NOAA Technical Memorandum NOS CS 46

NOAA NATIONWIDE SPATIAL PRIORITIES STUDY

Silver Spring, Maryland
October 2021

noaa National Oceanic and Atmospheric Administration

U.S. DEPARTMENT OF COMMERCE
National Ocean Service
Coast Survey Development Laboratory

Office of Coast Survey
National Ocean Service
National Oceanic and Atmospheric Administration
U.S. Department of Commerce

The Office of Coast Survey (OCS) is the Nation's only official chartmaker. As the oldest United States scientific organization, dating from 1807, this office has a long history. Today it promotes safe navigation by managing the National Oceanic and Atmospheric Administration's (NOAA) nautical chart and oceanographic data collection and information programs.

There are four components of OCS:

The Coast Survey Development Laboratory develops new and efficient techniques to accomplish Coast Survey missions and to produce new and improved products and services for the maritime community and other coastal users.

The Marine Chart Division acquires marine navigational data to construct and maintain nautical charts, Coast Pilots, and related marine products for the United States.

The Hydrographic Surveys Division directs programs for ship and shore-based hydrographic survey units and conducts general hydrographic survey operations.

The Navigational Services Division is the focal point for Coast Survey customer service activities, concentrating predominately on charting issues, fast-response hydrographic surveys, and Coast Pilot updates.

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NOAA NATIONWIDE SPATIAL PRIORITIES STUDY

Karen Gouws (GIS Specialist), Ashley Chappell (IOCM Coordinator)
Office of Coast Survey, Integrated Ocean and Coastal Mapping (IOCM), Silver Spring, Maryland

Ken Buja (IT Project Manager)
National Centers for Coastal Ocean Science, Marine Spatial Ecology Division (MSED), Silver Spring, Maryland

October 2021

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National Ocean Service
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Integrated Ocean and Coastal Mapping Program
Ashley Chappell
Program Coordinator

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Executive Summary

Spatial data about the bathymetry, habitat characteristics, underlying geology, and other features of the ocean are essential for decision-making. Marine research and management organizations use this data to help ensure safe navigation, promote sustainable fisheries, extract energy, and protect marine habitats in the coastal and ocean waters of the U.S. Exclusive Economic Zone (EEZ). Many of these organizations may have overlapping or shared mapping interests without knowing it.

It can be challenging and cumbersome to determine where other entities have shared or overlapping mapping interests, especially across a large agency such as NOAA. Lack of this knowledge can lead mapping offices to do redundant work, putting in significant effort on simultaneous projects when offices could have been working together, or mapping areas where other offices may have already recently collected data.

To address this issue, the Integrated Ocean and Coastal Mapping (IOCM) team conducted a spatial priorities study using a geospatial tool developed by the National Ocean Service's National Centers for Coastal and Ocean Science (NCCOS). The tool provided an easy-to-use online interface in which programs could identify their priorities in a simple and straightforward way. This study asked NOAA program offices to determine which areas of ocean (nearshore and offshore) and Great Lakes they needed mapped on a near-term, mid-term, and long-term timeframe, and why. Then, the responses were analyzed and overlapped to determine where there were shared mapping opportunities between different offices.

The results of this work will help NOAA program offices better understand how their priorities align with the needs of other NOAA offices, allow for more efficient mapping coordination and funding, and will enable partners to leverage assets and resources to fill their most pressing data and information gaps across U.S. ocean and Great Lakes waters.

In the future, this approach will be applied to other federal agencies, state and local governments, federally-recognized tribes, academia, and private industry (among other stakeholders) to seek out ocean mapping partnerships in conjunction with the National Ocean Mapping, Exploration and Characterization (NOMEC) goals "map once, use many times."

1. INTRODUCTION

Ocean and coastal mapping data, or spatial information about the bathymetry, habitat characteristics, underlying geology, and other ocean features, are essential for decision-making. Marine research and management organizations use this mapping data to help ensure safe navigation, promote sustainable fisheries, extract energy, and protect marine habitats in the coastal and ocean waters of the U.S. Exclusive Economic Zone (EEZ). Knowing the priority areas of different programs is essential to create opportunities for collaboration. Without this insight, it is easy for different programs to map the same area over and over again, not realizing other entities can share the burden; this wastes money, time, and effort. Understanding where programs and organizations need mapping data by analyzing for overlaps and alignments can streamline data acquisition, spur collaboration, leverage resources and avoid redundant collections. Program priorities also inform NOAA and interagency activities under the National Ocean Mapping, Exploration and Characterization, or NOMEC, Strategy.

To collect NOAA mapping data priorities across the U.S. EEZ, the Integrated Ocean and Coastal Mapping (IOCM) team conducted a spatial priorities study using a geospatial tool developed by the National Ocean Service's National Centers for Coastal and Ocean Science (NCCOS). The tool, known as the Spatial Prioritization Widget, provided an easy-to-use online interface in which programs could identify their priorities in a simple and straightforward way. This study asked NOAA program offices to determine which areas of ocean (nearshore and offshore) and Great Lakes they needed mapped on a near, mid, and long-term timeframe, and why. Then, the responses were analyzed and overlapped to determine where there were shared mapping opportunities between different offices. The analysis and results of this study allowed NOAA's Interagency Working Group on Ocean and Coastal Mapping (IWG-OCM) partners to see where resources could be allocated efficiently by sharing mapping work with other offices. Participating offices could better coordinate and leverage resources where there was a shared mapping need.

Previous studies have successfully applied this approach in the states of Washington (Battista et al., 2017), Florida (Florida Fish and Wildlife Commission), Alaska (Kumle and Overbeck, 2021), as well as in regions of the Great Lakes (Kendall et al., 2020), U.S. Caribbean (Kraus et al., 2020), and on the West Coast for offshore regions of Washington, Oregon, and California (Costa et al., 2019).

