SCIENTIFIC RESEARCH AND COLLECTING PERMIT

Grants permission in accordance with the attached general and special conditions

United States Department of the Interior
National Park Service
Hawaii Volcanoes

Study#: HAVO-00799
Permit#: HAVO-2023-SCI-0003
Start Date:
Expiration Date:
Coop Agreement#:
Optional Park Code:

Name of principal investigator:
Name: Mr Ian Godfrey **Phone:** **Email:**

Name of institution represented:
Laboratory of Atmospheric Chemistry National University of Costa Rica

Additional investigators or key field assistants:

Study Title:
Monitoring Volcanic Emissions in Hawaii Volcanoes National Park

Purpose of study:
The purpose of the proposed research investigation will be to gather valuable data on the state of volcanic degassing. The most significant emissions we will monitor for are SO2, H2S and CO2. Also we will track any inhalable particulate matter PM-1.0, 2.5 & 10, all inhalable particulate matter will be tracked and plotted around the Hawaii Volcanoes National Park.

The purpose is to measure and log all volcanic emissions. Generate volcanic emission reports showing GPS plotted emission readings from the Sniffer4D which tests for Temperature, Humidity and 9 additional parameters - Sulfur Dioxide SO2 (g/ m3), Volatile Organic Compounds VOCs (ppm), Carbon Monoxide CO (mg/m3), Carbon Dioxide CO2 (g/ m3), Ozone O3(g/ m3), Nitrogen Dioxide NO2 (g/ m3), O3+NO2 and Particulate Matter - PM 1.0, 2.5 & 10. The additional device the Sniffer V (Volcanic) will also be used, this device is strategically important because it has Sulfur Dioxide SO2 (g/ m3), Carbon Monoxide CO (mg/m3), Flammable Gas CxHy (%), Hydrogen Sulfide H2S (g/ m3),
Carbon Dioxide CO2 (g/ m3), Hydrogen chloride HCI(g/ m3), Hydrogen H2 (%) and Hydrogen fluoride HF(g/ m3). A consistent volcanic emission monitoring program is crucial to the safety of the people entering the park.

Toxic gas emissions such as Sulfur dioxide or SO2 which are the direct result of burning fossil fuels contribute to climate change and acid rain in the region. SO2 is also released from active volcanoes during periods of eruption and this research project was designed to greatly assist volcanologists measuring these gases.

Continuous gas monitoring provides significant insight into eruption “priming” processes at various timescales. Turrialba Volcano in Costa Rica had peaks in CO2/SO2 prior to eruptive phases in 2014 and 2015 which signaled magma injection that disrupted the overlying hydrothermal system, whereas the disappearance of H2S in emissions marked the transition from phreatic to phreatomagmatic activity. This is just one example of how the proposed research can be meaningful and serve an important purpose. The investigation will help NPS with an enhanced understanding of state of volcanic degassing which should contribute to the mitigation of any potential threats or hazards associated with the emissions being released from the active Kiluea crater.

Subject/Discipline:
Air Quality

Locations authorized:
The research proposed will take place in all accessible areas of the park where the general public gather and walk. The idea is to monitor the ambient air quality to see if any volcanic emissions are in areas of public use. This investigation was designed to assist the Hawaii Volcanoes National Park obtain valuable information identifying any potential threat to health of park guests relevant to air quality due to volcanic degassing associated with Kiluea. If there are any areas of significant degassing know by the park rangers where they wish to measure emissions, this will be accepted, and we can go to these additional areas.

Transportation method to research site(s):

This research will require me to walk several trails and drive the publicly accessible roads within the park.

Collection of the following specimens or materials, quantities, and any limitations on collecting:
No UAS, ground based only.

Name of repository for specimens or sample materials if applicable:

NPS General Conditions for Scientific Research and Collecting Permit (available at the RPRS HELP page) apply to this permit. The following specific conditions or restrictions, and any attached conditions, also apply to this permit:
PROJECT SPECIFIC CONDITIONS

1. Sampling will be conducted by walking or vehicle only. No UAS permitted.
2. Wear high visibility clothing, such as safety vest/uniform/or clothing with logo, to identify and differentiate researchers from park visitors. When working or sampling along roadsides, wear a ANSI Class 2 compliant high visibility safety vest, and ensure they can be seen and avoided by drivers.
3. Do not obstruct trails or roads while conducting research.
4. No access to closed areas.
5. Follow appropriate standards for respiratory protection from volcanic gasses while working in areas exposed to volcanic gasses and particles.

