

Compatibility Determination

Title

Compatibility Determination for Research, Exploration, Scientific Collections, and Surveys, Mariana Arc of Fire National Wildlife Refuge within the Mariana Trench Marine National Monument.

Refuge Use Category

Research and Surveys

Refuge Use Type(s)

Research, Exploration, Scientific Collections, and Surveys.

Refuge

Mariana Arc of Fire National Wildlife Refuge

Refuge Purpose(s) and Establishing and Acquisition Authority(ies)

Mariana Arc of Fire NWR:

"... for the development, advancement, management, conservation, and protection of fish and wildlife resources ... 16 U.S.C. § 742f(a)(4) "... for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude ..." 16 U.S.C. § 742f(b)(1) (Fish and Wildlife Act of 1956).

"... conservation, management, and ... restoration of the fish, wildlife, and plant resources and their habitats ... for the benefit of present and future generations of Americans..." 16 U.S.C. § 668dd(a)(2) (National Wildlife Refuge System Administration Act).

"... suitable for— (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species ..." 16 U.S.C. § 460k-1 "... the Secretary ... may accept and use ... real ... property. Such acceptance may be accomplished under the terms and conditions of restrictive covenants imposed by donors ..." 16 U.S.C. § 460k-2 (Refuge Recreation Act (16 U.S.C. § 460k-460k-4), as amended).

Mariana Trench Marine National Monument:

"...for the purpose of protecting the objects identified above..." "... [Interior Secretary] shall not allow or permit any appropriation, injury, destruction, or removal of any feature of this monument except as provided for by this proclamation or as

otherwise provided for by law”. (Presidential Proclamation 8335)

“...Regulation of Scientific Exploration and Research...Subject to such terms and conditions as the Secretary deems necessary for the care and management of the objects of this monument, the Secretary of the Interior may permit scientific exploration and research within the monument, including incidental appropriation, injury, destruction, or removal of features of this monument for scientific study...” (Presidential Proclamation 8335)

“...For each of the areas subject to this delegation, the Director of the [USFWS] shall provide for the proper care and management of the monument, including all objects of scientific and historic interest therein; the conservation of fish and wildlife; and the development of programs to assess and promote national and international monument-related scientific exploration and research.” (Section 4.a.(2) . . . subject to the provisions of the proclamation [8335] establishing this Monument. . .).” (Secretarial Order 3284).

National Wildlife Refuge System Mission

The mission of the National Wildlife Refuge System, otherwise known as Refuge System, is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans (Pub. L. 105-57; 111 Stat. 1252).

Description of Use

Is this an existing use?

Yes

What is the use?

When determined compatible on a refuge-specific basis, research, scientific collecting, and surveys (research) are allowable uses and are conducted on refuges by independent researchers, partnering agencies, and educational groups. Scientific exploration, as a directive of the Monument’s Presidential Proclamation 8335 and Secretarial Order 3284, are further allowable uses for the Monument and Refuge units. The USFWS defines the research uses as:

- Research: Planned, organized, and systematic investigation of a scientific nature.
- Scientific collecting: Gathering of refuge natural resources or cultural artifacts for scientific purposes.
- Surveys: Scientific inventory and monitoring.

Research and exploration may be conducted from research vessels, manned submersibles, or remotely operated vehicles. This equipment may have lighting adequate for navigation and illuminating subjects and provisions for luring marine organisms using bait. The purposes of research and exploration are to further the understanding of the natural resources and processes and to improve the management of such resources. The types of research and exploration are predicted to revolve around fundamental exploration; discovering, characterizing, and understanding bottom-dwelling eukaryotes, bacteria, and archaea; discovering, characterizing, and understanding geologic features and habitats; as well as characterizing and understanding geologic, biologic, oceanographic, physical, and chemical processes.

