Department of Land and Natural Resources
Division of Forestry and Wildlife
1151 Punchbowl St., Room 325
Honolulu, HI 96813
(808) 587-0063, (808) 587-0064 (Fax)

Application for Research/T&E Collection/Access/Activity Permit

---

Application Date: 4 September 2018

Name and Title of Principal Investigator or Coordinator:
William G. Gilmartin, Director of Research

Agency/Organization Supporting Activity:
Hawai'i Wildlife Fund (HWF)

Mailing Address:
P.O. Box 70, Volcano, HI 96785

Telephone Number 985-7041 / 895-0393 **FAX**

E-mail address bill.HWF@gmail.com **Local Contact** same

Type of Permit(s): NARS T&E Species Research X Landing Access X
Commercial Activity Management X

Statement of Proposed Activity (Attach study/activity plans and supplementary material as necessary).

1) **How will study/activity results benefit the area, resource, or management in the future?**
   A. Hawai'i Wildlife Fund (HWF) proposes to: 1) remove invasive fish species (primarily tilapia, other species, if necessary) from one pool (H-1) at the Ho'onoua anchialine pool complex on the coast at the Wai'ōhinu portion of the Ka'ū Forest Reserve; and 2) remove sediment from either or both of the two large pools within the Ho'onoua pool complex, as needed. These activities will aid in restoration of the native habitat and help to restore native anchialine species within these anchialine pools. The fish and sediment accumulation, if not dealt with, will lead to loss of the native 'ōpae 'ula and other native anchialine pool species. We have finished sediment removal from pool H-1 and H-3 in previous years (sediment removal from pool H-1 was completed during 2012, H-3 in early 2016). Based on restoration work done at The Four Seasons Resort by David Chai, this proposed restoration work will enable the native shrimp and plant species to repopulate the pools. This action will benefit preservation of the

high diversity of the Forest Reserve's native species and contribute to the longterm conservation of the biodiversity at the site. Testing of water movement may be conducting using fluorescein green dye to access resonance time and tidal flux in the larger pool (H-1).

B. A second activity is control of invasive plant species (other than near the anchialine pools) within the current areas of high native plant density where they threaten to overgrow the native species. This action will also benefit preservation of the high density of the forest reserve's native plants and contribute to the long term conservation of the biodiversity of the area.

C. A third activity is outplanting of native coastal dry forest species into the areas where invasive vegetation has already been removed. This project would be done in conjunction with: 1) Dr. Jon Price's (UH Hilo) historical map of rare plant species (to make sure candidates used to exist in this region); and 2) knowledgeable botanists who have access to seeds that have already been collected from nearby parcels in Ka'ū so any potential genetic diversity within species may be maintained. In addition, native seeds may be collected to contribute to the HWF collection within the Hawai'i Island Seed Bank under the guidance of Lyman Perry (DOFAW) and Jill Wagner (Future Foresters). Any seeds collected from the Wai'ōhinu Forest Reserve will not be done without explicit permission from DLNR-DOFAW.

D. A fourth activity is marine debris removal activities. HWF has been working to remove such pollution from the SE Hawai'i shoreline since 2003, and during that time has removed over 246 tons of marine debris from Hawai'i Island. As removal activities include larger community cleanup events we would prefer to list this activity within the scope this access / activity permit. As usual, all unusual debris items will be reported to the proper state (dlnr.marine.debris@hawaii.gov) and federal (disasterdebris@noaa.gov) and researcher (marinedebris@soest.hawaii.edu) reporting systems.

Activity objectives.

A. The primary objective of this work is to restore the Ho'onoua anchialine pools at Wai'ōhinu so that these ecosystems can flourish. Primary activities to achieve this goal (as outlined above) will be to remove invasive fish, plant species and accumulated sediment from inside/around these fragile aquatic and wetland ecosystems.

B. The primary objective is to control several widespread invasive species (sourbush, lantana, haole koa, christmasberry, kiawe, fountain grass, etc.) using targeted herbicide or hand to eliminate their threat to the native coastal strand plant populations.