The following report discusses the rollout, usage, analysis and results of the NOAA 2020 Spatial Priorities Study, which covered the entire U.S. EEZ by region. IOCM surveyed program offices across NOAA's Line Offices, including the National Marine Fisheries Service (NMFS), the National Ocean Service (NOS), the National Weather Service (NWS), and the Office of Ocean and Atmospheric Research (OAR).

1.1. Summary

This NOAA Spatial Priorities Study surveyed various NOAA offices on their mapping needs and goals. To do this, participants were chosen to represent their program offices and input their

office's priorities into the GIS web mapping application. Participants entered their priorities using the NCCOS-developed process and widget.

While identifying their priorities, participants answered the following questions:

1. *Where:* Where are there mapping priorities for your office?
2. *Why?:* Why do you need this area mapped?
3. *What?:* What data do you need from this area?

Once all participants had completed their submissions, the results were analyzed to identify significant relationships between priorities, justifications, and map products in order to identify areas of shared mapping interest among multiple NOAA offices. The analysis answered the following questions, among others:

1. What are the highest priority (urgent) areas?
2. Where do multiple offices need mapping data?
3. Where do multiple agencies/offices need the same type of data?

The results of this work will help NOAA program offices better understand how their priorities align with the needs of other NOAA offices, allow for more efficient mapping coordination and funding, and enable partners to leverage assets and resources to fill their most pressing data and information gaps across U.S. ocean and Great Lakes waters.

2. METHODS

The study was conducted using an online GIS web application. Multiple offices within NOAA were contacted to gauge interest. Each office selected at least one participant to submit priorities via the web application.

2.1 Application

The application was designed using ESRI's WebApp Builder and incorporated the Spatial Prioritization Widget, designed by the National Centers for Coastal Ocean Science (NCCOS) for previous prioritization studies (Buja and Christensen, 2019). The widget allows participants to mark their priorities and describe their mapping interests. It sits within the application and allows participants to easily select cells for prioritization from a pre-loaded grid.

The widget was modified slightly for the nationwide study. In prior NCCOS-run studies, to "prioritize" an area—and identify it as a mapping interest for one's organization—participants usually assigned a numerical "coin" value to the area. With this method, higher numbers of coins led to a higher priority. In the IOCM study, to "prioritize" an area, participants assigned a High/Medium/Low value to it. The High/Medium/Low values were defined to participants in terms of how soon mapping data was needed in that area, with a high priority corresponding to the most urgent need. Other modifications included adding additional criteria drop-down menus. A screenshot of the Spatial Prioritization Widget window can be seen in **Figure 1**.

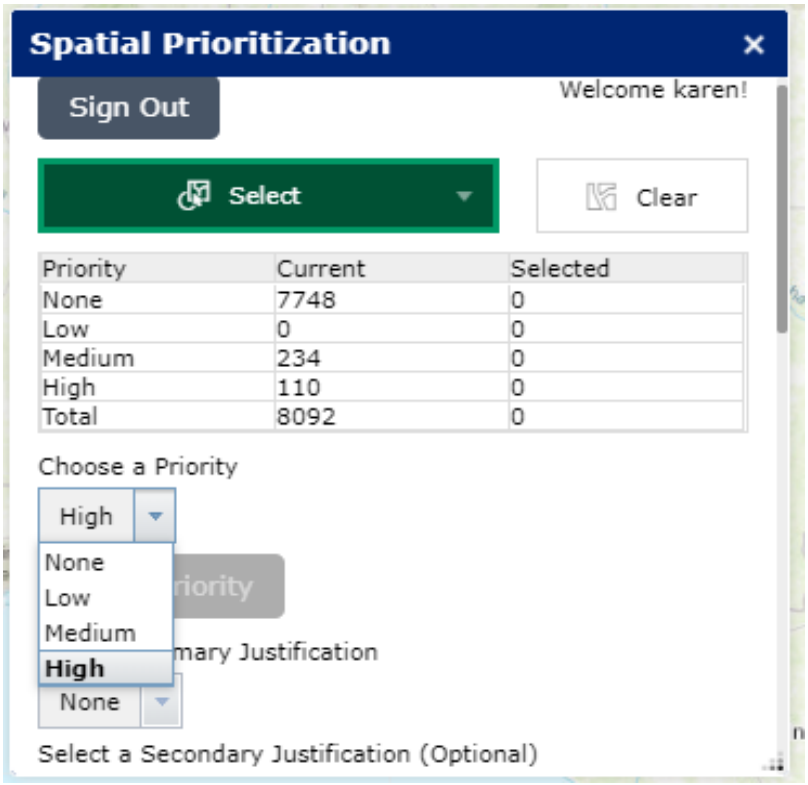

Figure 1. Screenshot of the Spatial Prioritization Widget's data entry window, in the application.

2.2 NOAA Grid

Participants entered priorities in a survey grid covering all waters under U.S. jurisdiction. The grid extended twenty (20) kilometers inland to the outermost extent of the U.S. EEZ. The inland extent ensured that specific coastal features and resources were captured, such as the Mississippi River delta, the Chesapeake Bay, and North Carolina's Outer Banks. A screenshot of the application, with the Spatial Prioritization Widget, can be seen in **Figure 2**.

