



INVESTIGATOR'S ANNUAL REPORT

If you are not using the automated system supporting this report process,
please fill out this form and return it to the appropriate park.
All or some of the information you provide may become available to the public.



Reporting Year 2008	Park Hawaii Volcanoes NP	Select the type of permit this report addresses: ☒ Scientific Study ☐ Science Education Activity	
Name of Principal Investigator or Responsible Official ☒ Dr. ☐ Ms. ☐ Mr. ☐ Mrs. First Name Lloyd Last Name Hihara		Office Phone (808)956-2365	Cell Phone (808)753-4707
Mailing Address 2540 Dole St. Holmes Hall 302, Honolulu, HI 96822		Office Fax (808)956-2373	Email Address hihara@hawaii.edu
Additional scientific study investigators: (first name, last name) Ryan Sugamoto (808)956-6715 rsugamot@hawaii.edu			
Project Title (maximum 300 characters) Corrosion Testing at the Hawaii Volcanoes National Park			
Park-assigned Study or Activity # HAVO-00227	Park-assigned Permit # HAVO-2006-SCI-0034	Permit Start Date Jun 08, 2006	Permit Expiration Date Dec 31, 2007
Scientific Study Starting Date Jun 08, 2006		Estimated Scientific Study Ending Date Dec 31, 2007	
For either a Scientific Study or a Science Education Activity, the status is: (select one) ☐ Completed (for a study, check only if all specimens are cataloged) ☒ Continuing ☐ Suspended ☐ Terminated before completion		For a Scientific Study that is completed, please check each of the following that applies: ☐ Final report has been provided to the park or will be provided to the park within the next two years ☐ Copies of field notes, data files, photos, or other study records, as agreed, have been provided to the park ☐ All collected and retained specimens and retained material originating from such specimens have been cataloged into the NPS catalog system and NPS has processed loan agreements as needed	
Activity Type: (select one) ☒ Research ☐ Inventory ☐ Monitoring ☐ Education ☐ Other:			
Subject/Discipline: (maximum 60 characters) Air Pollution Effects, Corrosion			
Purpose of Scientific Study or Science Education Activity during the reporting year: (maximum 4000 characters) The corrosion studies being conducted at Hawai'i Volcanoes National Park are part of research programs sponsored by the Department of Defense, and implemented through the Hawaii Corrosion Laboratory, Department of Mechanical Engineering, University of Hawai'i at Mānoa. The State of Hawai'i is an ideal location for conducting atmospheric corrosion research due to its spatially diverse climatic zones and environmental conditions, which represent that of a miniature continent. Rainfall, solar radiation, temperature, humidity, and wind vary significantly over relatively short distances. Humid tropical rainforests, the World's wettest spot, arid and semi-arid deserts, temperate, and frozen alpine microclimates exist in Hawai'i. In addition, environmental conditions such as marine, volcanic, industrial, and agricultural add to the diversity of corrosion test sites. One of the project objectives is to study corrosion of metals in Hawai'i's microclimates to determine if similarities exist with corrosion behavior in the Pacific Rim (Alaska, Japan, Korea, US Pacific Coast, etc.). Of particular interest is corrosion testing in the Hawai'i Volcanoes National Park due to highly corrosive acid rain conditions.			

Findings and status of Scientific Study (including collections made and catalog status of retained specimens and retained material originating from such specimens) or accomplishments of Science Education Activity during the reporting year:
(maximum 4000 characters)

Corrosion test racks and weather monitoring equipment have been deployed Hawaii Volcanoes National Park north of the Naulu Trail Rest Area on Chain of Craters Road at an elevation of around 1,800 feet above sea level and approximately 5 miles downwind of the Pu'u 'O'o vent. The equipment rests directly on the ground and is weighed down by concrete blocks and the weight of the test racks themselves. Solar panels and batteries are used for the weather monitoring equipment and no hazardous materials are used or exposed at the test site. Specimens exposed at the site include metallic panels and coated samples. No material is removed from the park other than the specimens that were deployed and retrieved as part of the study.

Data collected includes corrosion rates and environmental parameters such as temperature, relative humidity, rainfall, wind speed/direction, chloride and sulfate deposition rates, etc. Analysis includes correlations between key environmental factors. Raw data files and resulting journal publications can be made available to the Hawai'i Volcanoes National Park upon request.

In general, data collected at the site has revealed that the location offers a harsh environment particularly in terms of acid rain. Measurements of rainwater pH from August of 2006 to January of 2008 have ranged from a low of 3.1 to a high of 4.0. In addition, high humidity (75% or higher relative humidity (R.H.) 68% of the time), high time-of-wetness and significant amounts of chloride result in high corrosion rates for many metals and alloys exposed there.

Data collection and sample exposure at the site is ongoing.

For Scientific Studies (not Science Education Activities), do you still retain any specimens collected from the park or material originating from such specimens that have not been destroyed during analysis? ☐ Yes ☒ No
If "Yes", identify each institution and type of material where the specimens or material originating from such specimens currently are housed:

Funding specifically used in this park this reporting year that was provided by NPS: *(enter dollar amount)*

\$0.00

Funding specifically used in this park this reporting year that was provided by all other sources: *(enter dollar amount)*

\$12,000.00

List any other U.S. Government Agencies supporting this study or activity and the funding each provided this reporting:

Department of Defense

NOTICES

Privacy Act Statement

Privacy Act Statement

Authority: 16 U.S.C. 1, National Park Service Organic Act; 16 U.S.C. 3, Rules and regulations of national parks, reservations, and monuments; timber; leases; 16 U.S.C. 5935, National Parks Omnibus Management Act.

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Disclosure: Voluntary, however, the Investigator's Annual Report is required as a general condition of each permit issued; failure to provide the requested information may impede the processing and publication of the Investigator's Annual Report and the processing of associated permit renewal requests.

Paperwork Reduction Act Statement

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Estimated Burden Statement

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Name of Principal Investigator or Responsible Official ☒ Dr. ☐ Ms. ☐ Mr. ☐ Mrs. First Name Lloyd Last Name Hihara		Office Phone (808)956-2365	Cell Phone (808)753-4707
Mailing Address 2540 Dole St. Holmes Hall 302, Honolulu, HI 96822		Office Fax (808)956-2373	Email Address hihara@hawaii.edu
Additional scientific study investigators: (first name, last name) Ryan Sugamoto (808)956-6715 rsugamot@hawaii.edu			
Project Title (maximum 300 characters) Corrosion Testing at the Hawaii Volcanoes National Park			
Park-assigned Study or Activity # HAVO-00227	Park-assigned Permit # HAVO-2006-SCI-0034	Permit Start Date Jun 08, 2006	Permit Expiration Date Dec 31, 2007
Scientific Study Starting Date Jun 08, 2006		Estimated Scientific Study Ending Date Dec 31, 2007	
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Activity Type: (select one) ☒ Research ☐ Inventory ☐ Monitoring ☐ Education ☐ Other:			
Subject/Discipline: (maximum 60 characters) Air Pollution Effects, Corrosion			
Purpose of Scientific Study or Science Education Activity during the reporting year: (maximum 4000 characters) The corrosion studies being conducted at Hawai'i Volcanoes National Park are part of research programs sponsored by the Department of Defense, and implemented through the Hawaii Corrosion Laboratory, Department of Mechanical Engineering, University of Hawai'i at Mānoa. The State of Hawai'i is an ideal location for conducting atmospheric corrosion research due to its spatially diverse climatic zones and environmental conditions, which represent that of a miniature continent. Rainfall, solar radiation, temperature, humidity, and wind vary significantly over relatively short distances. Humid tropical rainforests, the World's wettest spot, arid and semi-arid deserts, temperate, and frozen alpine microclimates exist in Hawai'i. In addition, environmental conditions such as marine, volcanic, industrial, and agricultural add to the diversity of corrosion test sites. One of the project objectives is to study corrosion of metals in Hawai'i's microclimates to determine if similarities exist with corrosion behavior in the Pacific Rim (Alaska, Japan, Korea, US Pacific Coast, etc.). Of particular interest is corrosion testing in the Hawai'i Volcanoes National Park due to highly corrosive acid rain conditions.			

Findings and status of Scientific Study (including collections made and catalog status of retained specimens and retained material originating from such specimens) or accomplishments of Science Education Activity during the reporting year:
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Data collected includes corrosion rates and environmental parameters such as temperature, relative humidity, rainfall, wind speed/direction, chloride and sulfate deposition rates, etc. Analysis includes correlations between key environmental factors. Raw data files and resulting journal publications can be made available to the Hawai'i Volcanoes National Park upon request.

In general, data collected at the site has revealed that the location offers a harsh environment particularly in terms of acid rain. Measurements of rainwater pH from August of 2006 to January of 2008 have ranged from a low of 3.1 to a high of 4.0. In addition, high humidity (75% or higher relative humidity (R.H.) 68% of the time), high time-of-wetness and significant amounts of chloride result in high corrosion rates for many metals and alloys exposed there.