C. The primary objective of outplanting native species (e.g., wili wili, loulu palm) is to expand the range of these rare and endangered plant species to inside the protected Wai'ōhinu Forest Reserve boundaries. In addition, a secondary

objective of this project would be to involve community members, esp. youth, in these outplanting projects (with non-protected plant species only) to help inspire local stewardship of these natural resources. Collecting native seeds for this forest reserve was suggested during a site visit on August 3, 2018 by Lyman Perry (DOFAW) and Jill Wagner (Future Foresters / Hawai'i Island Seed Bank). HWF will pay the annual fee ($200) for a collection box in the seed bank and any additional seed trials deemed necessary. The objective is to safekeep the genetic line within seeds from this specific region in case something threatened its population in the future (pest species, fire, etc.).

D. The primary objective of the marine debris removal work is to restore the coastline by collecting / hauling away as much marine debris as possible. Where we are unable to remove certain items (due to safety issues or lack of space in the vehicle / sufficient manpower) we will notify the proper authority *and* if possible, move the debris item above the higher high tide level to prevent re-floating and possible interaction with marine wildlife.

2) Specific study/activity location(s). Attach map if needed.

A. The site of activity will be the two large anchialine pools on the Wai'ōhinu coast, Ka'ū Forest Reserve (labeled "Ho'onoua" on the attached topo map and on any Google Map search).

B. The potential area of activity is the full length of the Wai'ōhinu coast, inland to approximately 200-300 meters from shoreline (to end of vegetation line).

C. Same as above (see B) for any outplanting activities, as guided by the historical species distribution and guidance from native plant propagation specialists.

D. The entire Wai'ōhinu coastline within the Ka'ū Forest Reserve, up to the debris line (generally to within about 100'-200' from the shore), and occasionally into the beach crest vegetation.

4) Mode of travel to study/activity site.

Travel will be by 4x4 truck or suburban on existing coastal roads. Vehicles will not be driven off the existing roads. There is currently a road to each pool off the main coast road and we will make every effort to avoid driving on any native vegetation.

5) Duration of study/activity:

a. Overall 1 year

Comment [HWF1]: Can we make these any longer?

b. Dates for this request: **Start date** 9/10/2018 **End date** 9/09/2019

6) How is the study/activity to be accomplished? What are the methods to be used? Be specific in listing study/survey techniques and include efforts that will be taken to minimize effects on the resource and/or area.

A) Sediment/plant/fish removal around/in the anchialine pools:

- We hope to use a trash pump to continue sediment removal at both pools as needed. Invasive plants will be removed from the sediment in pool H-3 by hand using HWF contractors and community volunteers. The sediment slurry from H-3 will be pumped into the a`a lava approximately 100' from the pool, the site currently being used or another site agreed to/approved by DOFAW.
- Several water quality parameters (pH, temp, salinity, conductivity, DO), the presence/absence of fish, and native shrimp species relative abundance will be monitored before, during, and after the restoration activities.
- While conducting this restoration work we will be careful to avoid walking or driving on native plant species.
- We will apply a commonly-used water leakage test dye (fluorescein) into the H-1 pool system during a period of low tidal flux in order to access the connectivity and flow between the anchialine pool and the marine environment. DLNR DAR and UH Hilo researchers will be invited to participate in this study.

B) Coastal strand restoration work:

- Invasive tree and shrub species (including: Christmas berry, haole koa, kiawe, sourbush) will be treated with "Garlon 4 Ultra" at 25% and applied with low pressure hand sprayers on the base (trunks) of the plants. Lantana and other invasive grass species (e.g., fountain grass) will be selectively treated with RoundUp (3 oz/gal) and Remedy 25% water in with a little dish soap. Targeted treatment of invasive plant species will greatly reduce any possible overspray to nearby native species. Where possible, other invasive plant species will be hand or tool pulled. No spraying will be done near the ocean or anchialine pools. Work with herbicide will not be conducted within 100' of the anchialine pools. If invasives exist within this radius we will use only hand tools to remove them (e.g., seashore paspalum in pools).
- As with the pool restoration work, we (and our volunteers) will be careful to avoid walking or driving on native plant species. Only trained HWF contractors or volunteers will handle any herbicide.
- We will also avoid cutting any tree that provides shade for shoreline users within 100 yards of the shoreline without first consulting the permitting agency (DLNR-DOFAW) for specific permission.