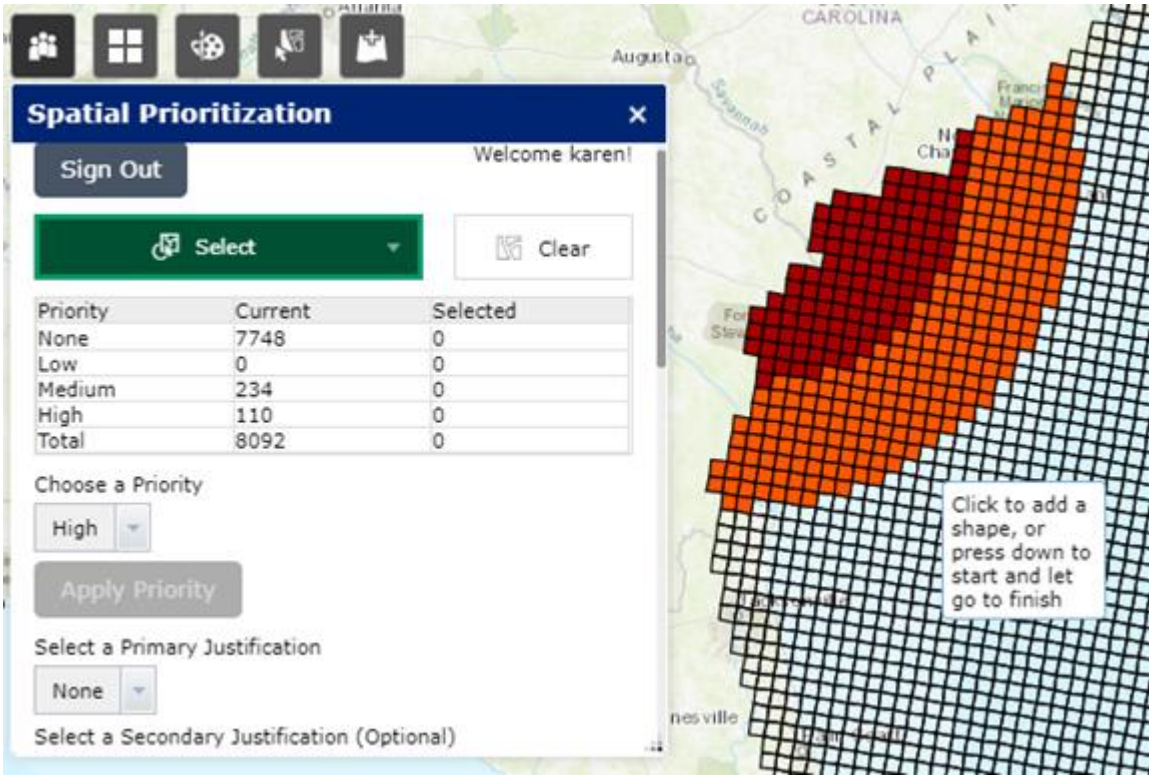

Figure 2. A screenshot of the application showing grid extent in Georgia and South Carolina.

The grid covered seven regions (**Figure 3**): The Northeast, the Southeast and Caribbean, the Gulf of Mexico, the Great Lakes, the West Coast, Alaska, and the Pacific Islands. Notes on specific regions are as follows:

- The Caribbean region included Puerto Rico and the U.S. Virgin Islands.
- The Pacific region included Hawaii, Guam, the Northern Mariana Islands, American Samoa, and the United States Minor Outlying Islands.
- The grid extended to the outermost extent of the U.S. EEZ in all regions *except* the Great Lakes, where, at the request of Great Lakes representatives, Canadian waters were included due to frequent collaboration with Canadian mapping entities.

Each grid cell was 10x10 kilometers in area.