All projects would be required to have a Special Use Permit (SUP). The USFWS, in consultation with NOAA and others as applicable, will evaluate each proposal and may put limits on the activities to ensure that negative impacts to resources are avoided or limited. Each research or exploration project would likely have different protocols and methods; therefore, each study necessitates its own scientific review. Each project would be carefully reviewed to prevent any significant short-term, long-term, or cumulative impacts. Evaluations and reviews would determine if the species studied, methods used, or habitat type and locations affected may lead to undesirable cumulative impacts. This degree of review would help ensure numerous levels and types of impacts are carefully considered before any permit for research or exploration is issued. Within the SUP, conditions would be clearly defined to protect and conserve the existing resources found within the Refuge. Some of the standard and specific conditions are included in this CD under Stipulations Necessary to Ensure Compatibility.

Collections of scientific specimens would be closely monitored and tracked as donations or loans to the permittee. Donations or loans of collections would be managed in accordance with Title 50 of the Code of Federal Regulations, sections 12.35 – 12.38, FWS Manual 701 FW 5, and Director's Order No. 109, as amended.

This use has been proposed because the collecting and analyzing scientific data is extremely valuable to the USFWS for its ongoing management of the Refuge units and helps to fulfill direction given in Presidential Proclamation 8335. The data gathered would be used by scientists and teachers around the world. The published reports from this research help to disseminate the USFWS mission and the significance of the Refuge and its resources to other researchers and the public.

Per Presidential Proclamation 8335, and relying on consultation between the federal agencies, nothing in this CD shall restrict scientific exploration or research activities by or for the Secretary of Commerce, and nothing shall be construed to require a permit or authorization for the Secretary of Commerce or his respective scientific activities.

Is the use a priority public use?

No

Where would the use be conducted?

The Mariana Arc of Fire NWR includes the following 18 units in the Philippine Sea, comprised of the submerged lands in a 1-mile radius from the center of each seamount/volcano or hydrothermal vent field. The Refuge includes unique geology, hydrothermal vent ecosystems, bottomfish habitats, and deep-sea coral and sponge communities. Vibrant groups of organisms thrive in these isolated benthic environments despite extreme pressure and heat, little to no sunlight, and toxic levels of dissolved metals and gases. Vent communities include squat lobsters as well as tubeworms, clams, and mussels that have developed a symbiotic relationship with chemosynthetic bacteria. The Refuge does not include the overlying water column. There are no USFWS facilities in this extreme environment.

Unit	Location	Summit Elevation
Fukujiin (volcano)	143° 27'30" E, 21° 56'30" N	-712 ft
Minami Kasuga 2 (volcano)	143° 38'30" E, 21° 36'36" N	-567 ft
Minami Kasuga 3 (volcano)	143° 38'0" E, 21° 24'0" N	-3675 ft
Northwest Eifuku (volcano)	144° 2'36" E, 21° 29'15" N	-5035 ft
Alice Springs (hydrothermal vent field)	144° 70'73" E, 18° 21'03" N	-2.23 mi
Central Trough (hydrothermal vent field)	144° 45'0" E, 18° 1'0" N	-2.28 mi
Zealandia Bank (overlapping volcanoes)	145° 51'4" E, 16° 52'57" N	3 ft
East Diamante (volcano)	145° 40'47" E, 15° 56'31" N	-416 ft
Ruby (volcano)	145° 34'24" E, 15° 36'15" N	-754 ft
Esmeralda Bank (volcano)	145° 14'45" E, 14° 47'30" N	-141 ft
Northwest Rota-1 (volcano)	144° 46'30" E, 14° 36'0" N	-1696 ft
West Rota (volcano)	144° 50'0" E, 14° 19'30" N	-984 ft
Forecast (volcano)	143° 55'12" E, 13° 23'30" N	-4816 ft
Seamount X (volcano)	144° 1'0" E, 13° 14'48" N	-4084 ft
South Backarc (hydrothermal vent field)	143° 37'8" E, 12° 57'12" N	-1.77 mi
Archaean (hydrothermal vent field)	143° 37'8" E, 12° 56'23" N	-1.9 mi
Pika (hydrothermal vent field)	143° 38'55" E, 12° 55'7" N	-1.72 mi
Toto (volcano)	143° 31'42" E, 12° 42'48" N	-1.88 mi

When would the use be conducted?

Research is expected to take place at any time of year or day, dependent on researcher availability and access to the site.

How would the use be conducted?

