneficial aquaculture activities combined with focused community outreach and education.

The objectives are to:

- *Form local Youth Teams (WOW Youth) statewide dedicated to maintaining the health of local water resources.* New youth groups will be assembled on Kaua'i, O'ahu, Maui, Molokai, Lāna'i, and Hawai'i Island to expand awareness about land-based impacts to water quality and connect youth to water quality improvement efforts. These groups will be composed of students from local high schools and middle schools, with university and community college students as mentors. New programs including Fish SMART, Swim SMART, and Drink SMART, will help students learn how to access, summarize and interpret existing water quality data and then engage in social media and other education and awareness campaigns to reverse the downward spiral of local water quality. WOW youth teams will meet quarterly to discuss topics affecting water quality in their community. On each island, these groups will educate elementary students about watershed systems and simple ways to reduce water pollution.
- *Actively improve water quality statewide by conducting environmentally beneficial aquaculture activities in watersheds currently listed by the EPA as impaired waters.* A combination of native aquatic plants and animals including oysters, sea cucumbers, seaweeds, and riparian plants will be re-established to reduce pollutants that have entered nearshore waters. These activities will take place in partnership with youth groups and other community groups in targeted watersheds on Kaua'i, O'ahu, Maui, Molokai, Lāna'i, and Hawai'i Island. The targeted watershed on each island will serve as a model for other watersheds on the island to improve their water quality and reestablish ecologically and culturally valuable resource areas.
- *Regularly monitor water quality in targeted watersheds across the state.* Youth groups will monitor the health of their watershed by participating in water quality (including temperature, pH, salinity, turbidity, and bacteria) monitoring activities.
- *Conduct quarterly cleanup events in targeted watersheds statewide.* Cleanup events help people interact with the health of their watershed. These events will address floating debris, microplastics, and discarded trash, and focus on cleaning beaches and areas adjacent to waterways to reduce the flow of debris down the watershed in storm events.
- *Conduct outreach and education statewide to reduce the flow of pollutants down the watershed and into the marine environment.* Waterkeepers and WOW Youth Teams will conduct outreach presentations about watershed systems and simple ways to reduce pollution from households and private properties in stormwater



events. Students will in turn share information with their families which contributes to long term community behavioral change.

- *Improve fishing safety and community health statewide.* Waterkeepers and youth teams will conduct awareness campaigns about the health of nearshore waters and the importance of not consuming fish and invertebrates from contaminated waters. We will utilize the Department of Health's existing educational materials about fish contamination and develop new materials to educate fishers in targeted watersheds about the potential hazards of consuming marine life from impaired waters.
- *Provide locally relevant information about cesspools.* The 88,000 cesspools currently in existence statewide significantly affect the health of Hawai'i's aquifers, streams, and nearshore waters. Waterkeepers and WOW youth groups will help improve community recognition and understanding of the need to convert cesspools statewide to improve water quality. These activities will expand Waterkeepers existing "Clean Water Under Our Homes" campaign. Targeted educational information will help identify and promote suitable alternatives to cesspools. In this way, youth can transmit cesspool information to their own families, to reduce social barriers and increase awareness and behavioral change.
- *Conduct targeted aquaculture development activities and training that contribute to economic growth and job creation.* The aquaculture species used for the water quality improvement activities (native bivalves, seaweed and sea cucumbers) will be an important part of low-impact, sustainable aquaculture development in Hawai'i and for job creation. An example of this is the recent development of the oyster culture industry in Hawai'i over the last nine years which led to eight commercial entities and approximately two dozen jobs. Much more can be done if water quality is improved and if a source of these species to stock farms is developed. Training will be provided to youth and community stakeholders in basic aquaculture methods for both water quality improvement and aquaculture.

The interventions proposed under this grant are intended to actively address significant water quality issues that affect the health of our people, our environment, and our economy. In partnership with WOW Youth Teams on each island, Waterkeepers will promote environmentally beneficial aquaculture to produce several species of native plants and animals that provide ecosystem services including bioremediation to improve water quality. While the restoration of these natural and cultural resources is a step forward toward improving the health of local watersheds, oysters, seaweed, and other biota are not the silver bullet that will address all of our water quality issues. The goal of this grant is to partner with local schools and community groups to achieve community-wide awareness about the sources of pollution and what each person can do to reduce the flow of pollutants into the marine environment.

Our long-term goal includes the promotion of environmentally beneficial aquaculture of multiple native species including *Dendostrea sandvicensis* (the Hawaiian Oyster), *Holothuria atra* (a native sea cucumber), *Sargassum echinocarpum*, a native seaweed known as limu kala, and two riparian plants; *Sesuvium portulacastrum* ('akulikuli or sea purslane), and *Cyperus javanicus* ('ahu awa). This combination of species will help to improve water clarity and quality by filtering pollutants near stream mouths, in estuaries, and in nearshore marine areas. Environmentally beneficial aquaculture is important to the health of our people and our economy. In addition, some of these plants and animals are economically valuable, and the

promotion of these species could lead to sustainable economic development opportunities in the future. Lastly, improvements in water quality will expand opportunities for aquaculture. Poor water quality is the primary reason that expansion of clam and oyster farming in Hawai'i is stymied.

3. The public purpose and need to be served;

Hawai'i has a culture deeply rooted in the *'āina* (the land) and the sacredness of the resources that the *'āina* provides. Clean, unpolluted water is the most important natural and cultural resource. It is something that all people value and rely on for their survival. The word for "wealth" in the Hawaiian language is "waiwai," which is a duplication, or aggregation, of the word for water (wai). This is likely because an abundance of water enabled the abundance of foods and other resources that created perceptions of wealth.

Under this grant, Waterkeepers will work in partnership with youth and community groups to conduct environmentally beneficial aquaculture activities in selected watersheds on Kaua'i, O'ahu Maui, Molokai, Lānai, and Hawai'i Island. Youth teams (WOW Youth) dedicated to water will be assembled on each of the islands to expand awareness about land-based impacts to water quality. Cleanup events that help people interact with the health of their watershed will be conducted quarterly.

Environmentally beneficial aquaculture activities will include a range of plants and animals that improve the health of our watershed. For example, oysters are filter feeders that remove harmful pollutants such as sediment, bacteria, heavy metals, organic compounds (such as PCBs), oil, microplastics, UV-filters (sunscreen components), nutrients, and carbon from the water column. Similarly, sea cucumbers serve an important role in the marine ecosystem as they help recycle nutrients, breaking down debris near the sediment and other organic matter which allows bacteria to continue the natural degradation process. Aquatic plants such as seaweed absorb pollutants including carbon, nitrogen, ammonium, and heavy metals. Several species of seaweed are used around the world to offset the wastewater impacts of concentrated fish farming in nearshore waters. 'Akulikuli is a groundcover that absorbs heavy metals through its roots. 'Ahu Awa is an important native sedge that anchors the soil on the sides of streambanks to prevent erosion. Erosion of sediment is one of the primary drivers of turbidity which impacts the health of coral reefs and nearshore waters. These plants and animals with bioremediation abilities provide enormous ecosystem services, by trapping land-based pollutants before they enter riparian areas and filtering pollutants from surface waters as well as the sediment below. Sadly, these native species have declined steady in recent years due to human activities.

There is a history of successful use of bivalves both for farming and for water quality improvement purposes in Hawai'i. Since 2008, the Pacific Aquaculture and Coastal Resources Center (PACRC) at the University of Hawai'i Hilo, has worked with local groups around the State to demonstrate the biological feasibility of growing four species of bivalve (including oysters and clams) with relative ease. The PACRC has also partnered with the newly formed Hilo Aquaculture Cooperative to explore commercial aquaculture of bivalves, pearl oysters and seaweed in Hilo Bay. Pacific Oysters grown in Hawaiian waters have one of the fastest growth rates in the world (8-9 mm/month) indicating rapid feeding rates in local waters.