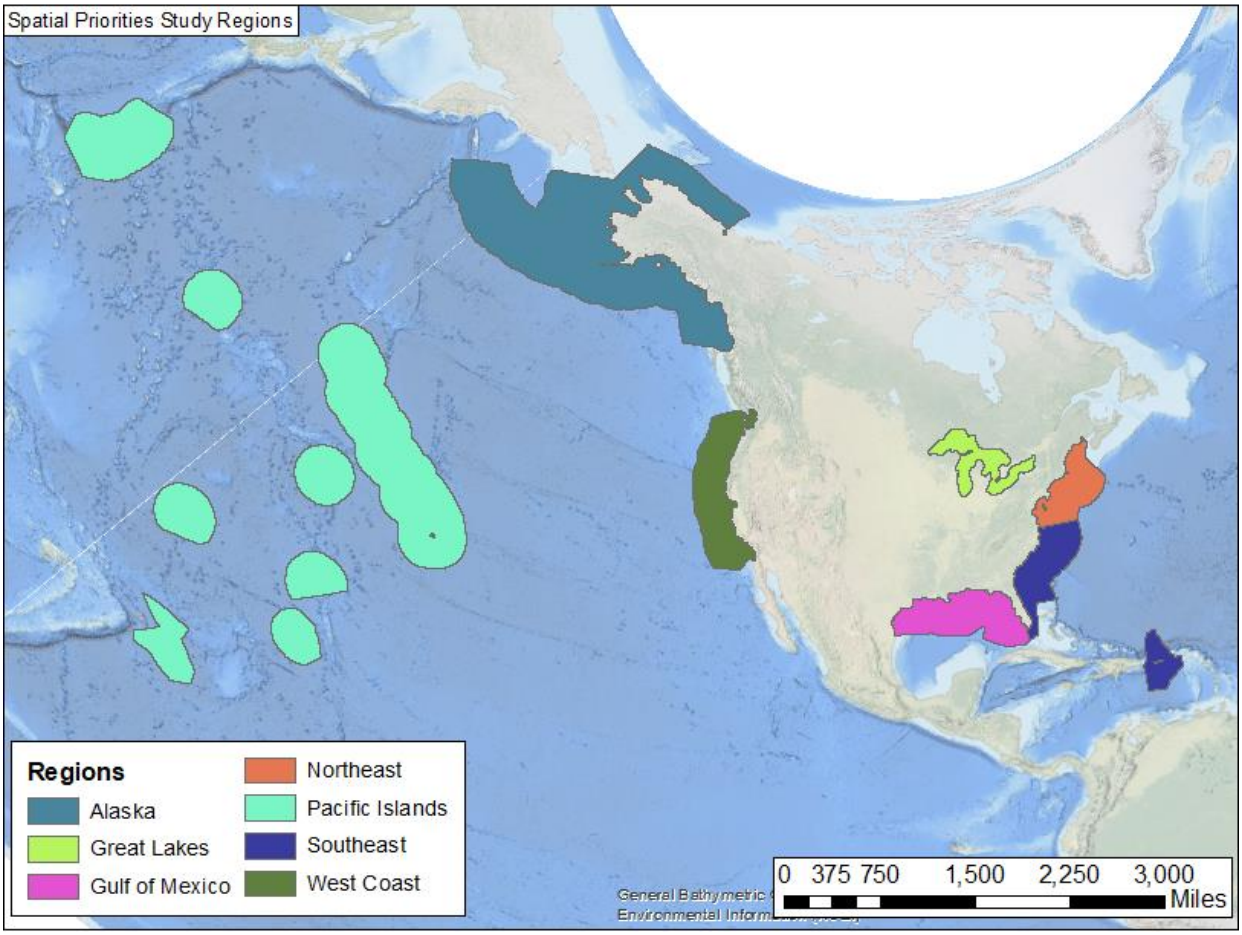

Figure 3. Regions for NOAA study.

2.3 Criteria

The original Spatial Prioritization Widget included the following seven (7) drop-down menus:

- Priority (*where* are there mapping priorities for your office?)
- Primary Justification, Secondary Justification, and Tertiary Justification (*why* do you need this area mapped?)
- Primary Map Product, Secondary Map Product, and Tertiary Map Product (*what* data do you need from this area?)

For this study, additional criteria drop-down menus were added to the prioritization widget in order to give participants more opportunities to define and describe their priority areas. These additional menus included:

- Drivers, which allowed participants to identify whether an executive, legislative, or program driver was motivating their mapping interests.

- Horizontal Resolution, which defined what spatial resolution participants desired for their priority area data. For example, if participants wanted high resolution data in their priority area, such as <1 meter, they could specify this information in the application.

Additional options were also added to the existing drop-down menus for Justification and Map Product. These were included to give participants more opportunities to be clear and specific about their mapping goals.

The criteria drop-down menus are listed below, along with instructional definitions of each option.

2.3.1 Priority

Participants used the drop-down menus to define priority levels for each selection. This answered the question *where?:* Where are there mapping priorities for your office? **Table 1** identifies each of the drop-down options for priority.

The priority method High/Medium/Low was chosen for a number of reasons. In prior studies, regional prioritization surveys generally used the coin method, which allowed for robust statistical analysis. However, the coin method may not be easily understood among users who did not themselves enter data in the study, and high ranges of coin values (0-100, for example) could lead to noise in the results. For this reason, the nationwide study used the High/Medium/Low prioritization method. By only asking participants to choose between four options (High, Medium, Low, and the default None), the High/Medium/Low method kept things straightforward for participants while ensuring meaningful results.

The rules for the High/Medium/Low selection were as follows:

- Participants could only select up to 10% of cells as High *in a given region*. For example, if the Gulf of Mexico grid has 500 cells, participants could only put 50 of those cells in the High priority bin. Cell selections in one region did not impact cell selections in another, nor did they reduce the number of available cells in another region.
- Participants could only select up to 25% of cells as Medium *in a given region*. For example, if the Gulf of Mexico grid has 500 cells, participants could only put 125 of those cells in the Medium priority bin. Cell selections in one region did not impact cell selections in another, nor did they reduce the number of available cells in another region.
- Participants could only select up to 50% of cells as Low *in a given region*. For example, if the Gulf of Mexico grid has 500 cells, participants could put 250 of those cells in the Low priority bin. Cell selections in one region did not impact cell selections in another, nor did they reduce the number of available cells in another region.
- While participants did have percent limits in each region (10% High, 25% Medium etc) they *did not* have to hit these limits. For example, if a participant had no priorities in the Gulf of Mexico, they did not have to select any cells to complete their submission. This ensured that participants only prioritized areas that were of interest to them and did not add extra priorities just to meet a submission cap, making the data more robust.

Table 1. Priority drop-down menu options.

Priority	
Criterion	**Details**
None	Default
Low	Mapping needs in 6-10 years (50% of grid cells in a given region)
Medium	Mapping needs in 3-5 years (25% of grid cells in a given region)
High	Mapping needs in 1-2 years (10% of grid cells in a given region)

2.3.2 Justification

Participants used the drop-down menus to define mapping justifications for each selection. This answered the question *why?:* Why do you need this area mapped? **Table 2** identifies each of the drop-down options for justification.

Within the application, there were three Justification drop-down menus: Primary Justification, Secondary Justification, and Tertiary Justification. This allowed participants to identify multiple rationales for their mapping needs. Only the Primary selection was required; Secondary and Tertiary selections were optional. Primary, Secondary and Tertiary Justifications were not weighted against each other; i.e. all were weighted equally in the results.

Table 2. Justification drop-down menu options.

Justification	
Criterion	**Details**
None	None
General knowledge gap	Default/general option; select if none of the other criteria meet your needs
Benthic exploration	Targeted benthic exploration for seafloor characterization
Water column exploration	Targeted water column exploration for water column characterization (e.g. upwelling, seeps, biological origin, biotoxins, harmful algae)
Commercial and recreational fishing	Fisheries management and regulation (e.g. commercial/recreational fishing locations, aquaculture siting, fisheries sampling stations, high bycatch areas, sport/charter fishing)
Cultural/historical resources	Shipwrecks, tribal use areas and other archaeological/cultural/historic resources
Energy	Energy permitting, siting, management, transmission (e.g., oil/natural gas platforms, deepwater ports, wind turbine, tidal/hydropower, cables, pipelines, etc.)