Although research ships are the most recognizable platforms for accessing isolated sites; cost effective technological innovations are providing researchers with unprecedented access and allow for long-term observation. Some of these innovations include both stationary observation systems (moorings and bottom-supported platforms) and mobile observation systems (ROVs, autonomous underwater vehicles, drifters, gliders). Access to most of the Refuge units is by remotely operated vehicles or manned submersibles. There are no USFWS facilities in this extreme environment. Permittees would pay the cost of all their actions related to the research. Researchers would have to be self-sufficient for safely accessing the Refuge and would be required to obtain any additional permits for their actions.

Why is this use being proposed or reevaluated?

The need for exploration and research stems from the need to understand the natural processes at work, and how these processes will affect Refuge resources. Research can inform management actions, assist in tracking resilience of the resources, and offer society a deeper understanding and breadth of knowledge about the complex ecosystems and physical, geological, and biochemical processes of the region. The abyssal zone habitat and its organisms can only be studied in place. Study of the submarine vents are important in understanding the physical, chemical, and geological factors that contributes to high levels of biodiversity found within these Refuge sites. No other sites with similar depth and pressure gradients are known to exist currently.

Availability of Resources

The analysis of cost for administering and managing each use will only include the incremental increase above general operational costs that we can show as being directly caused by the proposed use. Due to the complex nature of the research and exploration at the extreme depths and environments of the Refuge, only a handful of entities have the technology and capability to access their benthic environments.

During the period of this CD, it is estimated that no more than three science SUPs would be issued in a calendar year. We can manage this use at the projected level with current capabilities. We do so because the research and exploration of these units cannot currently be accomplished by the USFWS, so little is known about these areas, and all science investigations will expand knowledge of these deep sites – also benefitting management of them. (See Table 1).

Table 1. Annual Costs to Administer and Manage Research

Category and Itemization	Recurring Annual Expenses
Administration and Management	\$4,700
Monitoring and Adaptive Management	\$4,600
Total	\$9,300

The numbers above reflect the estimated cost for three permits per year. Estimated costs were calculated using 5% of the 2022 base cost of a GS-12/5 biologist, 2% cost of a GS-13/5 Refuge Manager, and 5% of a GS-7/5 biological technician assuming this use would use that “portion of a year” to administer.

Proposed use beyond three SUPs in a calendar year would require an application fee. The bulk of the cost for research SUPs is incurred in staff time to review scientific proposals, coordinate with researchers, write SUPs, oversee on-going research projects, and review the research results. Law enforcement and dissemination of information about research in the monument are not included in these cost estimates. We project that administering a research project SUP may require four weeks of intermittent staff time. Any accidents or responses involving the permittees will be their sole financial responsibility. Any funds expended by the USFWS as a result of an accident or response will be reimbursed by the permittee (see Table 2).

Table 2. Projected Costs to Applicants

Category and Itemization	One-Time Expenses
SUP Application Fee for first 3 permit applicants for research in the Mariana Trench NWR per calendar year	waived
SUP Application Fee for permit applicants #4 and up for research in the Mariana Arc of Fire NWR per calendar year	\$1,800*
Reimbursement for accident or response costs incurred by USFWS	Actual cost TBD after event

** Based on FY22 GS-12/5 basic salary for 40 hours*

Anticipated Impacts of the Use

Potential impacts of a proposed use on the refuge's purpose(s) and the Refuge System mission

Most of the possible impacts recognized are over or within the water column, and therefore outside the boundaries of the 18 Refuge units (which cover only the seafloor). These impacts may include: (1) disturbance of foraging sea birds and pelagic fish; (2) disturbance of marine mammals; (3) disturbance of endangered and threatened sea turtles; (4) release of pollution and contaminants; (5) disturbance and damage to fish, invertebrates, and algae. Possible impacts to the Refuge may include (1) disturbance to benthic marine organisms; (2) introduction of metals and other materials or equipment that are needed to travel to the bottom, and then discarded into the Refuge in order to return to the surface; and (3) accidental introduction of non-native extremophile species or contaminants from equipment used during the operations.