Data collection and sample exposure at the site is ongoing.

For Scientific Studies (not Science Education Activities), do you still retain any specimens collected from the park or material originating from such specimens that have not been destroyed during analysis? ☐ Yes ☒ No
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\$0.00

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\$12,000.00

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Reporting Year 2010	Park Hawaii Volcanoes NP	Select the type of permit this report addresses: ☒ Scientific Study ☐ Science Education Activity	
Name of Principal Investigator or Responsible Official ☒ Dr. ☐ Ms. ☐ Mr. ☐ Mrs. First Name Lloyd Last Name Hihara		Office Phone (808)956-2365	Cell Phone (808)753-4707
Mailing Address 2540 Dole St. Holmes Hall 302, Honolulu, HI 96822		Office Fax (808)956-2373	Email Address hihara@hawaii.edu
Additional scientific study investigators: (first name, last name) Ryan Sugamoto (808)956-6715 rsugamot@hawaii.edu			
Project Title (maximum 300 characters) Corrosion Testing at the Hawaii Volcanoes National Park			
Park-assigned Study or Activity # HAVO-00227	Park-assigned Permit # HAVO-2006-SCI-0034	Permit Start Date Jun 08, 2006	Permit Expiration Date Dec 31, 2007
Scientific Study Starting Date Jun 08, 2006		Estimated Scientific Study Ending Date Dec 31, 2007	
For either a Scientific Study or a Science Education Activity, the status is: (select one) ☐ Completed (for a study, check only if all specimens are cataloged) ☒ Continuing ☐ Suspended ☐ Terminated before completion		For a Scientific Study that is completed, please check each of the following that applies: ☐ Final report has been provided to the park or will be provided to the park within the next two years ☐ Copies of field notes, data files, photos, or other study records, as agreed, have been provided to the park ☐ All collected and retained specimens and retained material originating from such specimens have been cataloged into the NPS catalog system and NPS has processed loan agreements as needed	
Activity Type: (select one) ☒ Research ☐ Inventory ☐ Monitoring ☐ Education ☐ Other:			
Subject/Discipline: (maximum 60 characters) Air Pollution Effects, Corrosion			
Purpose of Scientific Study or Science Education Activity during the reporting year: (maximum 4000 characters) The corrosion studies being conducted at Hawai'i Volcanoes National Park are part of research programs sponsored by the Department of Defense, and implemented through the Hawaii Corrosion Laboratory, Department of Mechanical Engineering, University of Hawai'i at Mānoa. The State of Hawai'i is an ideal location for conducting atmospheric corrosion research due to its spatially diverse climatic zones and environmental conditions, which represent that of a miniature continent. Rainfall, solar radiation, temperature, humidity, and wind vary significantly over relatively short distances. Humid tropical rainforests, the World's wettest spot, arid and semi-arid deserts, temperate, and frozen alpine microclimates exist in Hawai'i. In addition, environmental conditions such as marine, volcanic, industrial, and agricultural add to the diversity of corrosion test sites. One of the project objectives is to study corrosion of metals in Hawai'i's microclimates to determine if similarities exist with corrosion behavior in the Pacific Rim (Alaska, Japan, Korea, US Pacific Coast, etc.). Of particular interest is corrosion testing in the Hawai'i Volcanoes National Park due to highly corrosive acid rain conditions.			

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In general, data collected at the site has revealed that the location offers a harsh environment particularly in terms of acid rain. Measurements of rainwater pH from August of 2006 to January of 2008 have ranged from a low of 3.1 to a high of 4.0. In addition, high humidity (75% or higher relative humidity (R.H.) 68% of the time), high time-of-wetness and significant amounts of chloride result in high corrosion rates for many metals and alloys exposed there.

Data collection and sample exposure at the site is ongoing.

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\$0.00

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\$5,000.00

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Department of Defense

NOTICES

Privacy Act Statement

Privacy Act Statement

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Reporting Year 2011	Park Hawaii Volcanoes NP	Select the type of permit this report addresses: ☒ Scientific Study ☐ Science Education Activity	
Name of Principal Investigator or Responsible Official ☒ Dr. ☐ Ms. ☐ Mr. ☐ Mrs. First Name Lloyd Last Name Hihara		Office Phone (808)956-2365	Cell Phone (808)753-4707
Mailing Address 2540 Dole St. Holmes Hall 302, Honolulu, HI 96822		Office Fax (808)956-2373	Email Address hihara@hawaii.edu
Additional scientific study investigators: (first name, last name) Ryan Sugamoto (808)956-6715 rsugamot@hawaii.edu			
Project Title (maximum 300 characters) Corrosion Testing at the Hawaii Volcanoes National Park			
Park-assigned Study or Activity # HAVO-00227	Park-assigned Permit # HAVO-2006-SCI-0034	Permit Start Date Jun 08, 2006	Permit Expiration Date Dec 31, 2007
Scientific Study Starting Date Jun 08, 2006		Estimated Scientific Study Ending Date Dec 31, 2007	
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Subject/Discipline: (maximum 60 characters) Air Pollution Effects, Corrosion			
Purpose of Scientific Study or Science Education Activity during the reporting year: (maximum 4000 characters) The corrosion studies being conducted at Hawai'i Volcanoes National Park are part of research programs sponsored by the Department of Defense, and implemented through the Hawaii Corrosion Laboratory, Department of Mechanical Engineering, University of Hawai'i at Mānoa. The State of Hawai'i is an ideal location for conducting atmospheric corrosion research due to its spatially diverse climatic zones and environmental conditions, which represent that of a miniature continent. Rainfall, solar radiation, temperature, humidity, and wind vary significantly over relatively short distances. Humid tropical rainforests, the World's wettest spot, arid and semi-arid deserts, temperate, and frozen alpine microclimates exist in Hawai'i. In addition, environmental conditions such as marine, volcanic, industrial, and agricultural add to the diversity of corrosion test sites. One of the project objectives is to study corrosion of metals in Hawai'i's microclimates to determine if similarities exist with corrosion behavior in the Pacific Rim (Alaska, Japan, Korea, US Pacific Coast, etc.). Of particular interest is corrosion testing in the Hawai'i Volcanoes National Park due to highly corrosive acid rain conditions.			

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Reporting Year 2012	Park Hawaii Volcanoes NP	Select the type of permit this report addresses: ☒ Scientific Study ☐ Science Education Activity	
Name of Principal Investigator or Responsible Official ☒ Dr. ☐ Ms. ☐ Mr. ☐ Mrs. First Name Lloyd Last Name Hihara		Office Phone (808)956-2365	Cell Phone (808)753-4707
Mailing Address 2540 Dole St. Holmes Hall 302, Honolulu, HI 96822		Office Fax (808)956-2373	Email Address hihara@hawaii.edu
Additional scientific study investigators: (first name, last name) Ryan Sugamoto (808)956-6715 rsugamot@hawaii.edu			
Project Title (maximum 300 characters) Corrosion Testing at the Hawaii Volcanoes National Park			
Park-assigned Study or Activity # HAVO-00227	Park-assigned Permit # HAVO-2006-SCI-0034	Permit Start Date Jun 08, 2006	Permit Expiration Date Dec 31, 2007
Scientific Study Starting Date Jun 08, 2006		Estimated Scientific Study Ending Date Dec 31, 2007	
For either a Scientific Study or a Science Education Activity, the status is: (select one) ☐ Completed (for a study, check only if all specimens are cataloged) ☒ Continuing ☐ Suspended ☐ Terminated before completion		For a Scientific Study that is completed, please check each of the following that applies: ☐ Final report has been provided to the park or will be provided to the park within the next two years ☐ Copies of field notes, data files, photos, or other study records, as agreed, have been provided to the park ☐ All collected and retained specimens and retained material originating from such specimens have been cataloged into the NPS catalog system and NPS has processed loan agreements as needed	
Activity Type: (select one) ☒ Research ☐ Inventory ☐ Monitoring ☐ Education ☐ Other:			
Subject/Discipline: (maximum 60 characters) Air Pollution Effects, Corrosion			
Purpose of Scientific Study or Science Education Activity during the reporting year: (maximum 4000 characters) The corrosion studies being conducted at Hawai'i Volcanoes National Park are part of research programs sponsored by the Department of Defense, and implemented through the Hawaii Corrosion Laboratory, Department of Mechanical Engineering, University of Hawai'i at Mānoa. The State of Hawai'i is an ideal location for conducting atmospheric corrosion research due to its spatially diverse climatic zones and environmental conditions, which represent that of a miniature continent. Rainfall, solar radiation, temperature, humidity, and wind vary significantly over relatively short distances. Humid tropical rainforests, the World's wettest spot, arid and semi-arid deserts, temperate, and frozen alpine microclimates exist in Hawai'i. In addition, environmental conditions such as marine, volcanic, industrial, and agricultural add to the diversity of corrosion test sites. One of the project objectives is to study corrosion of metals in Hawai'i's microclimates to determine if similarities exist with corrosion behavior in the Pacific Rim (Alaska, Japan, Korea, US Pacific Coast, etc.). Of particular interest is corrosion testing in the Hawai'i Volcanoes National Park due to highly corrosive acid rain conditions.			