Previously, nearly all bivalve aquaculture and water quality improvement trials in Hawai'i used introduced species such as the Pacific Oyster (*Crassostrea gigas*) and the Eastern Oyster (*Crassostrea virginica*). While these species are not invasive, the ability to use native bivalve species is clearly advantageous in terms of diversifying aquaculture products and because native species are better adapted to local environments, which vary considerable in Hawai'i.

The utility of suspension feeding bivalves to improve certain water quality parameters of and provide other ecological services is well-known. Bivalves can remove sediments through at least three functions related to filter feeding and their physical presence can also aid in settling out of sediments and particulate matter (Pollack et al. 2013). This proposed project follows the successful feasibility study (Bienfang, 2017) conducted by the Department of Land and Natural Resources (DLNR), Division of Aquatic Resources (DAR) on the use of *Crassostrea gigas* (Pacific Oyster), as a tool to improve quality and clarity of waters within Pearl Harbor. The DAR study, conducted in West Loch, found that oysters were able to survive and grow in the waters of Pearl Harbor. The initial effort provided valuable data on water quality, and demonstrated the oysters' ability to remove various pollutants such as heavy metals and PCBs from the water column.

Aggregations of bivalves can serve as habitat for multiple species, including fish. Some bivalves such as oysters in the genera *Crassostrea* and *Ostrea* form reefs which help stabilize shorelines and reduce the impacts of storms. Most of the research and restoration efforts that have used bivalve aquaculture have been done in temperate regions using a fairly limited array of species. Hawai'i presents entirely different types of environments and is characterized by coral reef environments, although estuaries do exist. Bivalves do not generally form reefs in Hawai'i with a few rare exceptions, but large aggregations were present in the past (Kay 1979).

Hawai'i has finally reached the point where governmental infrastructure and technical capacity has combined with a community-driven desire to expand environmentally beneficial aquaculture in Hawai'i to include native species for both economic and environmental reasons. In 2009, the Pacific Aquaculture and Coastal Resources Center ("PACRC") at the University of Hawai'i, Hilo ("UHH") began work developing hatchery and growout methods for several local species. Recently PACRC partnered with Waterkeeper to conduct water quality improvement projects using those species in areas around O'ahu. Under this grant, we propose to continue this work to develop native species for aquaculture to support local communities and as a tool to address environmental issues including the remediation of water quality.

#### 4. Describe the target population to be served

Water quality affects all residents and visitors to Hawai'i. The population of Hawai'i is approximately 1.45 million people. In addition, over 10 million visitors came to Hawai'i in 2018, in part to enjoy its beautiful marine environment. Hawai'i's economy is based primarily on the tourism industry, which brings approximately \$12 billion annually to the local economy. Accordingly, the health of Hawai'i's waters is directly related to the health of its economy.

Despite the critical importance of our water resources to all people, many popular beaches across the islands are closed regularly due to high bacteria levels. In nearshore waters, fish populations and corals are declining rapidly due in part to stormwater, urban, and

agricultural runoff. These issues threaten our natural and cultural resources and jeopardize the long-term health of our tourism, marine recreation, and commercial fishing economies.

Major water quality issues include:

- Watershed erosion and sediment in nearshore waters
- Stormwater runoff which carries pollutants from urban and industrial areas to the ocean
- Agricultural pollution from fertilizers and pesticides which can upset the fragile marine ecosystems
- Overfishing
- Marine debris and microplastics
- Compromised recreational opportunities due to elevated bacteria from cesspools and other leaking wastewater systems

**5. Describe the geographic coverage.**

Through this grant, Waterkeepers will work to improve water quality in targeted watersheds statewide. Waterkeepers will work with local community members to identify one watershed on Kaua‘i, O‘ahu, Maui, Molokai, Lāna‘i, and Hawai‘i Island to expand awareness about land-based impacts to water quality. Waterkeepers will work alongside youth and the community groups in the targeted watershed to conduct environmentally beneficial aquaculture activities in an effort to improve water quality. Watersheds will be chosen based upon the capacity and readiness of the community in combination with the status of the area’s waterbody. Preference will be given to sites with the most impaired water bodies.

In each community, youth teams (WOW Youth) will meet quarterly to conduct cleanups and discuss topics affecting water quality in their community. On each island, these groups will help to monitor and reduce water pollution. Youth groups will also educate elementary students and their families about watershed systems and simple ways to reduce water pollution in their homes. A targeted watershed on each island will serve as a model for other watersheds on the island to improve their water quality and reestablish ecologically and culturally valuable resource areas.

Our organization has already invested significant resources field testing these proposed techniques in a variety of locations. Through our pilot work on O‘ahu, we have begun to lay the scientific, cultural and social groundwork to enable the use of native species for bioremediation in a manner that is scientifically, culturally and socially feasible and appropriate statewide. Waterkeepers and the PACRC are currently working with native oysters to improve water quality at four locations on O‘ahu including Pearl Harbor, Ala Wai Boat Harbor, Kāne‘ohe Marine Corps Base, and the Kapālama Basin which flows into Ke‘ehi Lagoon.

### **III. Service Summary and Outcomes**

The Service Summary shall include a detailed discussion of the applicant's approach to the request. The applicant shall clearly and concisely specify the results, outcomes, and measures of effectiveness from this request. The applicant shall:

1. Describe the scope of work, tasks and responsibilities;

The goal of this initiative is to improve water quality in impaired water bodies across the state. Waterkeepers will select one demonstration watershed on each island, working with youth and community groups to promote environmentally beneficial aquaculture of species of native plants and animals at sites where they can contribute to improved water quality. In conjunction with the native species out-planting and restoration projects, Waterkeepers will engage the community in watershed education to reduce the flow of pollutants towards nearshore waters. The oysters provide a unique opportunity to discuss complex environmental issues including stormwater, wastewater, water quality, and risks related to consumption of marine life from impaired waters.

These tasks will be divided into two key components; 1) establish a framework for community education and action, and 2) re-establish native species in riparian and nearshore areas to improve water quality. The approach we will take includes the following steps:

**Establish a Framework for Community Education and Action**

1. Identify Waterkeeper and/or youth coordinator on each island
2. Set up WOW Youth Teams on each island
3. Select a demonstration watershed on each island in partnership with the local community
4. Coordinate with local schools to conduct stream cleanups and native plant restoration in the upper watershed to reduce the flow of sediment and pollutants downstream
5. Coordinate with community groups to outplant oysters, sea cucumbers, limu and native riparian plants at selected sites on each island
6. Deploy and evaluate substrates (tiles, plastic mesh, cloth mesh) for native oyster spat to settle on during natural spawning events
7. Conduct community outreach and coordinate volunteers to maintain cages and conduct water quality monitoring activities
8. Monitor the growth and survival of the restored species
9. Monitor water quality and clarity over time near the out-planting sites
  - Make existing data available
  - Collect new data
  - Utilize technology to share data (via our website, social media, posters, factsheets, press

- releases, newspaper and magazine articles)
10. Once the first out-plantings have been shown to survive and grow satisfactorily, upscale with sufficient numbers to achieve desired improvements in water quality
  11. Build on the momentum surrounding the native oyster restoration projects to engage the community, especially the youth, in watershed education. The oysters provide a unique opportunity to discuss complex environmental issues including stormwater, wastewater, water quality, and fishing safety

**Re-establish Native Species Through Aquaculture of Oysters, Sea Cucumbers, Limu, and Riparian Plants to Improve Water Quality**

1. PACRC will continue developing aquaculture techniques for selected species at the laboratory and field station in Hilo
  2. Work with community members to select demonstration watershed on each island, with priority given to the most impaired water bodies
  3. Additional watersheds may be chosen in conjunction with community and school groups
  4. Waterkeeper and/or youth coordinator positions support restoration activities
  5. Out-planting
    - a. Continue with lab and field production of plants and animals
    - b. Identify and collect broodstock
    - c. Capitalize on spawning events in the field and determine best substrates for settlement and growth
    - d. Remove invasive vegetation in preparation of native out-plantings
  6. Assess the effectiveness of various invertebrates and plants ability to filter water
2. Provide a projected annual timeline for accomplishing the results or outcomes of the service;

This project will be completed over a one-year time frame.