C) Native plant outplanting, if done:

- Native species for outplanting will be determined using Dr. Jon Price's historical rare plant maps and consulting knowledgeable botanists. At this time, proposed species include wili wili and loulu palms, however, HWF will confirm any additional species *before* any planting begins.
- Seeds will be collected from nearby populations and permission will be obtained for any protected species. The loulu seeds to be used have already been collected. Any seeds collected from within the Waiʻōhinu Forest Reserve will be done with prior-permission from the agency (DLNR-DOFAW).
- Seed propagation will be done off site and utmost caution will be given to avoiding transporting any new pest to the region.

- Any potting soil used during outplanting will be purchased new from a local farm/garden vendor and any extra will be taken off site.
- Tools used for planting will include basic hand tools (shovel, trowel, etc.) and will be washed before and after use to avoid any spread of possible pest species.
- Wherever possible, community volunteers and youth (*keiki*) will be invited to participate in the outplanting process to kindle respect and stewardship of the both the project and the Forest Reserve.

D) Marine debris removal:

- Derelict fishing net and line bundles will be removed using a specialized truck, winch / hook / ramp system that has proved safe and effective over the years.
- General marine debris removal activities will be conducted by HWF staff and contractors to within the scope of our training (i.e., no hazardous material will be handled / collected). Volunteers will be used to help with removal activities under the supervision of trained HWF staff and contractors. For the most part, no broken glass will be collected. Sharps will be handled by HWF staff and contractors ONLY.
- Debris will be collected in bags and removed to a pile along the coastal trail (above the higher high tide level). HWF will attempt to remove all debris collected, and return as soon as possible to the cleanup site should any bagged debris remain.

7) Justification: Removal of the sediment and invasive plants will increase the amount of open water habitat available in both pools and thus enable increased abundance of native flora (*Ruppia maritima*) and removal of the fish will allow native fauna (*Halocaridina rubra* and *Metaboteus lohena*) to repopulate these pools. The latter two are endemic shrimp currently observed commonly in one very small pool (H-2) between the two large degraded pools. Following our sediment removal to date from H-3, *H. rubra* is now commonly observed in this pool as well.

Another species that could benefit from the restoration of these anchialine pools is *Megalagrion xanthomelas*, a native damselfly that has been recorded in this area. Removal of the high volume of sediment and invasive plants is also expected to increased fresh water flow into the pools, tidal exchange, and ultimately the water quality in these pools. The increased water quality is expected to result in increased stem densities of the native emergent macrophyte *R. maritima*, increasing habitat for endemic shrimp and damselflies. One of the large pools (H-1) has fish that predate on the native shrimp. The fish will be removed mechanically or chemically.

Similarly, the invasive plant removal effort will benefit the long term conservation of the highly diverse native plant community on the coastal strand. Without attention to this problem in the very near future, the invasives will soon become unmanageable with the loss of many native species at the site.

The Wai'ōhinu coastal strand has over three dozen native plant species, including one endangered plant, 'ōhai. Continued maintenance and control of invasive species coupled with occasional outplanting activities will ensure that this area remains native species dominated. Positive interactions with HWF staff/contractors and shoreline users, including community service workdays during any outplanting or weed-pulling activities, will help bolster communication between users, caretakers, and managers and increase local stewardship of the Wai'ōhinu Forest Reserve.

Marine debris is a man-made problem with a history of endangering native wildlife. Over 690 species of marine wildlife have been documented to have been negatively impacted by marine debris worldwide. And while it will take an infinite amount of beach cleanups to restore our ecosystems back to a place before plastic, it is our responsibility to protect our native species and mitigate any potential damages created by humans. HWF has a long history of marine debris removal activities in the Wai'ōhinu portion of the Ka'ū Forest Reserve, and these include public outreach lessons about reducing the potential threats of marine debris on the native ecosystems.