Findings and status of Scientific Study (including collections made and catalog status of retained specimens and retained material originating from such specimens) or accomplishments of Science Education Activity during the reporting year:
(maximum 4000 characters)

Corrosion test racks and weather monitoring equipment have been deployed Hawaii Volcanoes National Park north of the Naulu Trail Rest Area on Chain of Craters Road at an elevation of around 1,800 feet above sea level and approximately 5 miles downwind of the Pu'u 'O'o vent. The equipment rests directly on the ground and is weighed down by concrete blocks and the weight of the test racks themselves. Solar panels and batteries are used for the weather monitoring equipment and no hazardous materials are used or exposed at the test site. Specimens exposed at the site include metallic panels and coated samples. No material is removed from the park other than the specimens that were deployed and retrieved as part of the study.

Data collected includes corrosion rates and environmental parameters such as temperature, relative humidity, rainfall, wind speed/direction, chloride and sulfate deposition rates, etc. Analysis includes correlations between key environmental factors. Raw data files and resulting journal publications can be made available to the Hawai'i Volcanoes National Park upon request.

In general, data collected at the site has revealed that the location offers a harsh environment particularly in terms of acid rain. Measurements of rainwater pH from August of 2006 to January of 2008 have ranged from a low of 3.1 to a high of 4.0. In addition, high humidity (75% or higher relative humidity (R.H.) 68% of the time), high time-of-wetness and significant amounts of chloride result in high corrosion rates for many metals and alloys exposed there.

Data collection and sample exposure at the site is ongoing.

For Scientific Studies (not Science Education Activities), do you still retain any specimens collected from the park or material originating from such specimens that have not been destroyed during analysis? ☐ Yes ☒ No
If "Yes", identify each institution and type of material where the specimens or material originating from such specimens currently are housed:

Funding specifically used in this park this reporting year that was provided by NPS: *(enter dollar amount)*

\$0.00

Funding specifically used in this park this reporting year that was provided by all other sources: *(enter dollar amount)*

\$12,000.00

List any other U.S. Government Agencies supporting this study or activity and the funding each provided this reporting:

Department of Defense

NOTICES

Privacy Act Statement

Privacy Act Statement

Authority: 16 U.S.C. 1, National Park Service Organic Act; 16 U.S.C. 3, Rules and regulations of national parks, reservations, and monuments; timber; leases; 16 U.S.C. 5935, National Parks Omnibus Management Act.

Purpose: The two primary uses of the records maintained in the system are to administer scientific research and collecting within units of the National Park System, and to make Investigator's Annual Reports available to the public.

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Disclosure: Voluntary, however, the Investigator's Annual Report is required as a general condition of each permit issued; failure to provide the requested information may impede the processing and publication of the Investigator's Annual Report and the processing of associated permit renewal requests.

Paperwork Reduction Act Statement

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Estimated Burden Statement

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INVESTIGATOR'S ANNUAL REPORT

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Reporting Year 2013	Park Hawaii Volcanoes NP	Select the type of permit this report addresses: ☒ Scientific Study ☐ Science Education Activity	
Name of Principal Investigator or Responsible Official ☒ Dr. ☐ Ms. ☐ Mr. ☐ Mrs. First Name Lloyd Last Name Hihara		Office Phone (808)956-2365	Cell Phone (808)753-4707
Mailing Address 2540 Dole St. Holmes Hall 302, Honolulu, HI 96822		Office Fax (808)956-2373	Email Address hihara@hawaii.edu
Additional scientific study investigators: (first name, last name) Ryan Sugamoto (808)956-6715 rsugamot@hawaii.edu , Jan Kealoha jnakaya@hawaii.edu			
Project Title (maximum 300 characters) Corrosion Testing at the Hawaii Volcanoes National Park			
Park-assigned Study or Activity # HAVO-00227	Park-assigned Permit # HAVO-2006-SCI-0034	Permit Start Date Jun 08, 2006	Permit Expiration Date Dec 31, 2007
Scientific Study Starting Date Jun 08, 2006		Estimated Scientific Study Ending Date Dec 31, 2007	
For either a Scientific Study or a Science Education Activity, the status is: (select one) ☐ Completed (for a study, check only if all specimens are cataloged) ☒ Continuing ☐ Suspended ☐ Terminated before completion		For a Scientific Study that is completed, please check each of the following that applies: ☐ Final report has been provided to the park or will be provided to the park within the next two years ☐ Copies of field notes, data files, photos, or other study records, as agreed, have been provided to the park ☐ All collected and retained specimens and retained material originating from such specimens have been cataloged into the NPS catalog system and NPS has processed loan agreements as needed	
Activity Type: (select one) ☒ Research ☐ Inventory ☐ Monitoring ☐ Education ☐ Other:			
Subject/Discipline: (maximum 60 characters) Air Pollution Effects, Corrosion			
Purpose of Scientific Study or Science Education Activity during the reporting year: (maximum 4000 characters) The corrosion studies being conducted at Hawai'i Volcanoes National Park are part of research programs sponsored by the Department of Defense, and implemented through the Hawaii Corrosion Laboratory, Department of Mechanical Engineering, University of Hawai'i at Mānoa. The State of Hawai'i is an ideal location for conducting atmospheric corrosion research due to its spatially diverse climatic zones and environmental conditions, which represent that of a miniature continent. Rainfall, solar radiation, temperature, humidity, and wind vary significantly over relatively short distances. Humid tropical rainforests, the World's wettest spot, arid and semi-arid deserts, temperate, and frozen alpine microclimates exist in Hawai'i. In addition, environmental conditions such as marine, volcanic, industrial, and agricultural add to the diversity of corrosion test sites. One of the project objectives is to study corrosion of metals in Hawai'i's microclimates to determine if similarities exist with corrosion behavior in the Pacific Rim (Alaska, Japan, Korea, US Pacific Coast, etc.). Of particular interest is corrosion testing in the Hawai'i Volcanoes National Park due to highly corrosive acid rain conditions.			

Findings and status of Scientific Study (including collections made and catalog status of retained specimens and retained material originating from such specimens) or accomplishments of Science Education Activity during the reporting year:
(maximum 4000 characters)

Corrosion test racks and weather monitoring equipment have been deployed Hawaii Volcanoes National Park north of the Naulu Trail Rest Area on Chain of Craters Road at an elevation of around 1,800 feet above sea level and approximately 5 miles downwind of the Pu'u 'O'o vent. The equipment rests directly on the ground and is weighed down by concrete blocks and the weight of the test racks themselves. Solar panels and batteries are used for the weather monitoring equipment and no hazardous materials are used or exposed at the test site. Specimens exposed at the site include metallic panels and coated samples. No material is removed from the park other than the specimens that were deployed and retrieved as part of the study.

Data collected includes corrosion rates and environmental parameters such as temperature, relative humidity, rainfall, wind speed/direction, chloride and sulfate deposition rates, etc. Analysis includes correlations between key environmental factors. Raw data files and resulting journal publications can be made available to the Hawai'i Volcanoes National Park upon request.

In general, data collected at the site has revealed that the location offers a harsh environment particularly in terms of acid rain. Measurements of rainwater pH from August of 2006 to January of 2008 have ranged from a low of 3.1 to a high of 4.0. In addition, high humidity (75% or higher relative humidity (R.H.) 68% of the time), high time-of-wetness and significant amounts of chloride result in high corrosion rates for many metals and alloys exposed there.

Data collection and sample exposure at the site is ongoing.

For Scientific Studies (not Science Education Activities), do you still retain any specimens collected from the park or material originating from such specimens that have not been destroyed during analysis? ☐ Yes ☒ No
If "Yes", identify each institution and type of material where the specimens or material originating from such specimens currently are housed:

Funding specifically used in this park this reporting year that was provided by NPS: *(enter dollar amount)*

\$0.00

Funding specifically used in this park this reporting year that was provided by all other sources: *(enter dollar amount)*

\$12,000.00

List any other U.S. Government Agencies supporting this study or activity and the funding each provided this reporting:

Department of Defense

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Privacy Act Statement

Authority: 16 U.S.C. 1, National Park Service Organic Act; 16 U.S.C. 3, Rules and regulations of national parks, reservations, and monuments; timber; leases; 16 U.S.C. 5935, National Parks Omnibus Management Act.