**Quarter 1 & 2**

- Begin laboratory aquaculture
- Select target watersheds on each island
- Identify WOW Youth Team Coordinators
- Initiate WOW Youth Teams and related education programs

**Quarter 3**

- Begin out-planting of oysters, limu, and native riparian plants
- Conduct presentations at schools and with community groups
- Begin WOW Youth water quality monitoring program
- First WOW Youth clean-up on each island

**Quarter 4**

- Continue out-planting of oysters, limu, and native riparian plants
- Continue presentations at schools and with community groups
- Continue WOW Youth water quality monitoring program
- Continue WOW Youth clean-ups

**Beyond the Grant Period**

- Evaluate effectiveness of out-planting activities
- Continue with youth water quality monitoring
- Continue with watershed cleanups

Example Timeline for Individual Tasks:

	YEAR	One			
	Quarter	1	2	3	4
<b>Task</b>	<b>Frequency</b>				
Monitor growth at existing cages	monthly				
Deploy new cages	twice				
Tag individuals	once				
Measure growth at new cages	bi-monthly				
Cage and oyster maintenance	weekly				
Deploy settling substrates	twice				
Monitor settling substrates	weekly				
Report (data analysis, writing)					

3. Describe its quality assurance and evaluation plans for the request. Specify how the applicant plans to monitor, evaluate, and improve their results; and

Waterkeepers has an active board of directors to help guide and evaluate all of the ongoing and proposed activities. The Board is supported by a robust program committee composed of scientists, attorneys, business leaders, and natural resources managers, as well as local divers, paddlers, and water users from Kaua'i, O'ahu, Maui, Molokai, Lāna'i, and Hawai'i Island. In addition, there will be quarterly meetings to assess progress, identify stumbling blocks, and adapt plans as necessary.

During a pilot study, Waterkeepers has successfully placed juvenile oysters in cages at three sites: the Ala Wai Canal, Pearl Harbor, and Kāne'ōhe Bay. A fourth site, Kapālama Basin, was added after the pilot study began. Prior to the pilot study, Waterkeepers coordinated site visits and determined optimum site selection, drafted and executed Memorandums of Understanding (MOUs) for restoration sites, initiated collection of oyster broodstock as well as spawning and production (at PACRC), applied for permits, and secured insurance. Through the pilot project, we have obtained permits and completed compliance with multiple agencies.

This project will, in part, make use of existing aquaculture facilities at PACRC including systems such as broodstock conditioning, microalgae production, larval culture and nursery tanks. Similarly, this project will utilize PACRC technicians and student employees that currently have the broodstock care, live feed production, and larval rearing skills needed for the project. In addition, successful pilot studies of oyster out-planting have been conducted at several sites on O'ahu, where survival and growth have been monitored.

We will monitor growth and survival in recently out-planted species. Oysters and sea cucumbers will be placed in plastic cages. Cages will be cleaned weekly and growth measured monthly. Cages are deployed under docks and bridges, and adjacent to moorings. As part of this project, we will evaluate cage size, mesh size, use of spat bags (tiny mesh) for smaller oysters, ideal cage configuration, and use of settling plates to attract oyster larvae. Cages and organisms will be assessed for biofouling and accumulation of sediment, and studies conducted to determine the best techniques for removing biofouling. Water quality parameters including temperature, pH, salinity, and turbidity will be monitored regularly at each sampling location. Probes (Hobotemps) will be installed at each site to continuously monitor water temperature.

WOW youth teams will be mentored by the Waterkeeper Executive Director, island specific Waterkeepers and/or youth coordinators, as well as university and community college students. Youth teams will assist in monitoring and maintaining out-planted species, coordinate watershed cleanups, and participate in education events for younger children and community groups. Surveys of participants will be conducted following WOW youth team meetings and clean up events, to allow us to improve and refine those activities as necessary.



4. List the measure(s) of effectiveness that will be reported to the State agency through which grant funds are appropriated (the expending agency). The measure(s) will provide a standard and objective way for the State to assess the program's achievement or accomplishment. Please note that if the level of appropriation differs from the amount included in this application that the measure(s) of effectiveness will need to be updated and transmitted to the expending agency.

We will measure our effectiveness in the following areas:

- Completed aquaculture trials for each of the selected species
- Establishment of WOW youth teams on each island
- Number of watershed cleanups
- Quantity of material removed during cleanups
- Number of hours of invasive plant removal
- Quantity of riparian plants out-planted
- Survival of riparian plants
- Quantity of limu out-planted
- Survival of limu at out-planting sites
- Number of oysters out-planted
- Number of sea cucumbers out-planted
- Percent survival of oysters
- Percent survival of sea cucumbers
- Growth of oysters
- Growth of sea cucumbers
- Number of school outreach events
- Number of community outreach events
- Number of social media posts about impaired waters

In addition, we will conduct a pre- and post-attendance student survey to show effectiveness of WOW youth engagement and educational activities.

## **IV. Financial**

### **Budget**

1. The applicant shall submit a budget utilizing the enclosed budget forms as applicable, to detail the cost of the request.
  - a. Budget request by source of funds ([Link](#))
  - b. Personnel salaries and wages ([Link](#))
  - c. Equipment and motor vehicles ([Link](#))
  - d. Capital project details ([Link](#))
  - e. Government contracts, grants, and grants in aid ([Link](#))

## BUDGET REQUEST BY SOURCE OF FUNDS

Period: July 1, 2020 to June 30, 2021

Applicant: Waiwai Ola Waterkeepers Hawaiian Islands

BUDGET CATEGORIES	Total State Funds Requested (a)	Total Federal Funds Requested (b)	Total County Funds Requested (c)	Total Private/Other Funds Requested (d)
<b>A. PERSONNEL COST</b>				
1. Salaries	105,600			
2. Payroll Taxes & Assessments	10,464			
3. Fringe Benefits	5,400			
<b>TOTAL PERSONNEL COST</b>	<b>121,464</b>			
<b>B. OTHER CURRENT EXPENSES</b>				
1. Airfare, Inter-Island	6,800			
2. Insurance	10,000			
3. Lease/Rental of Equipment	3,000			
4. Lease/Rental of Space	2,400			
5. Staff Training	9,029			
6. Supplies	15,007			
7. Telecommunication	5,000			
8. Utilities	4,800			
9. Social Media Fees	2,600			
10. Subcontracts/Subawards	78,900			
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
<b>TOTAL OTHER CURRENT EXPENSES</b>	<b>137,536</b>			
<b>C. EQUIPMENT PURCHASES</b>	<b>30,000</b>			
<b>D. MOTOR VEHICLE PURCHASES</b>	<b>0</b>			
<b>E. CAPITAL</b>	<b>0</b>			
<b>TOTAL (A+B+C+D+E)</b>	<b>289,000</b>			
<b>SOURCES OF FUNDING</b>		Budget Prepared By:		
(a) Total State Funds Requested	289,000	Rhiannon Chandler-Iao (808) 757-1488		
(b) Total Federal Funds Requested	0	Name (Please type or print) Phone		
(c) Total County Funds Requested	0	Signature of Authorized Official Date		
(d) Total Private/Other Funds Requested	0	Rhiannon Chandler-Iao, Executive Director		
<b>TOTAL BUDGET</b>	<b>289,000</b>	Name and Title (Please type or print)		