Why is the proposed study/activity important?

This activity is critical to the long term conservation of the diverse native species community at this location. In recent years, invasive species have become widespread in anchialine pools on Hawai'i Island and a serious threat to the native species diversity on this Wai'ōhinu coastal strand. Without attention to removal in the very near future, the sediment will entirely fill the H-3 pool and the fish in pool H-1 now precludes native shrimp habitation. This restoration activity will set the stage for repopulation of the Ho'onoua pools with native flora and fauna. Anchialine pools provide valuable habitat for several endemic flora and fauna that include the emergent macrophyte *R. maritima*, the damselfly *M. xanthomelas*, and the shrimp species, *M. lohena* and *H. rubra* and migratory waterbirds. While *R. maritima* has been observed in only pool H-3, research suggests that seed banks are likely present in the other pool as well and the species will recover following pool restoration, including removal of the invasive *P. vaginatum* grass. The damselfly has also been observed near the Hoo'noua pools. Both shrimp are currently only observed in the smallest pool (H-2), and *H. rubra* can now be seen again in H-3. Of ecological importance, Hawaii Island has three lineages of *H. rubra*, of which the Wai'ōhinu lineage has the most restricted distribution, found only at the Ho'onoua pools and one other nearby site, yet the shrimp at each of these two sites are unique and are considered distinct genetic groups. For this shrimp species alone, the Wai'ōhinu pools are significant and worthy of restoration and conservation management.

Additionally, there are no published anchialine pool restoration guidelines. Monitoring water quality, hydrology, and endemic species abundance during this restoration process should enable us to assess the efficacy of the restoration methods and publish the findings for others to use in anchialine pool restoration projects.

The invasive plant removal effort will benefit the long term conservation of the highly diverse native plant community on the coastal strand. Without attention to this problem in the very near future, the invasives will soon become unmanageable with the loss of many native species at the site.

Kamilo Point, within the Wai'ōhinu portion of the Ka'ū Forest Reserve has been labelled "Plastic Beach" and the "World's Direst Beach" and many other titles in various publications and media releases. HWF hopes people who come to Kamilo to enjoy the natural and cultural resources will help be a part in taking care of this special place. The cooperative and collaborative relationship between DLNR-DOFAW and HWF is a model example of a gov/NGO partnership that is in alignment with both of our missions.

If work is in a Natural Area Reserve, can it be done elsewhere? If so, justify use of
NARS. N/A

How will the information learned be applied?
Monitoring will inform us of how successful the restoration activities will be. Assuming successful restoration, we will publish the methods used, as there are no current published guidelines on anchialine pool restoration methods. With the invasive plant killing effort, we are currently monitoring the effectiveness of our work and adjusting treatments to facilitate efficient use of herbicide for the target species. With the marine debris removal activities, any trends noticed / documented, or innovative solutions created will be shared with the broader marine debris community in Hawai'i.

How will study/activity results be disseminated?
Activity reports will be delivered to DOFAW and we plan to publish treatment methods in a scientific journal. Our educational brochure about the Forest Reserve is passed out to all shoreline users that we interact with.

Will any specimens be collected? Yes, seeds will be collected from non-protected native plant species to include in the HWF collection box within the Hawai'i Island Seed Bank. No collection of protected plant species (e.g., 'ōhai) will be conducted by HWF.

If yes, state kind, quantities, storage methods, and ultimate disposition. A few tilapia and 'ōpae will be collected with nets and stored on site during the treatment period as bioassay controls. After the bioassays are conducted, any remaining live fish will be put on ice until they perish. Dead fish will be buried on site. 'Ōpae ula will be returned to the pool they were collected from once the rotenone content has dissipated to a point where the tilapia will survive.

8) **Have any studies (in the case of research proposals) been made that are similar to the one proposed? If yes, please cite.** Yes, Nico et. al. published a report after a laboratory study of the 'Aimakapā fishpond at Kaloko-Honokōhau National Park (2015). See attachment.