Accidental introduction of non-native species between deep sites has been documented at other deep-sea locations. A submersible transferred 38 limpets from the Gorda Ridge at 7457 feet depth to the Juan de Fuca Ridge after a 2-day journey of 394 miles. When the samples from this site were analyzed, the limpets were determined to be alive, having survived the time and depth of decompression and recompression between the two sites. As a precaution, permits will require disinfection of hard equipment surfaces (i.e., with diluted bleach solution) before deploying to other locations.

All research would be designed and managed in a fashion using best management practices to eliminate or minimize these impacts. However, even with proper management and execution of a well-planned project, so little is known about the Refuge units that certain responses may occur that could not be predicted or are not easily recognized. Although a single research or exploration project within a single year may cause few, if any, negative resource impacts, it may cause cumulative impacts over multiple years or when considered additively with all research and exploration projects to occur within the site. Therefore, it is critical for refuge managers to examine all projects with a multi-year timeframe in mind and consider all research that is planned concurrently in the Refuge unit(s) before approval is granted. It may be appropriate to set a limit to the number of research or exploration projects occurring in a particular habitat or relative to a single species or species group.

Short-term impacts

Short-term impacts to Refuge resources are expected to occur as a result of permitted activities including the disturbance of bottom sediments by ROV propellers

that may impact nearby coral and sponge communities, the interaction with turtles and marine mammals in the water column above the Refuge units, as well as the potential introduction of invasive species. Harm to geologic features or animals such as deep-sea corals and sponges may occur if specimens are not carefully collected, resulting in damage.

Long-term impacts

Potential long-term impacts include damage to geologic features, corals and coral reef ecosystems, and deep-sea hydrothermal vent and sponge communities. Repetitive sedimentation could smother corals, causing stress and preventing reproduction and growth. Permittees will minimize these effects by photographing and sampling animals and bottom features at different areas in the site, minimizing multiple visits to one area. Collection of deep-sea corals should be done with care and only on specimens where damage to the remaining colony can be minimized. Because of the depths at which these corals are found, corals will typically only grow a few millimeters per year. Damage done directly to coral animals can have long-term impacts on the survival of the animal. Invasive species may be introduced to the Refuge unintentionally from contaminated surfaces on the ROV or its components. A robust biosecurity plan must be approved prior to permitted activities to assure that invasive species introductions do not occur.

Public Review and Comment

The draft of this CD was included in the November 2020 Marianas Trench MNM Draft MMP/EA. The official public comment period for the MMP/EA was from February 24 – July 26, 2021. Comments were submitted to [regulations.gov](https://www.regulations.gov). The Draft MMP/EA was available on the web at multiple URLs including the Refuge Web pages. Hard copies were sent to public libraries in CNMI and Guam and available on request. A hard copy was also available at the Guam NWR Nature Center. In addition, FWS held four virtual public meetings in June 2021 to provide community-focused opportunities for the public to ask questions. Changes were made to the Draft CD in response to public comment, and current guidance on the preparation of Compatibility Determinations.

Determination

Is the use compatible?

Yes

Stipulations Necessary to Ensure Compatibility

1. Applicants for conducting research on the Refuge would be required to obtain a USFWS SUP. These permits may stipulate more detailed access restrictions and regulations to protect wildlife or Refuge integrity from anticipated site-specific negative effects caused by the project.
2. Up to three SUPs annually would be permitted free of charge. Research proposals beyond three in any given calendar year would require SUP application fees of \$1,800.
3. At the discretion of the Refuge Manager/ Superintendent, USFWS-approved staff may be assigned to accompany research expeditions.
4. If the proposed methods would materially impact, appropriate, injure, destroy, or remove any Refuge resource, the permittee must identify the issues in advance. Highly intrusive or manipulative research, survey, or collection techniques are generally not permitted. As many research, survey, or collection techniques will be experimental due to the extreme environment, any non-anticipated disturbance would immediately be brought to the attention of the Refuge Manager/ Superintendent.
5. Permittees are responsible for acquiring and/or renewing any necessary additional permits prior to beginning or continuing their project.
6. Permittee would be responsible to cover all Refuge costs associated with the research activity beyond what is predicted in this CD.
7. The Refuge Manager/ Superintendent or designated representative can suspend or modify conditions or terminate research that is already permitted and in progress should unacceptable, unforeseen, or unexpected impacts or issues arise or be noted.
8. Constant vigilance is kept for the presence of Federally listed species. When piloting vessels, vessel operators alter course to remain at least 100 yards from whales and at least 50 yards from other marine mammals and sea turtles.
9. Unless specifically covered under a separate permit that allows activity within proximity to protected species, all in-water work is postponed when whales are within 100 yards or other protected species are within 50 yards. Activity recommences only after the animal(s) depart the area. Should protected species enter the area while in-water work is already in progress, the activity may continue only when that activity has no reasonable expectation to adversely affect the animal(s); and no attempts are made to feed, touch, ride, or otherwise intentionally interact with any protected species.
10. Collection/survey sites should be staggered to prevent long-term damage to Refuge resources.