**BUDGET JUSTIFICATION - PERSONNEL SALARIES AND WAGES**

Period: July 1, 2020 to June 30, 2021

Applicant: Waiwai Ola Waterkeepers Hawaiian Islands

POSITION TITLE	FULL TIME EQUIVALENT	ANNUAL SALARY A	% OF TIME ALLOCATED TO GRANT REQUEST B	TOTAL STATE FUNDS REQUESTED (A x B)
O'ahu Waterkeeper	1.0 FTE	\$35,000.00	30.00%	\$ 10,500.00
Kona Coast Waterkeeper	1.0 FTE	\$35,000.00	30.00%	\$ 10,500.00
Hilo Bay Waterkeeper	1.0 FTE	\$35,000.00	30.00%	\$ 10,500.00
Maui Nui Youth Coordinator (Maui, Moloka'i, & Lana'i)	1.0 FTE	\$30,000.00	50.00%	\$ 15,000.00
Kaua'i Youth Coordinator	0.5 FTE	\$15,000.00	50.00%	\$ 7,500.00
Executive Director	1.0 FTE	\$84,000.00	30.00%	\$ 25,200.00
Field Assistant	0.5 FTE	\$15,000.00	30.00%	\$ 4,500.00
Administrative Assistant	1.0 FTE	\$24,000.00	30.00%	\$ 7,200.00
Science Director	0.5 FTE	\$25,000.00	30.00%	\$ 7,500.00
Outreach Specialist	0.5 FTE	\$24,000.00	30.00%	\$ 7,200.00
				\$ -
				\$ -
				\$ -
				\$ -
<b>TOTAL:</b>				<b>105,600.00</b>
<b>JUSTIFICATION/COMMENTS:</b>				

## BUDGET JUSTIFICATION - EQUIPMENT AND MOTOR VEHICLES

Period: July 1, 2020 to June 30, 2021

Applicant: Waiwai Ola Waterkeepers Hawaiian Islands

DESCRIPTION EQUIPMENT	NO. OF ITEMS	COST PER ITEM	TOTAL COST	TOTAL BUDGETED
Water Quality Probe	8.00	\$2,150.00	\$ 17,200.00	17200
Water Quality In-Water Sensors	8	\$1,600.00	\$ 12,800.00	12800
			\$ -	
			\$ -	
			\$ -	
<b>TOTAL:</b>	16		\$ 30,000.00	30,000
<b>JUSTIFICATION/COMMENTS:</b>				

DESCRIPTION OF MOTOR VEHICLE	NO. OF VEHICLES	COST PER VEHICLE	TOTAL COST	TOTAL BUDGETED
Not applicable.			\$ -	
			\$ -	
			\$ -	
			\$ -	
			\$ -	
<b>TOTAL:</b>				
<b>JUSTIFICATION/COMMENTS:</b>				

## BUDGET JUSTIFICATION - CAPITAL PROJECT DETAILS

Period: July 1, 2020 to June 30, 2021

Applicant: Waiwai Ola Waterkeepers Hawaiian Islands

FUNDING AMOUNT REQUESTED						
TOTAL PROJECT COST	ALL SOURCES OF FUNDS RECEIVED IN PRIOR YEARS		STATE FUNDS REQUESTED	OTHER SOURCES OF FUNDS REQUESTED	FUNDING REQUIRED IN SUCCEEDING YEARS	
	FY: 2018-2019	FY: 2019-2020	FY:2020-2021	FY:2020-2021	FY:2021-2022	FY:2022-2023
PLANS	Not applicable.					
LAND ACQUISITION	Not applicable.					
DESIGN	Not applicable.					
CONSTRUCTION	Not applicable.					
EQUIPMENT	Not applicable.					
<b>TOTAL: \$0</b>						
<b>JUSTIFICATION/COMMENTS:</b>						

**GOVERNMENT CONTRACTS, GRANTS, AND / OR GRANTS IN AID**

Applicant: Waiwai Ola Waterkeepers Hawaiian Islands

Contracts Total: -

	<b>CONTRACT DESCRIPTION</b>	<b>EFFECTIVE DATES</b>	<b>AGENCY</b>	<b>GOVERNMENT ENTITY (U.S. / State / Haw / Hon / Kau / Mau)</b>	<b>CONTRACT VALUE</b>
1	Not applicable.				
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
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21					
22					
23					
24					
25					
26					

27				
28				
29				
30				

- The applicant shall provide its anticipated quarterly funding requests for the fiscal year 2021.

Quarter 1	Quarter 2	Quarter 3	Quarter 4	Total Grant
\$72,250	\$72,250	\$72,250	\$72,250	\$289,000

- The applicant shall provide a listing of all other sources of funding that they are seeking for fiscal year 2021.

We will seek funding from the Hawai‘i Tourism Authority and Hawai‘i Community Foundation. We will also pursue corporate giving, individual giving, and fundraising events. The PACRC at UH Hilo also has 14 grants or philanthropic gifts that support much of the basic and applied research that is needed to produce and test the aquaculture species listed in this proposal.

- The applicant shall provide a listing of all state and federal tax credits it has been granted within the prior three years. Additionally, the applicant shall provide a listing of all state and federal tax credits they have applied for or anticipate applying for pertaining to any capital project, if applicable.

Not applicable.

- The applicant shall provide a listing of all federal, state, and county government contracts, grants, and grants in aid it has been granted within the prior three years and will be receiving for fiscal year 2021 for program funding.

Not applicable.

- The applicant shall provide the balance of its unrestricted current assets as of December 31, 2019.

\$3,507.49.

## **V. Experience and Capability**

### **1. Necessary Skills and Experience**

The applicant shall demonstrate that it has the necessary skills, abilities, knowledge of, and experience relating to the request. State your experience and appropriateness for providing the service proposed in this application. The applicant shall also provide a listing of verifiable experience of related projects or contracts for the most recent three years that are pertinent to the request.



Under the direction of Dr. Maria Haws, PACRC is a valuable in-state resource for the production of native aquacultured species. It has two locations - one nine-acre marine site and one three-acre freshwater site. The marine site, located on Hilo Bay, has a shellfish hatchery and two fish hatcheries, which are supplied with seawater and brackish water wells. It also hosts two marine microalgae production systems and a live feeds production system. The most recent addition to the PACRC is the Coral Reef Fish Breeding Program funded by the Hawai'i Community Foundation. This program is intended to research the biology and behavior of Hawaiian reef fish species with a focus on marine ornamental species. This fish hatchery is housed in a 1200 sq ft building equipped with 10 tanks and 20 aquaria. The water is heated and recirculated. The program is currently working with Flame Wrasse, Pottter's Angel, and Hawaiian Longfin Anthias.

PACRC's facilities and personnel expertise will form the basis for the proposed work. The facility has the capacity to produce all of the aquatic plants and animals proposed herein, including native limu and sea cucumbers. In addition, PACRC has worked with community groups and the private sector, including many fishpond groups around the state, for over ten years. In recent years, PACRC has successfully demonstrated that bivalves can be used for water quality mitigation. It is also engaged in developing methods to grow native species of seaweed. Waterkeepers work in this area focuses on using native species. Filter feeding bivalves have been repeatedly demonstrated in other parts of the U.S. to be effective in improving water clarity, reducing sedimentation and providing valuable habitat to other species.

Waterkeepers and PACRC are currently working together on environmentally beneficial aquaculture efforts including the restoration of native oysters to improve water quality. These activities are underway at four locations on O'ahu including Pearl Harbor, Ala Wai Boat Harbor, Kāne'ōhe Marine Corps Base, and the Kapālama Basin which flows into Ke'ehi Lagoon. Waterkeepers obtained permits from three state agencies for these activities. Waterkeepers preliminary bioremediation activities have been successful and have generated valuable data to inform future efforts. Waterkeepers already engage in outreach and education, but would expand such activities under this proposal.

As a nonprofit, Waterkeepers is uniquely suited to provide extended benefit to the environment in projects such as this. State and County agencies are struggling to address water quality issues in over 90 impaired water bodies around the state. In community efforts such as the one proposed herein, Waterkeepers can provide nearly a \$10 to \$1 return on investment through partnership with schools and community groups to serve as volunteer labor and secure business donations to strengthen efforts. The government cannot receive such non-monetary benefits, accordingly, Waterkeepers can help extend the value of tax-payer dollars to address these critical water quality issues.