9) **Who will participate in the study/activity (in the case of groups, list the leaders and/or responsible parties, or the principal permit holder who will carry overall responsibility)?**

Principal Coordinators William George Gilmartin & Megan Rose Lamson Leatherman
(As appears on Drivers License)

Title: **Hawai'i Wildlife Fund**

Background/Qualifications:
Gilmartin - Rare/protected/endangered species research and recovery work for 40 years. Spearheaded effort to get the Wai'ōhinu coastal strand transferred from Land Division to DOFAW for conservation of its native plants, anchialine pools, and petroglyphs.

Lamson Leatherman – Has been the coordinator for the Ho'onoua pool restoration work for the last 10 years, recruiting volunteer assistants, scheduling and leading restoration activities and ensuring necessary equipment is available. She has a M.Sc. degree in Conservation Biology from UH-Hilo.

Primary partners/assistants in this work are identified below. Additionally, UH-Hilo Marine Science Department volunteer assistants will be supervised in some of the tasks. If other qualified assistants become available to participate, we will inform DOFAW with this required information for approval.

Assistant:
(As appears on Drivers License)

Title: Stacey Irene Breining
HWF Field Technician & Education Coordinator

Assistant:
(As appears on Drivers License)

Title: Nohealani K. U. Kaawa
HWF Field Technician & Outreach Specialist

Assistant:
(As appears on Drivers License)

Title: Mattie Mae Larson
HWF Art Coordinator & Field Technician

Assistant:
(As appears on Drivers License)

Title: Kallie J. Barnes
HWF Asst. Program Coordinator & Field Technician

10) **Will your research/activity require camping or night work? If yes, please describe specific locations, duration and dates.**

Yes, overnight camping to:

1) Facilitate sediment removal. This work will take several days and it will be necessary to stay near the equipment to preclude vandalism/theft;

2) Watch equipment and pools if the rotenone treatment is necessary. We will occasionally stay at the site for 2-3 days to conduct the testing to assess pool linkage to the ocean water, treat pool H-1, and remain there to assess fish kill,

remove dead fish, and remove sediment. Camping would occur on the Wai'ōhinu coast where no native plant species would be affected. Hawai'i Wildlife Fund uses a portable "PETT" toilet with wag bags, so all human waste as well as other materials will be removed after each camping event. We cannot provide specific camp dates, as this will be dependent on many factors, including tides, rain and wind forecasts for the area. We will notify DOFAW of proposed camp dates when they are scheduled;

3) Facilitate efficient plant killing by reducing the number of trips needed to accomplish the work. During 2015, we are planning multiple day trips to Wai'ōhinu and possible several overnight (2 day, 1 night) trips to enable 2 full days of treatment with only one roundtrip travel to the site. We will notify DOFAW of proposed camp dates when they are scheduled. Camping would occur on the Wai'ōhinu coast where no native plant species would be affected. Again, Hawai'i Wildlife Fund carries a portable PETT toilet, so all human waste as well as other materials will be removed after each camping event;

4) Conduct rotenone pool treatment and monitoring protocols.

11) Will your research/activity involve the use of aircraft in any way? If yes, please describe specific locations, frequency of use and dates.
No.

12) Will your research/activity involve the use of firearms? If yes, describe locations, frequency of use, safeguard to be employed, etc.
No.

13) Will your research/activity require structures/equipment to be left in the field? If so, when will they be removed?
No.

14) Will permits from other agencies be required for your study/activity? If yes, please list agencies.
No.

15) What is the expected report date for your findings (in the case of research or commercial photographs)?

16) What information will be made available to the Department of Land & Natural Resources?
Hawai'i Wildlife Fund will provide a report on the activities conducted and the results of the activities within 30 days from the end of the permitted activity period or upon request.

16) Is this application part of graduate studies? If so, please include the name and affiliation of your major professor/advisor and his/her signature.
No.

William G. Gilmartin

Applicant's Signature

Hawai'i Wildlife Fund

Applicant's Signature

Hawai'i Wildlife Fund