HAVO GENERAL CONDITIONS

Follow the NPS General Condition and Park specific conditions for conducting research in the Park. If applicable, a copy of USFWS endangered species permit will be provided to the park. Also, the permittee agrees to keep the specific location of sensitive resources confidential. Sensitive resources include threatened species, endangered species, and rare species, archeological sites, caves, fossil sites, minerals, commercially valuable resources, and sacred ceremonial sites"

Only persons identified in the research permit are permitted to perform tasks associated with this permit. Names to be added to the permit at a later time must be approved by the park before they participate in any activities.

All vehicles must be parked completely off roadways and, whenever possible, on maintained pullouts. Vehicles should not be parked on dry grass because of fire potential.

Follow sanitation protocols to avoid introducing nonnative weed propagules, ants; coqui frogs; and rapid ohia death (ROD) disease into new areas. As much as possible stay on existing roads and trails and avoid entering areas where ohia trees bearing ROD-like symptoms are observed. The park's most recent ROD map can be found at https://www.nps.gov/havo/learn/nature/rapid-ohia-death.htm. Please note that undetected infected trees may be found elsewhere throughout the park.

Follow the protocols for marking and identifying plots and equipment deployed in the field (see attached). Unidentified equipment and items in the field run the risk of being removed. Make sure that unattended equipment, plots, markers (e.g. flagging) are inconspicuous from roads and trails. The PI will provide location and description information on all equipment and identifying markers (e.g. what color flagging if any, GPS location of mist nets etc) to the Research Coordinator. All such items must be removed at the end of the study period and a notice sent to the research coordinator when all items are removed from the field.

Complete MRDG analysis and obtain Superintendent authorization for any proposed use of helicopter, motorized and mechanical equipment and instrumentation in designated or eligible wilderness.

Maintain a 100 ft distance from Nene (Hawaiian Goose). Report observations of Nene (date, time approximate location and number of birds) to 808-985-6094.

Unmanned Aircraft. Launching, landing, or operating an unmanned aircraft from or on lands and waters administered by the National Park Service within the boundaries of Hawai‘i Volcanoes National Park is prohibited except as approved in writing by the superintendent. The term “unmanned aircraft” means a device that is used or intended to be used for flight in the air without the possibility of direct intervention from within or on the device, and the associated operational elements and components that are required for the pilot or system operator in command to operate or control the device (such as cameras, sensors, communication links). This term includes all types of devices that meet this definition (e.g., model airplanes, quadcopters, drones, etc.) that are used for any purpose, including for recreation or commerce.

Contact Public Affairs Specialist Jessica Ferracane 808-985-6018 regarding requirements for media or film crews accompanying your project inside the park.

This permit does not authorize entry into any caves or lava tubes. If applicable, follow conditions for conducting work in caves.

Under no circumstances should clothing, footwear or gear that was used in a White-Nose Syndrome-affected state or region be used.

Prior to entering earth cracks, conducting work on high angled slopes, and/or technical climbing, all park safety conditions must be met, and a safety plan approved by the Park Chief Ranger

Obtain an administrative use backcountry permit for all overnight stays at the Backcountry Office at the Visitor Emergency Operations Center (VEOC) tel:808-985-6178

Researchers are advised that they may encounter hazardous conditions within the park, including: volcanic fumes("vog"), earth cracks hidden by vegetation or cinder, extreme temperatures, and hazards associated with active lava flows (including "laze" or the plume at the ocean entry). You are urged to carry appropriate gear and communication devices to help ensure your safety. Contact the Kilauea Visitor Center for more information (808-985-6017).

Prior to going in the field, check in at the Visitor Front Desk to get current information on area closures.

ENTRY INTO AREAS CLOSED DUE TO VOLCANIC HAZARDS

Hawaii Volcanoes National Park will not authorize anyone with a research permit to enter a closed area due to volcanic hazards unless the information derived from the study will:

1) directly contribute towards planning, mitigation, and better understanding of hazards within the park or surrounding communities

2) identify and prevent injuries from recognizable threats to the safety and health of persons

The National Park Service is instructed to "work closely with specialists at the USGS and elsewhere…to devise effective geologic hazard identification and management strategies." The information is used so that "park managers will understand future hazards and…minimize their potential impacts on visitors, staff and developed areas." (NPS Management Policies 2006)

Research that does not meet the above criteria or that can be delayed will be denied. In addition, researchers must comply with park safety procedures and conditions for working in such areas.