In addition to partnering with PACRC, under this grant we will also partner with community groups including Hawaiian fishponds. The project is a win-win because as the bivalves grow, they provide water quality mitigation for the fishpond. UH Hilo is our strong partner in this project. They have had permits since 2008 for activities using bivalve shellfish, and have conducted trials in the He'eia Fishpond, Keawanui Fishpond, Waikalua Fishpond and in Hilo Bay.

## **2. Facilities**

The applicant shall provide a description of its facilities and demonstrate its adequacy in relation to the request. If facilities are not presently available, describe plans to secure facilities.

PACRC has exceptional physical facilities for aquaculture research and development. PACRC has two sites, one nine-acre marine site and one three-acre freshwater site. The marine site, located on Hilo Bay, has a shellfish hatchery and two fish hatcheries, which are supplied with seawater and brackish water wells. It also hosts two marine microalgae production systems and a live feeds production system. The most recent addition to the PACRC is the Coral Reef Fish Breeding Program funded by the Hawai'i Community Foundation. This program is intended to research the biology and behavior of Hawaiian reef fish species with a focus on marine ornamental species. This fish hatchery is housed in a 1200 sq ft building equipped with 10 tanks and 20 aquaria. The water is heated and recirculated. The program is current working with Flame Wrasse, Pottter's Angel, and Hawaiian Longfin Anthias. The PACRC also has a seaweed research and demonstration system, "the Limu Hale" where aquaculture methods for seaweed are being developed. The program facilities and personnel expertise will form the basis for the proposed work and the aquaculture organisms will be supplied from the PACRC.

Site locations for on each island will be chose in partnership with community members to determine a site's readiness and the surrounding community's capacity to support the project. Preference will be given to sites with the most impaired water bodies.

## **VI. Personnel: Project Organization and Staffing**

### **1. Proposed Staffing, Staff Qualifications, Supervision and Training**

The applicant shall describe the proposed staffing pattern and proposed service capacity appropriate for the viability of the request. The applicant shall provide the qualifications and experience of personnel for the request and shall describe its ability to supervise, train and provide administrative direction relative to the request.

Together, Waterkeepers and PACRC have the necessary skills, abilities, knowledge of, and experience to effectively deliver the proposed initiative. Although the individual Waterkeeper staff people are all under the direction of Waiwai Ola Waterkeepers Hawaiian Islands, the Waterkeeper staff members are "on the ground" and based in the watershed they represent. Each Waterkeeper position is supported by a local Advisory Council of dedicated individuals including scientists, attorneys, business leaders, and natural resources managers, as well as local paddlers and other water users from that community. Advisory Council members have experience working in Hawai'i's unique cultural, biological, and economic landscape. The Advisory Councils for the communities of O'ahu, Kona, and Hilo have already been formed to support Waterkeepers work in those areas. Waterkeepers on neighboring islands benefit from O'ahu Waterkeeper's partnership with PACRC. PACRC provides technical support and serves as the headquarters for environmentally beneficial aquaculture activities.

The primary personnel directing grant activities will be:

- 1) Dr. Maria Haws
- 2) Rhiannon R. Tereari'i Chandler-'Īao, Esq.
- 3) Dr. Anne Brasher

Dr. Maria Haws will serve as the Aquaculture Technical Advisor for the proposed activities.

**Bio of Dr. Maria Haws:**

**Maria C. Haws** has worked at UH Hilo for twenty-one years and currently holds the position of a Professor of Aquaculture and Director of the UH Sea Grant Center for Sustainable Aquaculture. She also served as the Director of the UH Hilo Pacific Aquaculture and Coastal Resource Center (PACRC) at Hilo Bay and conducts research in the fields of invertebrate biology, aquaculture and coastal management, and natural resources management policy. Haws is an internationally recognized expert and has provided technical assistance to the Pacific Islands, Vietnam, Tanzania, Senegal and several Latin American countries. served as the PACRC Director for six years and continues to serve as the Director for the UH Sea Grant Center of Excellence for Sustainable Aquaculture. Haws received her bachelor of arts in biology from Reed College, Oregon, and her doctor of philosophy in wildlife and fisheries sciences from Texas A&M.

Haws teaches introductory and advanced aquaculture courses and climate change adaptation at UH Hilo's College of Agriculture, Forestry and Natural Resource Management. She also trains and mentors student hatchery employees and interns at UH Hilo's Pacific Aquaculture and Coastal Resources Center and advises graduate students in the UH Hilo Tropical Conservation Biology and Environmental Science program.

She also is on the Board of Directors for the Marine and Environmental Research Institute of Pohnpei where she provides technical assistance in aquaculture development of pearls, sponges, corals, marine ornamentals in the U.S. Affiliated Pacific Islands.

Haws previously served as a UH Sea Grant Aquaculture Extension Specialist and as Director of the Pearl Research and Training Program. In these roles she provided technical assistance to the Hawai'i aquaculture industry, with a focus on development of the shellfish industry. She also provides technical assistance to groups managing traditional Hawaiian fishponds to revive ancient and new forms of aquaculture production. Haws's work on the Hawaiian oyster is significant since it is an important species in Hawai'i, being one of the last relatively common bivalves, yet so little information exists on it. Her research has discovered basic information on its biology and life cycle and shown that it can be a great aquaculture species. Haws has conducted basic aquaculture grow-out trials in traditional Hawaiian fish ponds starting in 2007. In addition, she has supervised the successful cultivation of *limu* (seaweed), which is prized by Native Hawaiians, and, in addition to its bioremediation abilities, could potentially be a high value aquaculture product.

As demonstrated above, Dr. Haws's expertise and capacity is extensive in the areas needed to support the proposed activities. Dr. Haws regularly supervises, trains and provides direction to students and others and is highly qualified to advise in the activities under this grant.

### **Resume of Dr. Maria Haws:**

#### **EDUCATION**

*Ph.D. in Wildlife and Fisheries Management, Texas A&M University.*

*Dissertation topic: Mortality and biochemical correlates during metamorphosis of the Pacific oyster (*Crassostrea gigas*) and Eastern Oyster (*Crassostrea virginica*). 1988-1993.*

*Bachelor of Science in Biology, Reed College, Portland, OR. 1980-1985.*

#### **EMPLOYMENT AND EXPERIENCE**

**Professor of Aquaculture and Director of the UH Sea Grant Center of Excellence for Sustainable Aquaculture.** August 2019 to present. Conducts research, training and educational activities to support sustainable aquaculture development throughout Hawaii and the U.S. Affiliated Pacific Islands. Teaches fish, invertebrate and seaweed aquaculture.

**Director of the Pacific Aquaculture and Coastal Resources Center and Associate Professor of Aquaculture.** July, 2013 to July 2019. Directs and administers a large aquaculture research and demonstration center. Responsible for fund raising and facilities design and management. Teaches aquaculture courses. Conducts research on: bivalve growout; bivalve genetics and breeding; nursery and hatchery systems; microalgae culture and systems; and other aquaculture topics. Engages in policy analysis and development for coastal management and climate change adaptation.

**Assistant and Associate Professor of Aquaculture/Director of Pearl Research Training Program/Sea Grant Extension Specialist.** January 1, 2009 to present. Pacific Aquaculture and Coastal Resources Center/University of Hawaii-Hilo and University of Hawaii Sea Grant Program. Duties: teaches aquaculture courses, operate PACRC bivalve hatchery, conduct extension in Hawaii, U.S. Affiliated Islands and manage international programs. Conducts research and outreach on climate change adaptation.

**Director of Pearl Research Training Program/Sea Grant Extension Specialist/Associate Professor of Aquaculture.** August 1999 to December 2008. Pacific Aquaculture and Coastal Resources Center/University of Hawaii-Hilo and University of Hawaii Sea Grant Program. Duties: program development and administration of international pearl research and training program at University of Hawai'i Hilo. Lead PACRC Coastal Management efforts in the Pacific Islands. Program emphasizes technical assistance for mariculture and ICZM, capacity building, institutional strengthening and training/educational efforts.