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Estimated Burden Statement

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INVESTIGATOR'S ANNUAL REPORT

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Reporting Year 2014	Park Hawaii Volcanoes NP	Select the type of permit this report addresses: ☒ Scientific Study ☐ Science Education Activity	
Name of Principal Investigator or Responsible Official ☒ Dr. ☐ Ms. ☐ Mr. ☐ Mrs. First Name Lloyd Last Name Hihara		Office Phone (808)956-2365	Cell Phone (808)753-4707
Mailing Address 2540 Dole St. Holmes Hall 302, Honolulu, HI 96822		Office Fax (808)956-2373	Email Address hihara@hawaii.edu
Additional scientific study investigators: (first name, last name) Ryan Sugamoto (808)956-6715 rsugamot@hawaii.edu , Jan Kealoha jnakaya@hawaii.edu			
Project Title (maximum 300 characters) Corrosion Testing at the Hawaii Volcanoes National Park			
Park-assigned Study or Activity # HAVO-00227	Park-assigned Permit # HAVO-2006-SCI-0034	Permit Start Date Jun 08, 2006	Permit Expiration Date Dec 31, 2007
Scientific Study Starting Date Jun 08, 2006		Estimated Scientific Study Ending Date Dec 31, 2007	
For either a Scientific Study or a Science Education Activity, the status is: (select one) ☐ Completed (for a study, check only if all specimens are cataloged) ☒ Continuing ☐ Suspended ☐ Terminated before completion		For a Scientific Study that is completed, please check each of the following that applies: ☐ Final report has been provided to the park or will be provided to the park within the next two years ☐ Copies of field notes, data files, photos, or other study records, as agreed, have been provided to the park ☐ All collected and retained specimens and retained material originating from such specimens have been cataloged into the NPS catalog system and NPS has processed loan agreements as needed	
Activity Type: (select one) ☒ Research ☐ Inventory ☐ Monitoring ☐ Education ☐ Other:			
Subject/Discipline: (maximum 60 characters) Air Pollution Effects, Corrosion			
Purpose of Scientific Study or Science Education Activity during the reporting year: (maximum 4000 characters) The corrosion studies being conducted at Hawai'i Volcanoes National Park are part of research programs sponsored by the Department of Defense, and implemented through the Hawaii Corrosion Laboratory, Department of Mechanical Engineering, University of Hawai'i at Mānoa. The State of Hawai'i is an ideal location for conducting atmospheric corrosion research due to its spatially diverse climatic zones and environmental conditions, which represent that of a miniature continent. Rainfall, solar radiation, temperature, humidity, and wind vary significantly over relatively short distances. Humid tropical rainforests, the World's wettest spot, arid and semi-arid deserts, temperate, and frozen alpine microclimates exist in Hawai'i. In addition, environmental conditions such as marine, volcanic, industrial, and agricultural add to the diversity of corrosion test sites. One of the project objectives is to study corrosion of metals in Hawai'i's microclimates to determine if similarities exist with corrosion behavior in the Pacific Rim (Alaska, Japan, Korea, US Pacific Coast, etc.). Of particular interest is corrosion testing in the Hawai'i Volcanoes National Park due to highly corrosive acid rain conditions.			

Findings and status of Scientific Study (including collections made and catalog status of retained specimens and retained material originating from such specimens) or accomplishments of Science Education Activity during the reporting year:
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Data collected includes corrosion rates and environmental parameters such as temperature, relative humidity, rainfall, wind speed/direction, chloride and sulfate deposition rates, etc. Analysis includes correlations between key environmental factors. Raw data files and resulting journal publications can be made available to the Hawai'i Volcanoes National Park upon request.

In general, data collected at the site has revealed that the location offers a harsh environment particularly in terms of acid rain. Measurements of rainwater pH from August of 2006 to January of 2008 have ranged from a low of 3.1 to a high of 4.0. In addition, high humidity (75% or higher relative humidity (R.H.) 68% of the time), high time-of-wetness and significant amounts of chloride result in high corrosion rates for many metals and alloys exposed there.

Data collection and sample exposure at the site is ongoing.

For Scientific Studies (not Science Education Activities), do you still retain any specimens collected from the park or material originating from such specimens that have not been destroyed during analysis? ☐ Yes ☒ No
If "Yes", identify each institution and type of material where the specimens or material originating from such specimens currently are housed:

Funding specifically used in this park this reporting year that was provided by NPS: *(enter dollar amount)*

\$0.00

Funding specifically used in this park this reporting year that was provided by all other sources: *(enter dollar amount)*

\$12,000.00

List any other U.S. Government Agencies supporting this study or activity and the funding each provided this reporting:

Department of Defense

NOTICES

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Privacy Act Statement

Authority: 16 U.S.C. 1, National Park Service Organic Act; 16 U.S.C. 3, Rules and regulations of national parks, reservations, and monuments; timber; leases; 16 U.S.C. 5935, National Parks Omnibus Management Act.

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Disclosure: Voluntary, however, the Investigator's Annual Report is required as a general condition of each permit issued; failure to provide the requested information may impede the processing and publication of the Investigator's Annual Report and the processing of associated permit renewal requests.

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Estimated Burden Statement

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INVESTIGATOR'S ANNUAL REPORT

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Reporting Year 2015	Park Hawaii Volcanoes NP	Select the type of permit this report addresses: ☒ Scientific Study ☐ Science Education Activity	
Name of Principal Investigator or Responsible Official ☒ Dr. ☐ Ms. ☐ Mr. ☐ Mrs. First Name Lloyd Last Name Hihara		Office Phone (808)956-2365	Cell Phone (808)753-4707
Mailing Address 2540 Dole St. Holmes Hall 302, Honolulu, HI 96822		Office Fax (808)956-2373	Email Address hihara@hawaii.edu
Additional scientific study investigators: (first name, last name) Ryan Sugamoto (808)956-6715 rsugamot@hawaii.edu , Jan Kealoha jnakaya@hawaii.edu			
Project Title (maximum 300 characters) Corrosion Testing at the Hawaii Volcanoes National Park			
Park-assigned Study or Activity # HAVO-00227	Park-assigned Permit # HAVO-2006-SCI-0034	Permit Start Date Jun 08, 2006	Permit Expiration Date Dec 31, 2007
Scientific Study Starting Date Jun 08, 2006		Estimated Scientific Study Ending Date Dec 31, 2007	
For either a Scientific Study or a Science Education Activity, the status is: (select one) ☐ Completed (for a study, check only if all specimens are cataloged) ☒ Continuing ☐ Suspended ☐ Terminated before completion		For a Scientific Study that is completed, please check each of the following that applies: ☐ Final report has been provided to the park or will be provided to the park within the next two years ☐ Copies of field notes, data files, photos, or other study records, as agreed, have been provided to the park ☐ All collected and retained specimens and retained material originating from such specimens have been cataloged into the NPS catalog system and NPS has processed loan agreements as needed	
Activity Type: (select one) ☒ Research ☐ Inventory ☐ Monitoring ☐ Education ☐ Other:			
Subject/Discipline: (maximum 60 characters) Air Pollution Effects, Corrosion			
Purpose of Scientific Study or Science Education Activity during the reporting year: (maximum 4000 characters) The corrosion studies being conducted at Hawai'i Volcanoes National Park are part of research programs sponsored by the Department of Defense, and implemented through the Hawaii Corrosion Laboratory, Department of Mechanical Engineering, University of Hawai'i at Mānoa. The State of Hawai'i is an ideal location for conducting atmospheric corrosion research due to its spatially diverse climatic zones and environmental conditions, which represent that of a miniature continent. Rainfall, solar radiation, temperature, humidity, and wind vary significantly over relatively short distances. Humid tropical rainforests, the World's wettest spot, arid and semi-arid deserts, temperate, and frozen alpine microclimates exist in Hawai'i. In addition, environmental conditions such as marine, volcanic, industrial, and agricultural add to the diversity of corrosion test sites. One of the project objectives is to study corrosion of metals in Hawai'i's microclimates to determine if similarities exist with corrosion behavior in the Pacific Rim (Alaska, Japan, Korea, US Pacific Coast, etc.). Of particular interest is corrosion testing in the Hawai'i Volcanoes National Park due to highly corrosive acid rain conditions.			

Findings and status of Scientific Study (including collections made and catalog status of retained specimens and retained material originating from such specimens) or accomplishments of Science Education Activity during the reporting year:
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Data collection and sample exposure at the site is ongoing.

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Funding specifically used in this park this reporting year that was provided by NPS: *(enter dollar amount)*

\$0.00

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Department of Defense

NOTICES

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Privacy Act Statement

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All or some of the information you provide may become available to the public.