CURATORIAL RESPONSIBILITIES OF COLLECTORS
HAWAII VOLCANOES NATIONAL PARK

Contact HAVO Museum Program (HAVO_Archive_Museum@nps.gov), or designee, regarding disposition of your collection and dissemination of findings, (typically copies of reports/thesis are stored in park archive). Note that specimen collection for personal collections are not allowed. Information given to the park may be made available to the public.

Collecting and doing research in the National Parks entails certain responsibilities and obligations regarding the curation of specimens and eventual public access to data. This is based on the Code of Federal Regulation which requires registration of specimens with the NPS Catalog. The CFR 36 2.5 (g) Research Specimens states, (1) specimens placed in displays or collections will bear official National Park Service museum labels and their catalog numbers will be registered in the National Park Service Catalog. (2) specimens and data derived from consumed specimens will be made available to the public and reports and publications resulting from a research specimen collection permit shall be filed with the superintendent. If you collect specimens that are to be permanently retained regardless of where they are kept those specimens must be accessioned and cataloged into the National Park Services Automated National Catalog System, and must bear National Park Service (NPS) labels containing NPS accession and catalog numbers.

Summary of permitted field methods and activities:

The proposed method would be simple, I would attach both Sniffer4D and SnifferV to batteries and either walk or drive around the park to plot any potential volcanic degassing spreading around through the park. The same day the SD chip will be removed from the device and the computed software will read the measurements and full detailed reports on all emission parameters will be sent to the NPS.

Recommended by park staff(name and title):

SIERRA MCDANIEL
Digitally signed by SIERRA MCDANIEL
Date: 2023.01.06 11:55:35 -10'00'

Natural Resource Program Manager

Reviewed by Collections Manager:

Yes X No ____

Approved by park official:

RHONDA LOH
Digitally signed by RHONDA LOH
Date: 2023.01.06 12:09:19 -10'00'

Date Approved:

Title:

Superintendent

I Agree To All Conditions And Restrictions Of this Permit As Specified
(Not valid unless signed and dated by the principal investigator)

(Principal investigator's signature) (Date)

THIS PERMIT AND ATTACHED CONDITIONS AND RESTRICTIONS MUST BE CARRIED AT ALL TIMES WHILE CONDUCTING RESEARCH ACTIVITIES IN THE DESIGNATED PARK(S)

GENERAL CONDITIONS
For
SCIENTIFIC RESEARCH AND COLLECTING PERMIT

United States Department of the Interior
National Park Service

1. **Authority** - The permittee is granted privileges covered under this permit subject to the supervision of the superintendent or a designee, and shall comply with all applicable laws and regulations of the National Park System area and other federal and state laws. A National Park Service (NPS) representative may accompany the permittee in the field to ensure compliance with regulations.

2. **Responsibility** - The permittee is responsible for ensuring that all persons working on the project adhere to permit conditions and applicable NPS regulations.

3. **False information** - The permittee is prohibited from giving false information that is used to issue this permit. To do so will be considered a breach of conditions and be grounds for revocation of this permit and other applicable penalties.

4. **Assignment** - This permit may not be transferred or assigned. Additional investigators and field assistants are to be coordinated by the person(s) named in the permit and should carry a copy of the permit while they are working in the park. The principal investigator shall notify the park's Research and Collecting Permit Office when there are desired changes in the approved study protocols or methods, changes in the affiliation or status of the principal investigator, or modification of the name of any project member.

5. **Revocation** - This permit may be terminated for breach of any condition. The permittee may consult with the appropriate NPS Regional Science Advisor to clarify issues resulting in a revoked permit and the potential for reinstatement by the park superintendent or a designee.

6. **Collection of specimens (including materials)** - No specimens (including materials) may be collected unless authorized on the Scientific Research and Collecting permit.

The general conditions for specimen collections are:

- Collection of archeological materials without a valid Federal Archeology Permit is prohibited.

- Collection of federally listed threatened or endangered species without a valid U.S. Fish and Wildlife Service endangered species permit is prohibited.

- Collection methods shall not attract undue attention or cause unapproved damage, depletion, or disturbance to the environment and other park resources, such as historic sites.

- New specimens must be reported to the NPS annually or more frequently if required by the park issuing the permit.Minimum information for annual reporting includes specimen classification, number of specimens collected, location collected, specimen status(e.g., herbarium sheet, preserved in alcohol / formalin, tanned and mounted, dried and boxed, etc.), and current location.