**Coastal Ecologist and Mariculture Policy Specialist.** September 1996 to 2009. Coastal Resources Center, University of Rhode Island.

**Director of Operations.** January 1996 to October 1999. BioPacific Development, Inc. Oakland, CA

**Regional Aquaculture Extension Agent.** May 1996 to August 1996. Center for Tropical and Subtropical Aquaculture.

**Chief of Party and Senior Scientist.** July 1994 to August 1995. Cook Island Black-lip Pearl Culture Project (USAID/RDA International, Inc.).

**Pearl Oyster Hatchery Specialist and Senior Scientist.** November 1993 to July 1994. Cook Island Black-lip Pearl Culture Project (USAID/RDA International, Inc.).

#### **SELECTED RECENT PUBLICATIONS AND EXTENSION MATERIALS**

McDermid, K., K. J. Martin and M.C. Haws. 2019 (invited manuscript). Seaweed Resources of the Hawaiian Islands. *Botanica Marina* Invited manuscript for special edition. Published online <https://doi.org/10.1515/bot-2018-0091>.

- Yamaguchi, Y., J.P. Breves, M.C. Haws, D.T. Lerner, E.G. Grau and A.P. Seale. 2018. Acute salinity tolerance and the control of two prolactins and their receptors in the Nile tilapia (*Oreochromis niloticus*) and Mozambique tilapia (*O. mossambicus*): a comparative study. *Gen Comp Endocrinology*. 257:168-176.
- Chen, J.Q., M.C. Haws, Q.S.W. Fong and P.S. Leung. 2017. Locally-grown oysters in Hawaii: chef preference and local premium?: LOCAL OYSTERS IN HAWAII. *Journal of the World Aquaculture Society* 48: 972-980.
- Chen, J.Q., M.C. Haws, Q.S.W. Fong and P.S. Leung. 2017. Economic feasibility of producing oysters using a small-scale Hawaiian fishpond model. *Aquaculture Reports* 5: 41-51.
- Li, C., M. Haws, H. Wang and X. Guo. 2017. Taxonomic classification of three oyster (Ostreidae) species from Myanmar. *Journal of Shellfish Research* 36:365-371.
- Intergovernmental Panel on Climate Change. 2015. (listed as contributing author and expert reviewer). *Climate change 2015. Impacts, Adaptation and Vulnerability. Part B: Regional Aspects*.
- Lopez-Lopez, V.V., G.A. Rodriguez M. de O., M.A. Galaviz, C.R. Reyes, E.A. Medina-Hernandez, K. Dabrowski and M. Haws. 2015. Descripción histológica comparativa del desarrollo del sistema digestivo y visual de larvas de chame *Dormitator latifrons* (Pisces: Eleotridae). *Lat. Am. J. Aquat. Res.* vol. 43 no. 3 Valparaíso.
- Puniwai, N., L. Canale, M. Haws, J. Potemra, C. Lepczyk and S. Gray. 214. Development of a GIS-based tool for Aquaculture Siting. *ISPRS Int. J. Geo-Inf.* 3:800-816
- Haws, M.C., P. Pascua, R. Howerton, A.H. Kawelo and K. Kotubetey. 2012. Abundance and culture trials of *Ruditapes philippinarum* (Adam and Reeve, 1850) and *Tellina (Quidnipagus) palatum* (Iredale, 1929) at two sites in Kāneʻohe Bay, Oʻahu, Hawaiʻi. *Aquaculture Research*, early publication online. <http://onlinelibrary.wiley.com/doi/10.1111/j.1365-2109.2012.03228.x/abstract>
- Rodriguez-Montes de Oca, G.A., E.A. Medina Hernandez, J. Velasquez Sandoval, V.V. Lopez Lopez, J.C. Roman Reyes, K. Dabrowski and M.C. Haws. 2012. Production of “chame” (*Dormitator latifrons*, Pisces: Eleotridae) larvae using GnRH $\alpha$  and LHRH $\alpha$ . *Revista Colombiana de Ciencia Pecuarias*. 25: 422-429.
- Crawford, B., M. Haws and K. Castro. 2011. Sustainable fisheries and aquaculture; A guide for USAID staff and partners. *Economic Growth, Agriculture and Trade*, United States Agency for International Development, Washington, DC. 169 pp.
- Crawford, B.C., M.D. Herrera, N. Hernandez, C. Rivas-LeClair, N. Jiddawi, M. Semba, M.C. Haws. 2010. Small scale fisheries management: lessons from cockle harvesters in Nicaragua and Tanzania. *Coastal Management Journal*. 38:195-215.
- Haws, M.C., B. Crawford, S.C. Ellis, N. Jiddawi, A. Mmochi, E. Gaxiola-Camacho, G. Rodriguez-Dominguez, G. Rodriguez, J. Francis, C. Rivas-LeClair, A. Saborio-Coze, N. Hernandez, E. Sandoval, K. Dabrowski, M.C. Portella and M. Jaroszewska. 2010. Aquaculture research and development as an entry-point and contributor to natural resources and coastal management. *Coastal Management Journal*: 38: 238-261.
- Martinez-Cordero, J.F., Q.S.W. Fong and M.C. Haws. 2010. Oyster preferences in Sinaloa, Mexico. Would buyers pay more for quality, availability? *Global Aquaculture Advocate*. November/December, 2010.
- Fong, S. W., F.C. Cordero-Martinez and M.C. Haws. 2009. Marketing Extension and Outreach in Sinaloa, Mexico: A Preliminary Analysis of Preferences for Oysters. *Marine Resource Economics*: 24:89-95.
- Haws, M.C., E. Ochoa-Moreno and A.A. Rojas Umana. 2008. (eds.). *Human Health and Aquaculture: three case studies of the relationships between human health, the environment and aquaculture in coastal communities of Sinaloa, Mexico*. Pond Dynamics/Aquaculture Collaborative Research Support Program, Oregon State University. 157 pp.
- Haws, M.C. and R. Howerton. 2009. A Shellfish in every pot...everywhere. *Ka Pili Kaʻi*. University of Hawaii Sea Grant College Program. Vol. 30, No. 3. Fall 2008.
- Haws, M.C. and S.C. Ellis. 2009. Recent advances in aquaculture in Micronesia. *Ka Pili Kaʻi*. University of Hawaii Sea Grant College Program. Vol. 30, No. 3. Fall 2008.
- Chang, F., G. Li, M. Haws and T. Niu. 2007. Element concentrations in shell of *Pinctada margaritifera* from French Polynesia and evaluation for using as a food supplement. *Food Chemistry* 104:1171-1176.
- Haws, M.C. 2007. (editor). *Assessment of Natural Resources Management Needs for Coastal and Littoral Marine Ecosystems of the U.S.- Affiliated Pacific Islands: American Samoa, Guam, Commonwealth of the Northern Marianas, Republic of the Marshall Islands, Federated States of Micronesia and the Republic of Palau*. Technical Report for U.S. Geological Survey Pacific Island Ecosystems Research Center (PIERC).

Haws, M.C., S.C. Ellis and E.P. Ellis. 2007. Producing half-pearls (Mabe). Western Indian Ocean Marine Science Association. Zanzibar, Tanzania. 15 pp.

Haws, M.C. and J. Supan. 2007. Edible bivalve culture in Hawai'i, bridging the past, present and future: a white paper. Pacific Aquaculture and Coastal Resources Center, University of Hawai'i Hilo.

Haws, M.C., D. Svoboda, S.C. Ellis and J. Kwock. 2007. Marketing and sales skills for producers of natural products in Hawai'i and the Western Pacific: A training tool box. Pacific Aquaculture and Coastal Resources Center, University of Hawai'i Hilo. 430 pp.