Reporting Year 2016	Park Hawaii Volcanoes NP	Select the type of permit this report addresses: ☒ Scientific Study ☐ Science Education Activity	
Name of Principal Investigator or Responsible Official ☒ Dr. ☐ Ms. ☐ Mr. ☐ Mrs. First Name Lloyd Last Name Hihara		Office Phone (808)956-2365	Cell Phone (808)753-4707
Mailing Address 2540 Dole St. Holmes Hall 302, Honolulu, HI 96822		Office Fax (808)956-2373	Email Address hihara@hawaii.edu
Additional scientific study investigators: (first name, last name) Ryan Sugamoto (808)956-6715 rsugamot@hawaii.edu , Jan Kealoha jnakaya@hawaii.edu			
Project Title (maximum 300 characters) Corrosion Testing at the Hawaii Volcanoes National Park			
Park-assigned Study or Activity # HAVO-00227	Park-assigned Permit # HAVO-2006-SCI-0034	Permit Start Date Jun 08, 2006	Permit Expiration Date Dec 31, 2007
Scientific Study Starting Date Jun 08, 2006		Estimated Scientific Study Ending Date Dec 31, 2007	
For either a Scientific Study or a Science Education Activity, the status is: (select one) ☐ Completed (for a study, check only if all specimens are cataloged) ☒ Continuing ☐ Suspended ☐ Terminated before completion		For a Scientific Study that is completed, please check each of the following that applies: ☐ Final report has been provided to the park or will be provided to the park within the next two years ☐ Copies of field notes, data files, photos, or other study records, as agreed, have been provided to the park ☐ All collected and retained specimens and retained material originating from such specimens have been cataloged into the NPS catalog system and NPS has processed loan agreements as needed	
Activity Type: (select one) ☒ Research ☐ Inventory ☐ Monitoring ☐ Education ☐ Other:			
Subject/Discipline: (maximum 60 characters) Air Pollution Effects, Corrosion			
Purpose of Scientific Study or Science Education Activity during the reporting year: (maximum 4000 characters) The corrosion studies being conducted at Hawai'i Volcanoes National Park are part of research programs sponsored by the Department of Defense, and implemented through the Hawaii Corrosion Laboratory, Department of Mechanical Engineering, University of Hawai'i at Mānoa. The State of Hawai'i is an ideal location for conducting atmospheric corrosion research due to its spatially diverse climatic zones and environmental conditions, which represent that of a miniature continent. Rainfall, solar radiation, temperature, humidity, and wind vary significantly over relatively short distances. Humid tropical rainforests, the World's wettest spot, arid and semi-arid deserts, temperate, and frozen alpine microclimates exist in Hawai'i. In addition, environmental conditions such as marine, volcanic, industrial, and agricultural add to the diversity of corrosion test sites. One of the project objectives is to study corrosion of metals in Hawai'i's microclimates to determine if similarities exist with corrosion behavior in the Pacific Rim (Alaska, Japan, Korea, US Pacific Coast, etc.). Of particular interest is corrosion testing in the Hawai'i Volcanoes National Park due to highly corrosive acid rain conditions.			

Findings and status of Scientific Study (including collections made and catalog status of retained specimens and retained material originating from such specimens) or accomplishments of Science Education Activity during the reporting year:
(maximum 4000 characters)

Corrosion test racks and weather monitoring equipment have been deployed Hawaii Volcanoes National Park north of the Naulu Trail Rest Area on Chain of Craters Road at an elevation of around 1,800 feet above sea level and approximately 5 miles downwind of the Pu'u 'O'o vent. The equipment rests directly on the ground and is weighed down by concrete blocks and the weight of the test racks themselves. Solar panels and batteries are used for the weather monitoring equipment and no hazardous materials are used or exposed at the test site. Specimens exposed at the site include metallic panels and coated samples. No material is removed from the park other than the specimens that were deployed and retrieved as part of the study.

Data collected includes corrosion rates and environmental parameters such as temperature, relative humidity, rainfall, wind speed/direction, chloride and sulfate deposition rates, etc. Analysis includes correlations between key environmental factors. Raw data files and resulting journal publications can be made available to the Hawai'i Volcanoes National Park upon request.

In general, data collected at the site has revealed that the location offers a harsh environment particularly in terms of acid rain. Measurements of rainwater pH from August of 2006 to January of 2008 have ranged from a low of 3.1 to a high of 4.0. In addition, high humidity (75% or higher relative humidity (R.H.) 68% of the time), high time-of-wetness and significant amounts of chloride result in high corrosion rates for many metals and alloys exposed there.

Data collection and sample exposure at the site is ongoing.

For Scientific Studies (not Science Education Activities), do you still retain any specimens collected from the park or material originating from such specimens that have not been destroyed during analysis? ☐ Yes ☒ No
If "Yes", identify each institution and type of material where the specimens or material originating from such specimens currently are housed:

Funding specifically used in this park this reporting year that was provided by NPS: *(enter dollar amount)*

\$0.00

Funding specifically used in this park this reporting year that was provided by all other sources: *(enter dollar amount)*

\$3,000.00

List any other U.S. Government Agencies supporting this study or activity and the funding each provided this reporting:

Department of Defense

NOTICES

Privacy Act Statement

Privacy Act Statement

Authority: 16 U.S.C. 1, National Park Service Organic Act; 16 U.S.C. 3, Rules and regulations of national parks, reservations, and monuments; timber; leases; 16 U.S.C. 5935, National Parks Omnibus Management Act.

Purpose: The two primary uses of the records maintained in the system are to administer scientific research and collecting within units of the National Park System, and to make Investigator's Annual Reports available to the public.

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Disclosure: Voluntary, however, the Investigator's Annual Report is required as a general condition of each permit issued; failure to provide the requested information may impede the processing and publication of the Investigator's Annual Report and the processing of associated permit renewal requests.

Paperwork Reduction Act Statement

We are collecting this information subject to the Paperwork Reduction Act (44 U.S.C. 3501) and National Parks Omnibus Management Act of 1998 (NPOMA, Sections 201 (4), 201 (5), and 205 which govern the use of parks for study to benefit park management and broader science, and also publication of information derived from studies conducted in the National Park System. Scientific research, education and collecting activities within units of the National Park System that may impact parks invoke a permitting and reporting requirement per regulations at 36 CFR 1.6 (Permits), 36 CFR 2.1 (Preservation of Natural, Cultural and Archeological Resources), and 36 CFR 2.5 (Research Specimens). The National Park Service collects information about permit applicants and permittees to administer and document research, collecting, and reporting activities within parks. All applicable parts of the form must be completed in order for your request to be considered. Failure to provide the information may result in denial of your permit application. A Federal agency may not conduct or sponsor and you are not required to respond to a collection of information unless it displays a currently valid OMB control number. OMB has approved this collection of information and assigned OMB Control No. 1024-0236.

Estimated Burden Statement

Public reporting burden for this form is estimated to average 15 minutes per response, including the time it takes for reviewing instructions, gathering and maintaining data, and completing and reviewing the form. Comments regarding this burden estimate or any aspect of this form should be sent to the Information Collection Clearance Officer, National Park Service, 12201 Sunrise Valley Dr. (MS-242), Reston, VA 20192. Please do not send your completed form to this address.



INVESTIGATOR'S ANNUAL REPORT

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Reporting Year 2017	Park Hawaii Volcanoes NP	Select the type of permit this report addresses: ☒ Scientific Study ☐ Science Education Activity	
Name of Principal Investigator or Responsible Official ☒ Dr. ☐ Ms. ☐ Mr. ☐ Mrs. First Name Lloyd Last Name Hihara		Office Phone (808)956-2365	Cell Phone (808)753-4707
Mailing Address 2540 Dole St. Holmes Hall 302, Honolulu, HI 96822		Office Fax (808)956-2373	Email Address hihara@hawaii.edu
Additional scientific study investigators: (first name, last name) Jan Kealoha jnakaya@hawaii.edu			
Project Title (maximum 300 characters) Corrosion Testing at the Hawaii Volcanoes National Park			
Park-assigned Study or Activity # HAVO-00227	Park-assigned Permit # HAVO-2006-SCI-0034	Permit Start Date Jun 08, 2006	Permit Expiration Date Dec 31, 2007
Scientific Study Starting Date Jun 08, 2006		Estimated Scientific Study Ending Date Dec 31, 2007	
For either a Scientific Study or a Science Education Activity, the status is: (select one) ☐ Completed (for a study, check only if all specimens are cataloged) ☒ Continuing ☐ Suspended ☐ Terminated before completion		For a Scientific Study that is completed, please check each of the following that applies: ☐ Final report has been provided to the park or will be provided to the park within the next two years ☐ Copies of field notes, data files, photos, or other study records, as agreed, have been provided to the park ☐ All collected and retained specimens and retained material originating from such specimens have been cataloged into the NPS catalog system and NPS has processed loan agreements as needed	
Activity Type: (select one) ☒ Research ☐ Inventory ☐ Monitoring ☐ Education ☐ Other:			
Subject/Discipline: (maximum 60 characters) Air Pollution Effects, Corrosion			
Purpose of Scientific Study or Science Education Activity during the reporting year: (maximum 4000 characters) The corrosion studies being conducted at Hawai'i Volcanoes National Park are part of research programs sponsored by the Department of Defense, and implemented through the Hawaii Corrosion Laboratory, Department of Mechanical Engineering, University of Hawai'i at Mānoa. The State of Hawai'i is an ideal location for conducting atmospheric corrosion research due to its spatially diverse climatic zones and environmental conditions, which represent that of a miniature continent. Rainfall, solar radiation, temperature, humidity, and wind vary significantly over relatively short distances. Humid tropical rainforests, the World's wettest spot, arid and semi-arid deserts, temperate, and frozen alpine microclimates exist in Hawai'i. In addition, environmental conditions such as marine, volcanic, industrial, and agricultural add to the diversity of corrosion test sites. One of the project objectives is to study corrosion of metals in Hawai'i's microclimates to determine if similarities exist with corrosion behavior in the Pacific Rim (Alaska, Japan, Korea, US Pacific Coast, etc.). Of particular interest is corrosion testing in the Hawai'i Volcanoes National Park due to highly corrosive acid rain conditions.			