Justification	
Criterion	**Details**
Habitat/biota/natural area	Includes Essential Fish Habitat, Critical Habitat (for marine mammals and other protected species), spawning/nursery areas, feeding grounds, key benthic habitats, habitat mapping, coastal geomorphology and other ecologically significant areas
Coastal/marine natural hazards	Detection, forecast and management of coastal and marine hazards, including weather/storm surge, flooding, tsunamis, earthquakes, geologic faults, harmful algal blooms, etc.
Infrastructure (non-energy)	Existing or potential infrastructure development, includes port facilities, bridges, telecommunication cables, roads, etc.
Protection/Management Areas	Marine protected area, sanctuaries, conservation areas, restoration sites, dynamic management areas for marine mammals and other protected species
Monitoring	Monitoring of specific study areas for scientific or other purposes (such as coral health monitoring, invasive species monitoring, etc.)
Modeling	Modelling of specific study areas for scientific or other purposes
Navigation safety	Safe navigation in U.S. waters, e.g. shipping lanes, ferry routes, harbors/approaches, port facilities and marinas; includes detection of hazards to navigation (rocks, wrecks, other obstructions)
Scientific research	General scientific research, not including monitoring of a specific area
Mineral resources	Critical and base mineral resources, aggregate resources for beach re-nourishment and/or heavy sands mineral resource, other non-energy mineral resources
Sediment transport	Sediment movement and management needs, managing beach erosion/re-nourishment or sediment buildups in channels and ports
Maritime Boundaries, Maritime Domain Awareness and Enforcement	Authoritative boundary maintenance, DoD/DHS security operations, countermine measures, border patrols, law enforcement
Recreational activities (other than fishing)	Recreational activities (e.g. boating, ecotourism, swimming and diving)

Justification	
Criterion	**Details**
Public health	Contaminants and hazards that could impact communities, subsistence cultures and food safety (e.g. seafood safety) such as contaminated sediments, marine biotoxins, chemicals around oil wells and pipelines, waste and dredge material dumping sites, etc.

2.3.3 Map Product

Participants used the drop-down menus to define map products for each selection. This answered the question *what?:* What data do you need from this area? **Table 3** identifies each of the drop-down options for map product.

Within the application, there were three Map Product drop-down menus: Primary Map Product, Secondary Map Product, and Tertiary Map Product. This allowed participants to identify multiple data products they may wish to acquire from the same priority area. Only the Primary selection was required; Secondary and Tertiary selections were optional. Primary, Secondary and Tertiary Map Product were not weighted against each other; i.e. all were weighted equally in the results.

Table 3. Map Product drop-down menu options.

Map Product	
Criterion	**Details**
None	None
Elevation (bathymetry/topography)	Measurement of height/depth of seabed or coastal terrain. Collected using multibeam sonar, airborne LiDAR or other methods. Processed into bathy grids, Digital Elevation Models for a wide variety of downstream products
Backscatter intensity	Seabed imagery of reflected intensity (acoustic or optical) for location and distribution of different substrate types and habitat
Magnetometer surveys	For detection of magnetic anomalies, ferrous objects, man-made objects or evidence of human activity, cultural resource surveys, archaeological assessment, unexploded ordnance, wrecks, debris, etc.

Map Product	
Criterion	**Details**
Photographs/videos/imagery (surface or underwater)	Imagery of seabed/benthos/water column. Includes video and still imagery in all spectral bands. May be collected with ROVs, AUVs, other camera platforms, satellites, etc.
Biological, chemical or physical samples	Samples collected from seafloor/subseafloor/water column using divers, AUVs, ROVs, cores, grabs, CTDs, rosettes, etc.
Substrate/Sub-bottom geologic characterization	Remote-sensing derived (i.e. seismic, chirp sub-bottom, multibeam sonar, sub-bottom profiling sonars, magnetic susceptibility, self-potential) seafloor type and characteristics (i.e. hardness/roughness/thickness/grain size/substrate type/mineralogy, etc.)
Water column mapping/characterization	Commonly collected with multibeam/split-beam sonar systems; used to identify bubbles, plankton layers, fish, harmful algae, biotoxins, seeps, etc.
Shoreline characterization/topographic maps	Delineation and characterization of shoreline/coastal topography/coastal infrastructure and features (port facilities, boat ramps, docks, pipe landfalls, etc.)
Habitat map/characterization	Identification/suitability of benthic environment and habitat distribution; derived from remote sensing, optical imaging, and physical sampling
Nautical map and chart products	Electronic Navigational Charts, other products for navigation
Human use statistics	Socioeconomic, demographic, and other statistics regarding human use of ocean areas
Wildlife population characterization	Includes marine mammal, bird, sea turtle surveys; stock assessments
Ocean use infrastructure site maps	Delineation and characterization of oil platforms, wells, pipelines, wastewater treatment plant outfalls, waste dredge material dump sites, shipping lanes, and aquaculture sites
Land use impacts on coastal zone	Location and metadata from wastewater treatment plant inputs and seepages, riverine runoff, storm water runoff, and other impacts from manmade coastal zone inputs
Other mapping products not listed	Other mapping products not listed

2.3.4 Driver

Participants used the drop-down menus to define drivers for each selection. This allowed participants to identify if an executive, legislative, or program driver was motivating their mapping

interests, such as an executive order or legal mandate. This selection was optional. **Table 4** identifies each of the drop-down options for driver.

Table 4. Driver drop-down menu options.