#### **DR. MARIA HAWS' SELECTED RECENT GRANTS AND PROJECTS**

**Principal Investigator.** Developing bivalve farming in Hawaii, Year 6. \$100,000. CTSA/USDA. 9/18 to 9/21 (pending execution of award).

**Principal Investigator.** Coral Reef Fish Breeding Program, Phase II. Hawaii Community Foundation and the Anderson-Beck Kokua Ulu Fund. \$713,202. 10/16 to 10/21.

**Principal Investigator.** Coral Reef Fish Breeding Program. Hawaii Community Foundation and the Anderson-Beck Kokua Ulu Fund. \$1,000,000. 11/15 to 10/20.

**Principal Investigator.** Continuation of research agreement, Developing oyster hatchery methods. \$421,190. Hawaiian Shellfish LLC. 10/09 to present.

**Principal Investigator.** Increasing Opportunities for Aquaculture of High Value Marine Fish in Hawaii. \$182,995. Sea Grant Aquaculture Program. 9/18 to 8/20.

**Principal Investigator.** Developing culture methods for native fish species in support of new business models for increased participation in mariculture. Saltonstall-Kennedy Fisheries Program, National Oceanographic and Atmospheric Administration. \$299,999. 1/18 to 12/19.

**Principal Investigator.** Service agreement-production of Hawaiian oyster spat. O'ahu Waterkeeper. \$11,000. 12/17 to 11/19.

**Principal Investigator:** Elucidating the physiological response of tetraploid and triploid Pacific Oysters (*Crassostrea gigas*) to environmental stressors. \$300,000. 11/16 to 9/19.

**Co-Principal Investigator.** With Simon Ellis, Co-PI and Sea Grant Director, Darren Lerner serves as the PI. Sustainable Capture-based Aquaculture, of Siganids, with Associated Hatchery-based Aquaculture Development, in Pohnpei, FSM, an Alternative Income and Food Security for Rural Fishing Communities. \$245,580. Sea Grant Aquaculture Program. 9/17 to 8/19.

**Co-Principal Investigator.** Sea Grant Director, Darren Lerner serves as the PI. Alternative business and farming models to advance shellfish aquaculture in Hawai'i. Sea Grant Aquaculture Program. \$149,972. 9/17 to 8/19.

**Principal Investigator.** Services agreement-evaluating the feasibility of land-based aquaculture. Hilo Fish Company. \$116,900.00. 10/16 to 1/19.

**Principal Investigator.** Establishing oyster farms in Hilo Bay to create jobs and diversify opportunities. \$30,171. USDA Rural Development. 7/16 to 12/18.

**Principal Investigator.** Assuring oyster seed availability and quality for Hawaii and the West Coast. CTSA/USDA. 10/15 to 4/18. \$100,00.

**Principal Investigator.** Vegetative guide and dashboard related to climate change impacts in the Republic of the Marshall Islands. \$140,498. United States Geological Survey. 10/14 to 9/16.

**Principal Investigator.** Aquaculture Production and Human Health, Nutrition, and Food Supply in Ghana and Tanzania. \$115,108. Purdue University/Collaborative Research and Support Program-USAID. 3/14 to 2/16.

**Principal Investigator.** Expanding and diversifying near-shore aquaculture in Hawaii and the Pacific Islands. \$291,045. Sea Grant Program. 9/12 to 6/15.

**Principal Investigator.** Establishing bivalve culture in Hawaii. Center for Tropical and Subtropical Aquaculture/USDA. \$38,216. 10/12 to 7/14.

**Co-Principal Investigator (Principal Investigator: Robert Howerton, Sea Grant).** Addressing bottlenecks to diversify Hawaii's seafood industry. NOAA Hawaii Seafood Program 2010. \$200,000. 7/10-6/12.

**Collaborator.** (Kevin Hopkins-Principal Investigator). Microalgae for Biofuels & Fish Feeds. Pacific Basin Agriculture Research Center/USDA. \$99,834. 1/12 to 12/12.

**Principal Investigator.** Culturing native species of macroalgae in Hawai'i and the U.S. Affiliated Pacific Islands. Center for Tropical and Subtropical Aquaculture/USDA. \$36,030. 10/11 to 9/13.

**Principal Investigator.** Human health and aquaculture: Health benefits through improving aquaculture sanitation and best management practices, Phase IV. AquaFish CRSP, OSU. \$450,000. 1/10 to 9/11.

**Collaborator.** (with International Resources Group, LLC). Consultancy on Impacts of Climate Change in the Coastal and Marine Areas of the Western Indian Ocean (WIO Climate Change). \$60,000. 10/10 to 7/2011.

**Co-Principal Investigator.** (Principal Investigator-Mark Merrifield). Effects of Sea Level on Wave-Driven Inundation for Reef-Fringed Shorelines. National Science Foundation. \$1.58 million. 10/09 to 9/12.

2) Rhiannon R. Tereari‘i Chandler-‘Īao, Esq., Executive Director

### **Bio of Rhiannon Chandler-‘Īao:**

**Rhiannon “Rae” Tereari‘i Chandler-‘Īao** earned her B.A. in Ethnic Studies from the University of Hawai‘i at Mānoa in 2004 and graduated from the William S. Richardson School of Law in 2016 with certificates in both Native Hawaiian and Environmental Law. After graduating, she worked as a Post-JD Research & Teaching Fellow at Ka Huli Ao for one year. Prior to attending law school, Rhiannon served as the Executive Director of the environmental non-profit Community Work Day Program, d.b.a. Mālama Maui Nui. While on Maui, Rhiannon served as a member of the Maui Nui Marine Resource Council, Maui County Cultural Resources Commission, a board member of the Maui Non-Profit Directors Association and a Steering Committee member of Ka Ipu Kukui Fellows Leadership Program. She currently serves as the Executive Director of Waiwai Ola Waterkeepers Hawaiian Islands where she channels her past experience into current efforts to protect and preserve natural resources. Rhiannon has previous experience in wetland restoration utilizing akulikuli and ahu‘awa to increase water filtration and prevent major sediment runoff and other pollution from reaching nearshore waters.

### **Resume of Rhiannon Chandler-‘Īao:**

#### **EDUCATION**

**Juris Doctor**, with Certificates in Environmental Law and Native Hawaiian Rights Law

William S. Richardson School of Law  
University of Hawai‘i at Mānoa, 2016

William S. Boyd School of Law  
University of Nevada, Las Vegas  
(August 2013 – May 2014)

**B.A. Ethnic Studies, Magna Cum Laude**  
Emphasis in Hawaiian Studies & Hawaiian Language  
University of Hawai‘i at Mānoa, 2004

#### **EXPERIENCE**

**January 1, 2018 – Present Hawai‘i**

**Executive Director & O‘ahu Waterkeeper, Waterkeepers Hawaiian Islands**

- Fulfill the mission of this environmental non-profit organization by assisting in the development and partnerships and projects for improved water quality
- Identify priority community water challenges and formulate appropriate action strategies
- Facilitate the permits and other technical aspects of native oyster restoration projects

- Ensure fiscal and programmatic accountability in accordance with State and Federal funding and accounting mandates
- Manage the organization's public relations and community education about water quality issues
- Direct program contractors and volunteers
- Write grants and secure partnerships to obtain funding and other resources to support water quality remediation projects

**September 2016 – December 31, 2017 Hawai'i**

**Hawai'i Coordinator, Waterkeeper Alliance**

- Contracted by Waterkeeper Alliance to support the expansion of Waterkeeper affiliates and organizations across the Hawaiian Islands
- Identify priority community water challenges and formulate appropriate action strategies
- Write grants and secure partnerships to obtain funding and other resources to support water quality remediation projects