Findings and status of Scientific Study (including collections made and catalog status of retained specimens and retained material originating from such specimens) or accomplishments of Science Education Activity during the reporting year:
(maximum 4000 characters)

Corrosion test racks and weather monitoring equipment have been deployed Hawaii Volcanoes National Park north of the Naulu Trail Rest Area on Chain of Craters Road at an elevation of around 1,800 feet above sea level and approximately 5 miles downwind of the Pu'u 'O'o vent. The equipment rests directly on the ground and is weighed down by concrete blocks and the weight of the test racks themselves. Solar panels and batteries are used for the weather monitoring equipment and no hazardous materials are used or exposed at the test site. Specimens exposed at the site include metallic panels and coated samples. No material is removed from the park other than the specimens that were deployed and retrieved as part of the study.

Data collected includes corrosion rates and environmental parameters such as temperature, relative humidity, rainfall, wind speed/direction, chloride and sulfate deposition rates, etc. Analysis includes correlations between key environmental factors. Raw data files and resulting journal publications can be made available to the Hawai'i Volcanoes National Park upon request.

In general, data collected at the site has revealed that the location offers a harsh environment particularly in terms of acid rain. Measurements of rainwater pH from August of 2006 to January of 2008 have ranged from a low of 3.1 to a high of 4.0. In addition, high humidity (75% or higher relative humidity (R.H.) 68% of the time), high time-of-wetness and significant amounts of chloride result in high corrosion rates for many metals and alloys exposed there.

Data collection and sample exposure at the site is ongoing.

For Scientific Studies (not Science Education Activities), do you still retain any specimens collected from the park or material originating from such specimens that have not been destroyed during analysis? ☐ Yes ☒ No
If "Yes", identify each institution and type of material where the specimens or material originating from such specimens currently are housed:

Funding specifically used in this park this reporting year that was provided by NPS: *(enter dollar amount)*

\$0.00

Funding specifically used in this park this reporting year that was provided by all other sources: *(enter dollar amount)*

\$3,000.00

List any other U.S. Government Agencies supporting this study or activity and the funding each provided this reporting:

Department of Defense

NOTICES

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Privacy Act Statement

Authority: 16 U.S.C. 1, National Park Service Organic Act; 16 U.S.C. 3, Rules and regulations of national parks, reservations, and monuments; timber; leases; 16 U.S.C. 5935, National Parks Omnibus Management Act.

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Disclosure: Voluntary, however, the Investigator's Annual Report is required as a general condition of each permit issued; failure to provide the requested information may impede the processing and publication of the Investigator's Annual Report and the processing of associated permit renewal requests.

Paperwork Reduction Act Statement

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Estimated Burden Statement

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INVESTIGATOR'S ANNUAL REPORT

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Reporting Year 2018	Park Hawaii Volcanoes NP	Select the type of permit this report addresses: ☒ Scientific Study ☐ Science Education Activity	
Name of Principal Investigator or Responsible Official ☒ Dr. ☐ Ms. ☐ Mr. ☐ Mrs. First Name Lloyd Last Name Hihara		Office Phone (808)956-2365	Cell Phone (808)753-4707
Mailing Address 2540 Dole St. Holmes Hall 302, Honolulu, HI 96822		Office Fax (808)956-2373	Email Address hihara@hawaii.edu
Additional scientific study investigators: (first name, last name) Jan Kealoha jnakaya@hawaii.edu			
Project Title (maximum 300 characters) Corrosion Testing at the Hawaii Volcanoes National Park			
Park-assigned Study or Activity # HAVO-00227	Park-assigned Permit # HAVO-2006-SCI-0034	Permit Start Date Jun 08, 2006	Permit Expiration Date Dec 31, 2007
Scientific Study Starting Date Jun 08, 2006		Estimated Scientific Study Ending Date Dec 31, 2007	
For either a Scientific Study or a Science Education Activity, the status is: (select one) ☐ Completed (for a study, check only if all specimens are cataloged) ☒ Continuing ☐ Suspended ☐ Terminated before completion		For a Scientific Study that is completed, please check each of the following that applies: ☐ Final report has been provided to the park or will be provided to the park within the next two years ☐ Copies of field notes, data files, photos, or other study records, as agreed, have been provided to the park ☐ All collected and retained specimens and retained material originating from such specimens have been cataloged into the NPS catalog system and NPS has processed loan agreements as needed	
Activity Type: (select one) ☒ Research ☐ Inventory ☐ Monitoring ☐ Education ☐ Other:			
Subject/Discipline: (maximum 60 characters) Air Pollution Effects, Corrosion			
Purpose of Scientific Study or Science Education Activity during the reporting year: (maximum 4000 characters) The corrosion studies being conducted at Hawai'i Volcanoes National Park are part of research programs sponsored by the Department of Defense, and implemented through the Hawaii Corrosion Laboratory, Department of Mechanical Engineering, University of Hawai'i at Mānoa. The State of Hawai'i is an ideal location for conducting atmospheric corrosion research due to its spatially diverse climatic zones and environmental conditions, which represent that of a miniature continent. Rainfall, solar radiation, temperature, humidity, and wind vary significantly over relatively short distances. Humid tropical rainforests, the World's wettest spot, arid and semi-arid deserts, temperate, and frozen alpine microclimates exist in Hawai'i. In addition, environmental conditions such as marine, volcanic, industrial, and agricultural add to the diversity of corrosion test sites. One of the project objectives is to study corrosion of metals in Hawai'i's microclimates to determine if similarities exist with corrosion behavior in the Pacific Rim (Alaska, Japan, Korea, US Pacific Coast, etc.). Of particular interest is corrosion testing in the Hawai'i Volcanoes National Park due to highly corrosive acid rain conditions.			

Findings and status of Scientific Study (including collections made and catalog status of retained specimens and retained material originating from such specimens) or accomplishments of Science Education Activity during the reporting year:
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Corrosion test racks and weather monitoring equipment have been deployed Hawaii Volcanoes National Park north of the Naulu Trail Rest Area on Chain of Craters Road at an elevation of around 1,800 feet above sea level and approximately 5 miles downwind of the Pu'u 'O'o vent. The equipment rests directly on the ground and is weighed down by concrete blocks and the weight of the test racks themselves. Solar panels and batteries are used for the weather monitoring equipment and no hazardous materials are used or exposed at the test site. Specimens exposed at the site include metallic panels and coated samples. No material is removed from the park other than the specimens that were deployed and retrieved as part of the study.

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In general, data collected at the site has revealed that the location offers a harsh environment particularly in terms of acid rain. Measurements of rainwater pH from August of 2006 to January of 2008 have ranged from a low of 3.1 to a high of 4.0. In addition, high humidity (75% or higher relative humidity (R.H.) 68% of the time), high time-of-wetness and significant amounts of chloride result in high corrosion rates for many metals and alloys exposed there.

Data collection and sample exposure at the site is ongoing.

For Scientific Studies (not Science Education Activities), do you still retain any specimens collected from the park or material originating from such specimens that have not been destroyed during analysis? ☐ Yes ☒ No
If "Yes", identify each institution and type of material where the specimens or material originating from such specimens currently are housed:

Funding specifically used in this park this reporting year that was provided by NPS: *(enter dollar amount)*

\$0.00

Funding specifically used in this park this reporting year that was provided by all other sources: *(enter dollar amount)*

\$500.00

List any other U.S. Government Agencies supporting this study or activity and the funding each provided this reporting:

Department of Defense

NOTICES

Privacy Act Statement

Privacy Act Statement

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Estimated Burden Statement

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INVESTIGATOR'S ANNUAL REPORT