Driver
Criterion
None
Blue Economy
Coastal Zone Management Act
Endangered Species Act
Energy Policy Act of 2005
Executive Order 13817 (Reliable Supplies of Critical Minerals)
Executive Order 13840 (Ocean Policy to Advance Economic, Security, and Environment Interests)
Great Lakes Restoration Initiative
Magnuson–Stevens Fishery Conservation and Management Act
National Historic Preservation Act
National Marine Sanctuaries Act
National Park Service Organic Act of 1916
Oil Pollution Act
Outer Continental Shelf Lands Act
2019 Presidential Memorandum on Ocean Mapping (Mapping, Exploration, Characterization)
Public Law 89-560 (Soil Surveys Act)
Public Law 111-11 (Omnibus Public Land Management Act)
Public Law 1115-25 (Weather Research and Forecasting Innovation Act and Tsunami Warning, Education, and Research Act)
National Weather Service Organic Act
Marine Mammal Protection Act (MMPA)
Safety of Life at Sea Convention (Treaty)
Seabed 2030
Lakebed 2030
Great Lakes Water Quality Agreement
Great Lakes Council of Lakes Committees priorities
Coast and Geodetic Survey Act of 1947
Hydrographic Services Improvement Act
USGS Organic Act of 1879
Ocean and Coastal Mapping Integration Act
Ocean Exploration Act
Integrated Coastal and Ocean Observation System Act
Federal Food, Drug, and Cosmetic Act
National Shellfish Sanitation Program Model Ordinance

Driver
Criterion
Other drivers not listed

2.3.5 Horizontal Resolution

Participants used the drop-down menus to define preferred resolutions for each selection. For example, if participants wanted high resolution data in their priority area, such as <1 meter, they could specify this information upfront. This selection was optional. **Table 5** identifies each of the drop-down options for horizontal resolution.

Table 5. Resolution drop-down menu options.

Horizontal Resolution	
Criterion	**Details**
Not specified	Resolution not specified
<100m	One pixel of data output must represent at most 100x100m of coverage
<25m	One pixel of data output must represent at most 25x25m of coverage
<10m	One pixel of data output must represent at most 10x10m of coverage
<5m	One pixel of data output must represent at most 5x5m of coverage
<1m	One pixel of data output must represent at most 1x1m of coverage

2.4 Participants

Participants were invited to enter the application throughout the spring, summer, and fall of 2020. Participants came from the following line offices: the National Marine Fisheries Service (NMFS), the National Ocean Service (NOS), the National Weather Service (NWS), and the Office of Oceanic and Atmospheric Research (OAR).

Participants were contacted by email or telephone and invited to an introductory call during which the application was presented and demonstrated. Afterwards, they were given access to the application to begin making their priority selections.

Results available in this technical memo include nineteen (19) offices who either:

- Submitted data, or
- Gave a reason why they would not be providing a response by February 2021.

The fifteen (15) offices who submitted data included in this report are:

- NMFS: Fisheries Science Centers and Regional Offices, Chesapeake Bay Office, Office of Aquaculture (joint response with NOS Aquaculture)
- NOS: National Centers for Coastal Ocean Science, National Geodetic Survey, National Marine Sanctuaries, Office for Coastal Management, Office for Coastal Management – NERRS, Office of Coast Survey, University of New Hampshire Joint Hydrographic Center, Office of Aquaculture (joint response with NMFS Aquaculture)
- NWS: Tropical Program, Tsunami Program, Water Resources Services Branch/Office of Water Prediction
- OAR: Ocean Exploration and Research, Pacific Marine Environmental Laboratory

The four (4) offices that chose not to submit data for a variety of reasons included:

- NMFS: Deep Sea Coral Research & Technology Program
- NOS: Center for Operational Oceanographic Products and Services, Marine Protected Areas
- NWS: Office of Observations

Several other offices and programs were contacted throughout 2020 and began the process of entering submissions, but did not complete their entries before the deadline in February 2021. Their submissions are not included in the analysis.

3. RESULTS

The study sought to answer questions about where multiple offices had mapping need, and to identify areas of highest interest among multiple offices. The goal of the analysis was to identify this information in an easy, straightforward format that would allow people from multiple backgrounds, including GIS, statistical, survey, and non-scientific personnel, to be able to recognize where there were areas of high interest.

Results from the study were analyzed in ArcGIS using a variety of geospatial tools. The tools were developed in May 2020 in ModelBuilder and were designed to answer the following questions, among others:

- What are the most high priority (urgent) areas?
- Where do multiple offices have mapping need?
- Where do multiple agencies/offices need the same type of data?

3.1 Priority

Priority values were analyzed in five ways.

High Priority, Medium Priority, and Low Priority: The number of offices who selected a cell as High, Medium, or Low was calculated and summed for each grid cell in order to generate three maps: number of offices who selected a cell as High, number of offices who selected a cell as Medium, and number of offices who selected a cell as Low.

Any Priority: The number of offices who assigned a cell as any priority (High, Medium, *or* Low) was calculated in order to identify collaborative opportunities between offices regardless of priority level—i.e. even if one office felt the area was urgent and another found it less so.

Weighted Priority: A "weight" was assigned to each priority value (High, Medium, Low, and None) in order to gain a subjective picture of which areas were of the highest interest among multiple offices. High priority cells were assigned a weight of three (3), Medium of two (2), Low of one (1), and None of zero (0). It is important to note that the weights are subjective; i.e. they are only useful for visualization purposes. However, the Weighted Priority map gives a good indication of which areas are of high interest among multiple offices.

The following maps demonstrate priority interest across NOAA offices surveyed as a part of this study.

One important note: the maps may give off the impression that the most-nearshore areas are not a priority to any office, as the most-inland regions of the map tend to have no priorities assigned (i.e. they were left at the default, "None" priority by a majority of offices). However, it is important to remember that the survey grid stretched from the outermost extent of the U.S. EEZ to twenty (20) kilometers inland, *not* just to shoreline. The grid was extended inland in order to ensure that specific coastal features and resources were captured, such as the Mississippi River Delta, the Chesapeake Bay, and North Carolina's Outer Banks. However, in other regions of the country,

this meant that the innermost extent of the grid sat over terrestrial features that were not of interest to ocean mapping entities. Priority maps are also available in **Appendix B**.