**June 2016 – December 2016 Honolulu, HI**

**Post-J.D. Research and Teaching Fellow, Ka Huli Ao Center for Excellence in Native Hawaiian Law**

- Supported the work of the Ka Huli Ao Center for Excellence in Native Hawaiian Law through outreach and community education
- Assisted with legal research, writing, and confidential Environmental Law Clinic work
- Teaching Assistant for Emerging Hawai'i Water Issues course and the Environmental Law Clinic

**January 2016 – May 2016 Honolulu, HI**

**Graduate Assistant, UH Mānoa Advocacy Office**

- Supported the Gender Equity Specialist and Civil Rights Specialist in providing advocacy resources to university students and faculty
- Assisted with the facilitation of confidential case management
- Assisted in legal research on civil rights and gender equity laws

**May 2015 – August 2015 Honolulu, HI**

**Law Clerk, Earthjustice Mid-Pacific Office**

- Assisted staff attorneys by researching case law and consolidating relevant information, preparing declarations, drafting letters of support, and attending hearings

**January 2015 – May 2015 Honolulu, HI**

**Law Clerk Extern, Hawai'i Supreme Court**

- Assisted Justice Richard Pollack in consolidating case information and composing draft opinions and memoranda

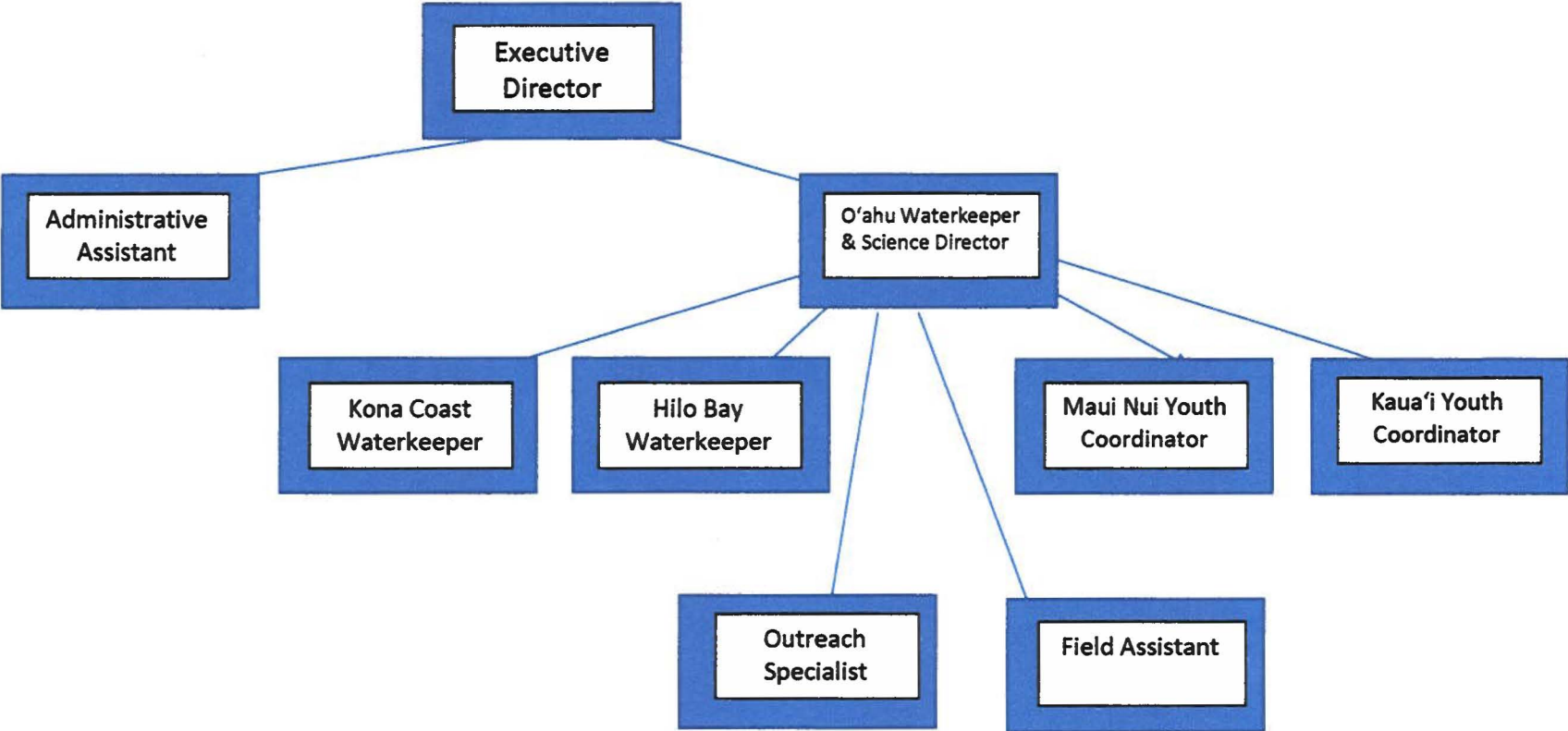
**August 2014 – December 2014 Honolulu, HI**

**Intern, Architectural History Division, Honolulu Authority for Rapid Transportation**

- Assisted the Architectural Historian by conducting archival, census, and other research and consolidating relevant historical information to support the preservation and documentation of historic and cultural resources
- Translated Hawaiian language documents and review agency materials for the proper use of Hawaiian diacritical markings, place names, and native plant names to promote authentic representation of historic and cultural resources



# Organizational Chart



### **3. Compensation**

The applicant shall provide an annual salary range paid by the applicant to the three highest paid officers, directors, or employees of the organization by position title, not employee name.

- 1) Executive Director - \$84,000
- 2) O'ahu Waterkeeper & Science Director (one position) - \$60,000
- 3) Outreach Specialist - \$24,000

## **VII. Other**

### **1. Litigation**

The applicant shall disclose any pending litigation to which they are a party, including the disclosure of any outstanding judgement. If applicable, please explain.

Not applicable.

### **2. Licensure or Accreditation**

The applicant shall specify any special qualifications, including but not limited to licensure or accreditation that the applicant possesses relevant to this request.

No additional personnel qualifications are necessary beyond the group expertise discussed above in Section VI. Permits are in place for Waterkeepers current restoration of native oysters. If awarded, Waterkeepers will obtain the necessary permits to conduct activities stated herein.

In addition, PACRC holds all the required permits to conduct aquaculture activities of this type. The small experimental farm in Hilo Bay was established under the auspices of a Special Activities Permit (SAP) from the Division of Aquatic Resources (DAR). Use of native species does not require the approval of the Hawai'i State Department of Agriculture Plant Quarantine permit, but transfer between islands does. PACRC has held a Plant Quarantine permit (PQ-7) for use of the various bivalve species since 2009.

### **3. Private Educational Institutions**

The applicant shall specify whether the grant will be used to support or benefit a sectarian or non-sectarian private educational institution. Please see [Article X, Section 1, of the State Constitution](#) for the relevance of this question.

Not applicable.

#### **4. Future Sustainability Plan**

The applicant shall provide a plan for sustaining after fiscal year 2020-21 the activity funded by the grant if the grant of this application is:

- (a) Received by the applicant for fiscal year 2020-21, but
- (b) Not received by the applicant thereafter.

This grant will lay a critical foundation for the expansion of youth groups, volunteer networks, and other capacity building efforts statewide that can serve as a sustainable source of labor and support. Through this grant, technical processes will be developed which lower barriers to future sustainable aquaculture production. Moreover, mother plants can be established for different wetland plants, so that seeds and cuttings maybe taken to make new starter plants. This will save money on purchasing plants over time.

In addition, Waterkeepers will seek out multiple sources of revenue to sustain water quality improvement activities including applying for funding from the Hawai'i Tourism Authority and Hawai'i Community Foundation as well as seeking funding from private and corporate giving opportunities, individual donors, and fundraising events. Waterkeepers will also look at ways to generate revenue through environmentally beneficial aquaculture activities to make programs self-sustaining. Waterkeepers will continue to engage in social media and promote online giving to sustain its initiatives and promote fishable, swimmable, drinkable waters.