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Reporting Year 2019	Park Hawaii Volcanoes NP	Select the type of permit this report addresses: ☒ Scientific Study ☐ Science Education Activity	
Name of Principal Investigator or Responsible Official ☒ Dr. ☐ Ms. ☐ Mr. ☐ Mrs. First Name Lloyd Last Name Hihara		Office Phone (808)956-2365	Cell Phone (808)753-4707
Mailing Address 2540 Dole St. Holmes Hall 302, Honolulu, HI 96822		Office Fax (808)956-2373	Email Address hihara@hawaii.edu
Additional scientific study investigators: (first name, last name) Jan Kealoha jnakaya@hawaii.edu			
Project Title (maximum 300 characters) Corrosion Testing at the Hawaii Volcanoes National Park			
Park-assigned Study or Activity # HAVO-00227	Park-assigned Permit # HAVO-2006-SCI-0034	Permit Start Date Jun 08, 2006	Permit Expiration Date Dec 31, 2007
Scientific Study Starting Date Jun 08, 2006		Estimated Scientific Study Ending Date Dec 31, 2007	
For either a Scientific Study or a Science Education Activity, the status is: (select one) ☐ Completed (for a study, check only if all specimens are cataloged) ☒ Continuing ☐ Suspended ☐ Terminated before completion		For a Scientific Study that is completed, please check each of the following that applies: ☐ Final report has been provided to the park or will be provided to the park within the next two years ☐ Copies of field notes, data files, photos, or other study records, as agreed, have been provided to the park ☐ All collected and retained specimens and retained material originating from such specimens have been cataloged into the NPS catalog system and NPS has processed loan agreements as needed	
Activity Type: (select one) ☒ Research ☐ Inventory ☐ Monitoring ☐ Education ☐ Other:			
Subject/Discipline: (maximum 60 characters) Air Pollution Effects, Corrosion			
Purpose of Scientific Study or Science Education Activity during the reporting year: (maximum 4000 characters) The corrosion studies being conducted at Hawai'i Volcanoes National Park are part of research programs sponsored by the Department of Defense, and implemented through the Hawaii Corrosion Laboratory, Department of Mechanical Engineering, University of Hawai'i at Mānoa. The State of Hawai'i is an ideal location for conducting atmospheric corrosion research due to its spatially diverse climatic zones and environmental conditions, which represent that of a miniature continent. Rainfall, solar radiation, temperature, humidity, and wind vary significantly over relatively short distances. Humid tropical rainforests, the World's wettest spot, arid and semi-arid deserts, temperate, and frozen alpine microclimates exist in Hawai'i. In addition, environmental conditions such as marine, volcanic, industrial, and agricultural add to the diversity of corrosion test sites. One of the project objectives is to study corrosion of metals in Hawai'i's microclimates to determine if similarities exist with corrosion behavior in the Pacific Rim (Alaska, Japan, Korea, US Pacific Coast, etc.). Of particular interest is corrosion testing in the Hawai'i Volcanoes National Park due to highly corrosive acid rain conditions.			

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Funding specifically used in this park this reporting year that was provided by NPS: *(enter dollar amount)*

\$0.00

Funding specifically used in this park this reporting year that was provided by all other sources: *(enter dollar amount)*

\$3,000.00

List any other U.S. Government Agencies supporting this study or activity and the funding each provided this reporting:

Department of Defense

NOTICES

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Privacy Act Statement

Authority: 16 U.S.C. 1, National Park Service Organic Act; 16 U.S.C. 3, Rules and regulations of national parks, reservations, and monuments; timber; leases; 16 U.S.C. 5935, National Parks Omnibus Management Act.

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Reporting Year 2020	Park Hawaii Volcanoes NP	Select the type of permit this report addresses: ☒ Scientific Study ☐ Science Education Activity	
Name of Principal Investigator or Responsible Official ☒ Dr. ☐ Ms. First Name Lloyd Last Name Hihara ☐ Mr. ☐ Mrs. Name		Office Phone (808)956-2365	Cell Phone (808)753-4707
Mailing Address 2540 Dole St. Holmes Hall 302, Honolulu, HI 96822		Office Fax (808)956-2373	Email Address hihara@hawaii.edu
Additional scientific study investigators: (first name, last name) Jan Kealoha jnakaya@hawaii.edu			
Project Title (maximum 300 characters) Corrosion Testing at the Hawaii Volcanoes National Park			
Park-assigned Study or Activity # HAVO-00227	Park-assigned Permit # HAVO-2006-SCI-0034	Permit Start Date Jun 08, 2006	Permit Expiration Date Dec 31, 2007
Scientific Study Starting Date Jun 08, 2006		Estimated Scientific Study Ending Date Dec 31, 2007	
For either a Scientific Study or a Science Education Activity, the status is: (select one) ☐ Completed (for a study, check only if all specimens are cataloged) ☒ Continuing ☐ Suspended ☐ Terminated before completion		For a Scientific Study that is completed, please check each of the following that applies: ☐ Final report has been provided to the park or will be provided to the park within the next two years ☐ Copies of field notes, data files, photos, or other study records, as agreed, have been provided to the park ☐ All collected and retained specimens and retained material originating from such specimens have been cataloged into the NPS catalog system and NPS has processed loan agreements as needed	
Activity Type: (select one) ☒ Research ☐ Inventory ☐ Monitoring ☐ Education ☐ Other:			
Subject/Discipline: (maximum 60 characters) Air Pollution Effects, Corrosion			
Purpose of Scientific Study or Science Education Activity during the reporting year: (maximum 4000 characters) The corrosion studies being conducted at Hawai'i Volcanoes National Park are part of research programs sponsored by the Department of Defense, and implemented through the Hawaii Corrosion Laboratory, Department of Mechanical Engineering, University of Hawai'i at Mānoa. The State of Hawai'i is an ideal location for conducting atmospheric corrosion research due to its spatially diverse climatic zones and environmental conditions, which represent that of a miniature continent. Rainfall, solar radiation, temperature, humidity, and wind vary significantly over relatively short distances. Humid tropical rainforests, the World's wettest spot, arid and semi-arid deserts, temperate, and frozen alpine microclimates exist in Hawai'i. In addition, environmental conditions such as marine, volcanic, industrial, and agricultural add to the diversity of corrosion test sites. One of the project objectives is to study corrosion of metals in Hawai'i's microclimates to determine if similarities exist with corrosion behavior in the Pacific Rim (Alaska, Japan, Korea, US Pacific Coast, etc.). Of particular interest is corrosion testing in the Hawai'i Volcanoes National Park due to highly corrosive acid rain conditions.			

Findings and status of Scientific Study (including collections made and catalog status of retained specimens and retained material originating from such specimens) or accomplishments of Science Education Activity during the reporting year:
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Data collected includes corrosion rates and environmental parameters such as temperature, relative humidity, rainfall, wind speed/direction, chloride and sulfate deposition rates, etc. Analysis includes correlations between key environmental factors. Raw data files and resulting journal publications can be made available to the Hawai'i Volcanoes National Park upon request.

In general, data collected at the site has revealed that the location offers a harsh environment particularly in terms of acid rain. Measurements of rainwater pH from August of 2006 to January of 2008 have ranged from a low of 3.1 to a high of 4.0. In addition, high humidity (75% or higher relative humidity (R.H.) 68% of the time), high time-of-wetness and significant amounts of chloride result in high corrosion rates for many metals and alloys exposed there.

Data collection and sample exposure at the site is ongoing.

For Scientific Studies (not Science Education Activities), do you still retain any specimens collected from the park or material originating from such specimens that have not been destroyed during analysis? ☐ Yes ☒ No
If "Yes", identify each institution and type of material where the specimens or material originating from such specimens currently are housed:

Funding specifically used in this park this reporting year that was provided by NPS: *(enter dollar amount)*

\$0.00

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\$500.00

List any other U.S. Government Agencies supporting this study or activity and the funding each provided this reporting:

Department of Defense

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Paperwork Reduction Act Statement

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INVESTIGATOR'S ANNUAL REPORT

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Name of Principal Investigator or Responsible Official ☒ Dr. ☐ Ms. ☐ Mr. ☐ Mrs. First Name Lloyd Last Name Hihara		Office Phone (808)956-2365	Cell Phone (808)753-4707
Mailing Address 2540 Dole St. Holmes Hall 302, Honolulu, HI 96822		Office Fax (808)956-2373	Email Address hihara@hawaii.edu
Additional scientific study investigators: (first name, last name) Jan Kealoha jnakaya@hawaii.edu			
Project Title (maximum 300 characters) Corrosion Testing at the Hawaii Volcanoes National Park			
Park-assigned Study or Activity # HAVO-00227	Park-assigned Permit # HAVO-2006-SCI-0034	Permit Start Date Jun 08, 2006	Permit Expiration Date Dec 31, 2007
Scientific Study Starting Date Jun 08, 2006		Estimated Scientific Study Ending Date Dec 31, 2007	
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Activity Type: (select one) ☒ Research ☐ Inventory ☐ Monitoring ☐ Education ☐ Other:			
Subject/Discipline: (maximum 60 characters) Air Pollution Effects, Corrosion			
Purpose of Scientific Study or Science Education Activity during the reporting year: (maximum 4000 characters) The corrosion studies being conducted at Hawai'i Volcanoes National Park are part of research programs sponsored by the Department of Defense, and implemented through the Hawaii Corrosion Laboratory, Department of Mechanical Engineering, University of Hawai'i at Mānoa. The State of Hawai'i is an ideal location for conducting atmospheric corrosion research due to its spatially diverse climatic zones and environmental conditions, which represent that of a miniature continent. Rainfall, solar radiation, temperature, humidity, and wind vary significantly over relatively short distances. Humid tropical rainforests, the World's wettest spot, arid and semi-arid deserts, temperate, and frozen alpine microclimates exist in Hawai'i. In addition, environmental conditions such as marine, volcanic, industrial, and agricultural add to the diversity of corrosion test sites. One of the project objectives is to study corrosion of metals in Hawai'i's microclimates to determine if similarities exist with corrosion behavior in the Pacific Rim (Alaska, Japan, Korea, US Pacific Coast, etc.). Of particular interest is corrosion testing in the Hawai'i Volcanoes National Park due to highly corrosive acid rain conditions.			