11. Collections of scientific specimens would be closely monitored and tracked as donations or loans to the permittee. Donations or loans of collections would be managed in accordance with Title 50 of the Code of Federal Regulations, sections 12.35 – 12.38, FWS Manual 701 FW 5, and Director's Order No. 109, as amended.
12. Discarding or abandonment of nondegradable umbilicals from deep-sea exploration vehicles is prohibited.
13. Permittees will follow the USFWS-provided Best Management Practices for Deep-Sea Research Marine Invasive Species Prevention or provide their own biosecurity plan with their SUP application for review and approval to ensure that invasive species will not be inadvertently introduced into the Refuge.
14. Permittees will inspect all equipment prior to beginning work each day to ensure the equipment is in good working condition, and there are no contaminant (oil, fuel, etc.) leaks. All equipment found to be leaking contaminants must be removed from service until repaired.
15. All fueling or repairs to equipment must be done in a location with the appropriate controls that prevents the introduction of contaminants to the marine environment
16. Ship crews will prevent discharges of chemicals and other fluids dissimilar from seawater into the water column.
17. Researchers will use materials that are nontoxic to aquatic organisms, such as untreated wood, concrete, or steel (avoid pressure treated lumber).
18. All permit holders would be required to submit an annual report to the Refuge Manager/ Superintendent that summarizes their activities for a given year and a final report when the project is completed. The report would include at a minimum the following: project title, SUP number, fiscal year, progress, important findings, and problems encountered, proposed resolution to problems, preparer, and date prepared. The report and all publications and products derived from the SUP will appropriately acknowledge the U.S. Fish & Wildlife Service and those activities were conducted under a National Wildlife Refuge System permit. Appropriate acknowledgement should also be given to the National Oceanic and Atmospheric Administration, when applicable. All reports, publications, or products will reference the Mariana Arc of Fire National Wildlife Refuge and Mariana Trench Marine National Monument.

Justification

The stipulations outlined above would help ensure that the use is compatible at the Mariana Arc of Fire NWR. Scientific research, collection, and surveys, as outlined in this compatibility determination, would not conflict with the national policy to maintain the biological diversity, integrity, and environmental health of the refuge.

Based on available science and best professional judgement, the Service has determined that the scientific research, collection, and surveys within the Mariana Arc of Fire NWR, in accordance with the stipulations provided here, would not materially interfere with or detract from the fulfillment of the National Wildlife Refuge System mission or the purposes of the Refuge and the Mariana Trench Marine National Monument. Rather, appropriate and compatible scientific research, collection, and surveys would be the use of the Refuge through which the public can develop an appreciation for wildlife and wild lands.

Signature of Determination

Tammy Summers 7/27/2022

Refuge Manager Signature and Date

Signature of Concurrence

Acting Regional Refuge Chief Signature and Date

Mandatory Reevaluation Date

2032

Literature Cited/References

Draft Mariana Trench National Monument Management Plan and Environmental Assessment, 2020.

Vescovo, Victor L., Jamieson, Alan J., Lahey, Patrick, McCallum, Rob, Stewart, Heather A., and Machado, Casey. 2021. Safety and conservation at the deepest place on Earth: A call for prohibiting the deliberate discarding of nondegradable umbilicals from deep-sea exploration vehicles, *Marine Policy*, Volume 128, 2021, 104463, ISSN 0308-597X. Available at: <https://doi.org/10.1016/j.marpol.2021.104463> (<https://www.sciencedirect.com/science/article/pii/S0308597X21000749>)