- Collected specimens that are not consumed in analysis or discarded after scientific analysis remain federal property.The NPS reserves the right to designate the repositories of all specimens removed from the park and to approve or restrict reassignment of specimens from one repository to another. Because specimens are Federal property, they shall not be destroyed or discarded without prior NPS authorization.
- Each specimen (or groups of specimens labeled as a group) that is retained permanently must bear NPS labels and must be accessioned and cataloged in the NPS National Catalog.Unless exempted by additional park - specific stipulations, the permittee will complete the labels and catalog records and will provide accession information.It is the permittee's responsibility to contact the park for cataloging instructions and specimen labels as well as instructions on repository designation for the specimens.

- Collected specimens may be used for scientific or educational purposes only, and shall be dedicated to public benefit and be accessible to the public in accordance with NPS policies and procedures.

- Any specimens collected under this permit, any components of any specimens (including but not limited to natural organisms, enzymes or other bioactive molecules, genetic materials, or seeds), and research results derived from collected specimens are to be used for

scientific or educational purposes only, and may not be used for commercial or other revenue - generating purposes unless the permittee has entered into a Cooperative Research And Development Agreement(CRADA) or other approved benefit - sharing agreement with the NPS.The sale of collected research specimens or other unauthorized transfers to third parties is prohibited.Furthermore, if the permittee sells or otherwise transfers collected specimens, any components thereof, or any products or research results developed from such specimens or their components without a CRADA or other approved benefit-sharing agreement with NPS, permittee will pay the NPS a royalty rate of twenty percent(20 %) of gross revenue from such sales or other revenues. In addition to such royalty, the NPS may seek other damages to which the NPS may be entitled including but not limited to injunctive relief against the permittee.

7. **Reports** - - The permittee is required to submit an Investigator's Annual Report and copies of final reports, publications, and other materials resulting from the study. Instructions for how and when to submit an annual report will be provided by NPS staff.Park research coordinators will analyze study proposals to determine whether copies of field notes, databases, maps, photos, and / or other materials may also be requested.The permittee is responsible for the content of reports and data provided to the National Park Service

8. **Confidentiality** - - The permittee agrees to keep the specific location of sensitive park resources confidential. Sensitive resources include threatened species, endangered species, and rare species, archeological sites, caves, fossil sites, minerals, commercially valuable resources, and sacred ceremonial sites.

9. **Methods of travel** - Travel within the park is restricted to only those methods that are available to the general public unless otherwise specified in additional stipulations associated with this permit.

10. **Other permits** - The permittee must obtain all other required permit(s) to conduct the specified project.

11. **Insurance** - If liability insurance is required by the NPS for this project, then documentation must be provided that it has been obtained and is current in all respects before this permit is considered valid.

12. **Mechanized equipment** - No use of mechanized equipment in designated, proposed, or potential wilderness areas is allowed unless authorized by the superintendent or a designee in additional specific conditions associated with this permit.

13. **NPS participation** - The permittee should not anticipate assistance from the NPS unless specific arrangements are made and documented in either an additional stipulation attached to this permit or in other separate written agreements.

14. **Permanent markers and field equipment** - The permittee is required to remove all markers or equipment from the field after the completion of the study or prior to the expiration date of this permit. The superintendent or a designee may modify this requirement through additional park specific conditions that may be attached to this permit. Additional conditions regarding the positioning and identification of markers and field equipment may be issued by staff at individual parks.

15. **Access to park and restricted areas** - Approval for any activity is contingent on the park being open and staffed for required operations. No entry into restricted areas is allowed unless authorized in additional park specific stipulations attached to this permit.

16. **Notification** - The permittee is required to contact the park's Research and Collecting Permit Office (or other offices if indicated in the stipulations associated with this permit) prior to initiating any fieldwork authorized by this permit.Ideally this contact should occur at least one week prior to the initial visit to the park.

17. **Expiration date** - Permits expire on the date listed. Nothing in this permit shall be construed as granting any exclusive research privileges or automatic right to continue, extend, or renew this or any other line of research under new permit(s).

18. **Other stipulations** - This permit includes by reference all stipulations listed in the application materials or in additional attachments to this permit provided by the superintendent or a designee. Breach of any of the terms of this permit will be grounds for revocation of this permit and denial of future permits.