3.1.1 High Priority

Across the **Continental United States** (**Figure 4**), high priority areas were concentrated coastally, with particular interest in Cape Cod Bay and coastal Massachusetts, the Chesapeake and Delaware Bays, coastal Texas and Louisiana, and Puget Sound. In particular, Puget Sound was of very high interest, with over five individual offices listing it as a high priority.

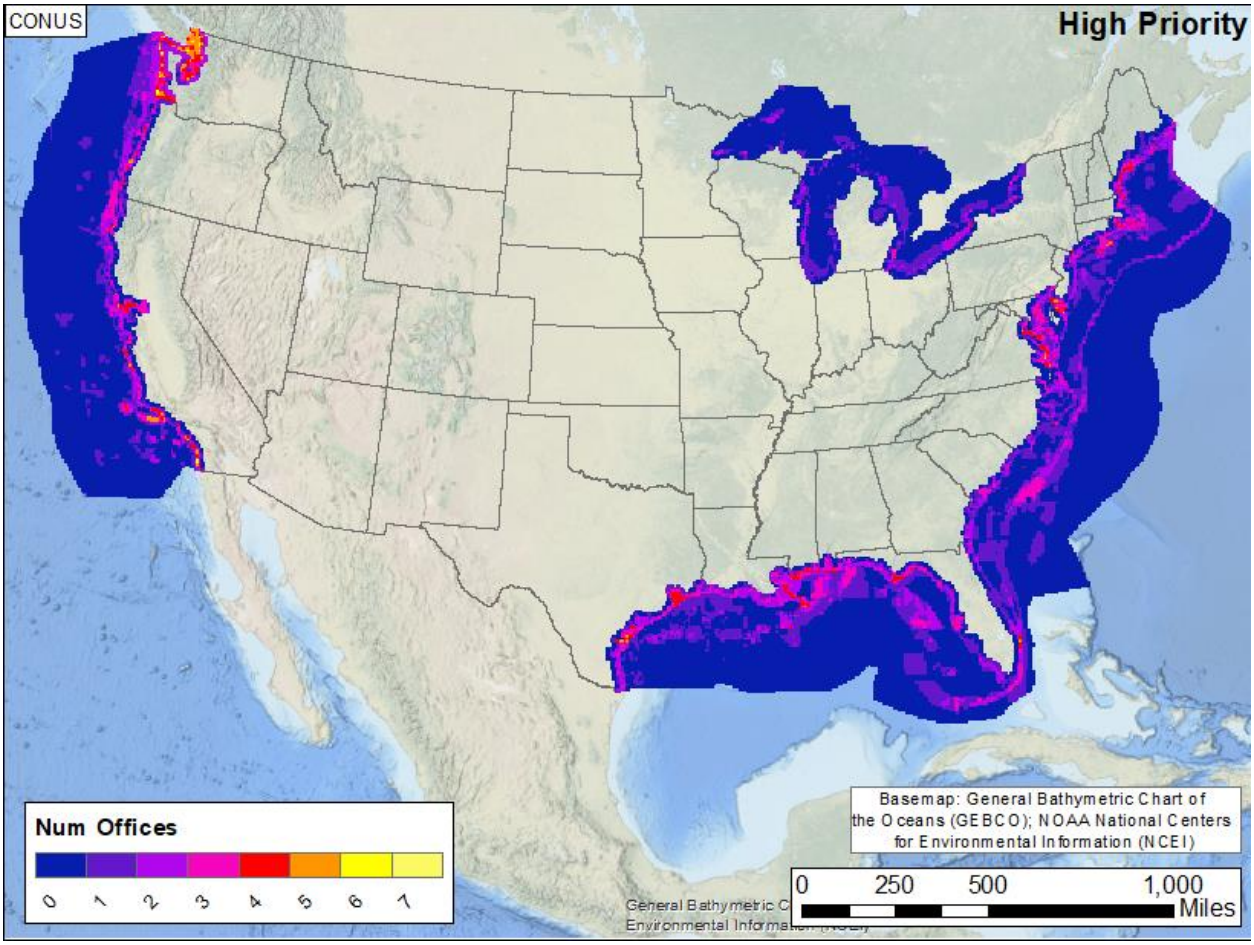

Figure 4. Number of respondents selecting cell as High Priority (Continental U.S.).

Figure 5 shows these results in **American Samoa**, **Guam** and the **Northern Mariana Islands**, and the **U.S. Caribbean**. In **American Samoa**, high priorities were concentrated around the islands of Tutuila and the Manu'a Islands. In **Guam** and the **Northern Mariana Islands**, high priority areas were concentrated on the coasts, and offshore up to 80-90 kilometers in some locations. In the **U.S. Caribbean**, the highest interest was found on the southern coast of Puerto Rico, including the Isla De Mona, and in the coastal U.S. Virgin Islands.