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Reporting Year 2022	Park Hawaii Volcanoes NP	Select the type of permit this report addresses: ☒ Scientific Study ☐ Science Education Activity	
Name of Principal Investigator or Responsible Official ☒ Dr. ☐ Ms. ☐ Mr. ☐ Mrs. First Name Lloyd Last Name Hihara		Office Phone (808)956-2365	Cell Phone (808)753-4707
Mailing Address 2540 Dole St. Holmes Hall 302, Honolulu, HI 96822		Office Fax (808)956-2373	Email Address hihara@hawaii.edu
Additional scientific study investigators: (first name, last name) Ryan Sugamoto (808)956-6715 rsugamot@hawaii.edu , Jan Kealoha jnakaya@hawaii.edu			
Project Title (maximum 300 characters) Corrosion Testing at the Hawaii Volcanoes National Park			
Park-assigned Study or Activity # HAVO-00227	Park-assigned Permit # HAVO-2006-SCI-0034	Permit Start Date Jun 08, 2006	Permit Expiration Date Dec 31, 2007
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\$0.00

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\$500.00

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Name of Principal Investigator or Responsible Official ☒ Dr. ☐ Ms. ☐ Mr. ☐ Mrs. First Name Lloyd Last Name Hihara		Office Phone (808)956-2365	Cell Phone (808)753-4707
Mailing Address 2540 Dole St. Holmes Hall 302, Honolulu, HI 96822		Office Fax (808)956-2373	Email Address hihara@hawaii.edu
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Reporting Year 2024	Park Hawaii Volcanoes NP	Select the type of permit this report addresses: ☒ Scientific Study ☐ Science Education Activity	
Name of Principal Investigator or Responsible Official ☒ Dr. ☐ Ms. ☐ Mr. ☐ Mrs. First Name Lloyd Last Name Hihara		Office Phone (808)956-2365	Cell Phone (808)753-4707
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Project Title (maximum 300 characters) Corrosion Testing at the Hawaii Volcanoes National Park			
Park-assigned Study or Activity # HAVO-00227	Park-assigned Permit # HAVO-2006-SCI-0034	Permit Start Date Jun 08, 2006	Permit Expiration Date Dec 31, 2007
Scientific Study Starting Date Jun 08, 2006		Estimated Scientific Study Ending Date Dec 31, 2007	
For either a Scientific Study or a Science Education Activity, the status is: (select one) ☐ Completed (for a study, check only if all specimens are cataloged) ☒ Continuing ☐ Suspended ☐ Terminated before completion		For a Scientific Study that is completed, please check each of the following that applies: ☐ Final report has been provided to the park or will be provided to the park within the next two years ☐ Copies of field notes, data files, photos, or other study records, as agreed, have been provided to the park ☐ All collected and retained specimens and retained material originating from such specimens have been cataloged into the NPS catalog system and NPS has processed loan agreements as needed	
Activity Type: (select one) ☒ Research ☐ Inventory ☐ Monitoring ☐ Education ☐ Other:			
Subject/Discipline: (maximum 60 characters) Air Pollution Effects, Corrosion			
Purpose of Scientific Study or Science Education Activity during the reporting year: (maximum 4000 characters) The corrosion studies being conducted at Hawai'i Volcanoes National Park are part of research programs sponsored by the Department of Defense, and implemented through the Hawaii Corrosion Laboratory, Department of Mechanical Engineering, University of Hawai'i at Mānoa. The State of Hawai'i is an ideal location for conducting atmospheric corrosion research due to its spatially diverse climatic zones and environmental conditions, which represent that of a miniature continent. Rainfall, solar radiation, temperature, humidity, and wind vary significantly over relatively short distances. Humid tropical rainforests, the World's wettest spot, arid and semi-arid deserts, temperate, and frozen alpine microclimates exist in Hawai'i. In addition, environmental conditions such as marine, volcanic, industrial, and agricultural add to the diversity of corrosion test sites. One of the project objectives is to study corrosion of metals in Hawai'i's microclimates to determine if similarities exist with corrosion behavior in the Pacific Rim (Alaska, Japan, Korea, US Pacific Coast, etc.). Of particular interest is corrosion testing in the Hawai'i Volcanoes National Park due to highly corrosive acid rain conditions.			

Findings and status of Scientific Study (including collections made and catalog status of retained specimens and retained material originating from such specimens) or accomplishments of Science Education Activity during the reporting year:
(maximum 4000 characters)

Corrosion test racks and weather monitoring equipment have been deployed Hawaii Volcanoes National Park north of the Naulu Trail Rest Area on Chain of Craters Road at an elevation of around 1,800 feet above sea level and approximately 5 miles downwind of the Pu'u 'O'o vent. The equipment rests directly on the ground and is weighed down by concrete blocks and the weight of the test racks themselves. Solar panels and batteries are used for the weather monitoring equipment and no hazardous materials are used or exposed at the test site. Specimens exposed at the site include metallic panels and coated samples. No material is removed from the park other than the specimens that were deployed and retrieved as part of the study.

Data collected includes corrosion rates and environmental parameters such as temperature, relative humidity, rainfall, wind speed/direction, chloride and sulfate deposition rates, etc. Analysis includes correlations between key environmental factors. Raw data files and resulting journal publications can be made available to the Hawai'i Volcanoes National Park upon request.

In general, data collected at the site has revealed that the location offers a harsh environment particularly in terms of acid rain. Measurements of rainwater pH from August of 2006 to January of 2008 have ranged from a low of 3.1 to a high of 4.0. In addition, high humidity (75% or higher relative humidity (R.H.) 68% of the time), high time-of-wetness and significant amounts of chloride result in high corrosion rates for many metals and alloys exposed there.

Data collection and sample exposure at the site is ongoing.

For Scientific Studies (not Science Education Activities), do you still retain any specimens collected from the park or material originating from such specimens that have not been destroyed during analysis? ☐ Yes ☒ No
If "Yes", identify each institution and type of material where the specimens or material originating from such specimens currently are housed:

Funding specifically used in this park this reporting year that was provided by NPS: *(enter dollar amount)*

\$0.00

Funding specifically used in this park this reporting year that was provided by all other sources: *(enter dollar amount)*

\$10,000.00

List any other U.S. Government Agencies supporting this study or activity and the funding each provided this reporting:

Department of Defense

NOTICES

Privacy Act Statement

Privacy Act Statement

Authority: 16 U.S.C. 1, National Park Service Organic Act; 16 U.S.C. 3, Rules and regulations of national parks, reservations, and monuments; timber; leases; 16 U.S.C. 5935, National Parks Omnibus Management Act.

Purpose: The two primary uses of the records maintained in the system are to administer scientific research and collecting within units of the National Park System, and to make Investigator's Annual Reports available to the public.

Routine Uses: In addition to those disclosures generally permitted under 5 U.S.C. 552a(b) of the Privacy Act, records or information contained in this system may be disclosed outside DOI as a routine use pursuant to 5 U.S.C. 552a(b)(3) to other federal, state, local, tribal or foreign governments and organizations, and members of the general public based on an authorized routine use when the disclosure is compatible with the purpose for which the records were compiled as described under the system of records notice for this system.

Disclosure: Voluntary, however, the Investigator's Annual Report is required as a general condition of each permit issued; failure to provide the requested information may impede the processing and publication of the Investigator's Annual Report and the processing of associated permit renewal requests.

Paperwork Reduction Act Statement

We are collecting this information subject to the Paperwork Reduction Act (44 U.S.C. 3501) and National Parks Omnibus Management Act of 1998 (NPOMA, Sections 201 (4), 201 (5), and 205 which govern the use of parks for study to benefit park management and broader science, and also publication of information derived from studies conducted in the National Park System. Scientific research, education and collecting activities within units of the National Park System that may impact parks invoke a permitting and reporting requirement per regulations at 36 CFR 1.6 (Permits), 36 CFR 2.1 (Preservation of Natural, Cultural and Archeological Resources), and 36 CFR 2.5 (Research Specimens). The National Park Service collects information about permit applicants and permittees to administer and document research, collecting, and reporting activities within parks. All applicable parts of the form must be completed in order for your request to be considered. Failure to provide the information may result in denial of your permit application. A Federal agency may not conduct or sponsor and you are not required to respond to a collection of information unless it displays a currently valid OMB control number. OMB has approved this collection of information and assigned OMB Control No. 1024-0236.

Estimated Burden Statement

Public reporting burden for this form is estimated to average 15 minutes per response, including the time it takes for reviewing instructions, gathering and maintaining data, and completing and reviewing the form. Comments regarding this burden estimate or any aspect of this form should be sent to the Information Collection Clearance Officer, National Park Service, 12201 Sunrise Valley Dr. (MS-242), Reston, VA 20192. Please do not send your completed form to this address.