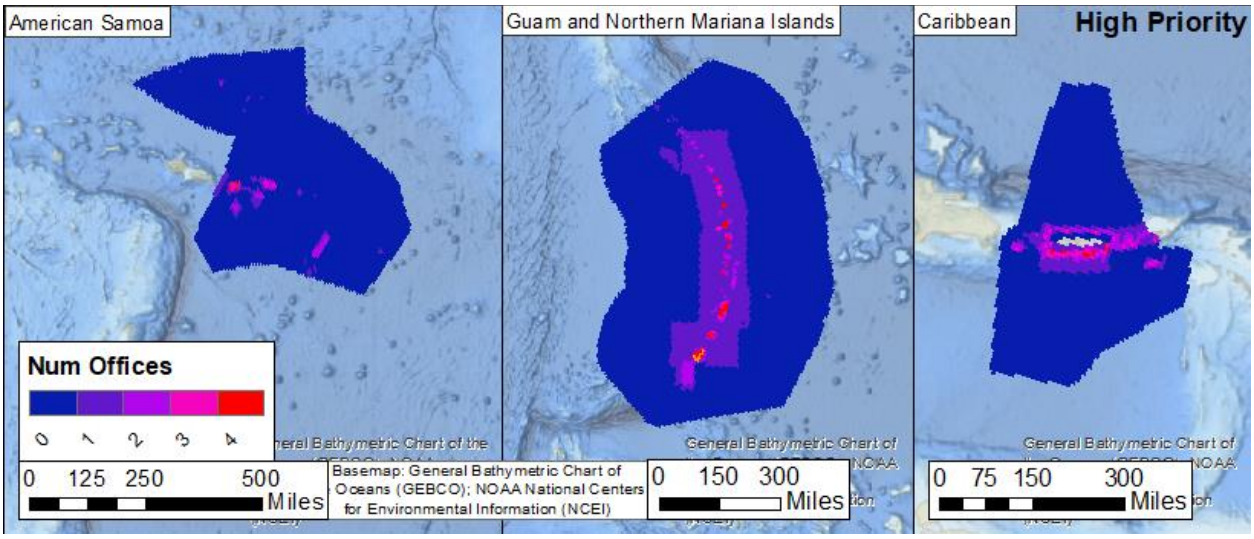

Figure 5. Number of respondents selecting cell as High Priority (America Samoa, Guam and Northern Mariana Islands, and U.S. Caribbean).

In **Alaska** (**Figure 6**), areas of highest interest included the coasts, with high priorities identified from the southeast to the Aleutian Islands to the far north. Fixed fishery bottom-trawl-survey stations in the Bering Sea made up a number of single high priority cells, while lines in the northern Bering Sea represent the sub-sampling pattern adopted by the NMFS Fisheries and Regional Offices when there was insufficient effort for comprehensive mapping of an area (McConnaughey et al, 2020). For more information on Fisheries priorities, please see the NOAA Fisheries – Alaska Response report, available here (URL: https://repository.library.noaa.gov/view/noaa/26366).

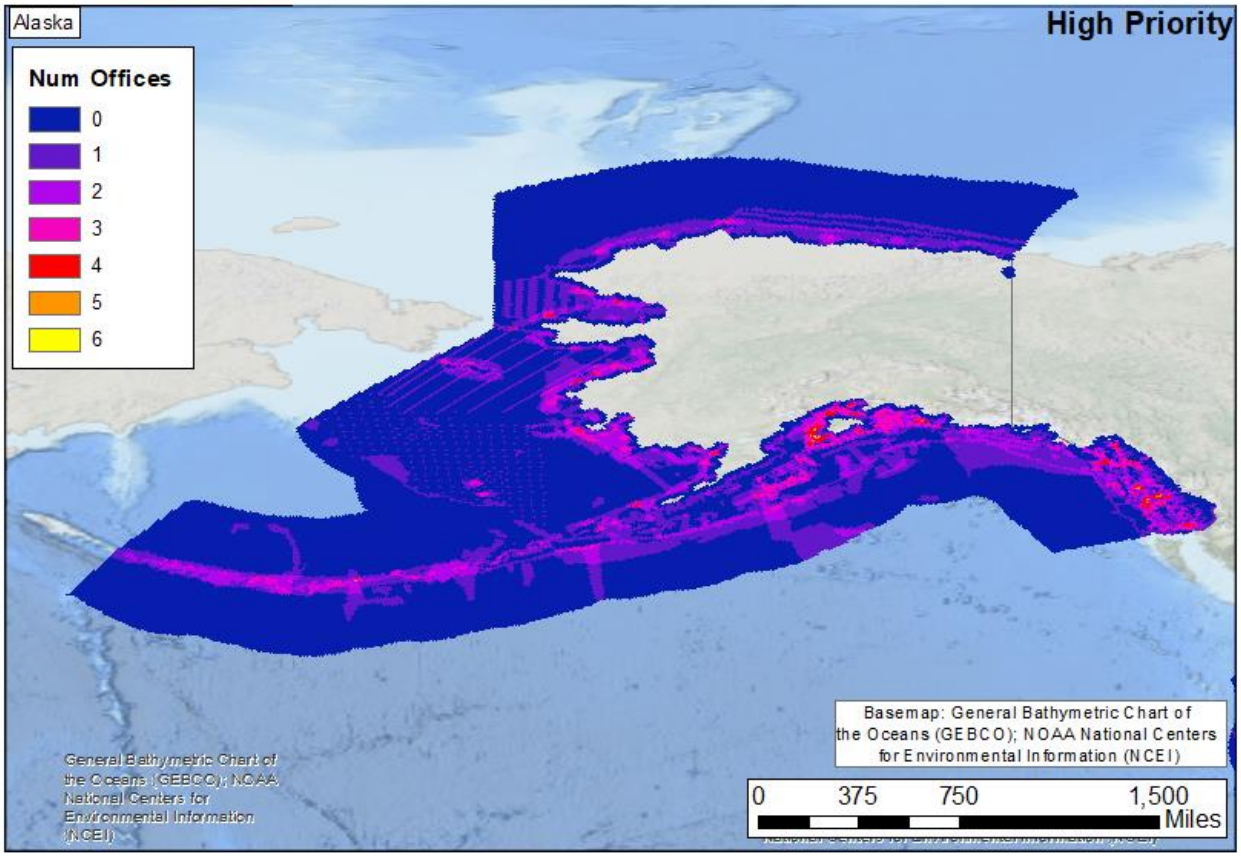

Figure 6. Number of respondents selecting cell as High Priority (Alaska).

In **Hawaii** (**Figure 7**), high priorities were concentrated in nearshore areas, with particular interest around Maui, Moloka'i, Lanai, and O'ahu. In the **U.S. Minor Outlying Islands**, high priorities were concentrated around Johnston Atoll.

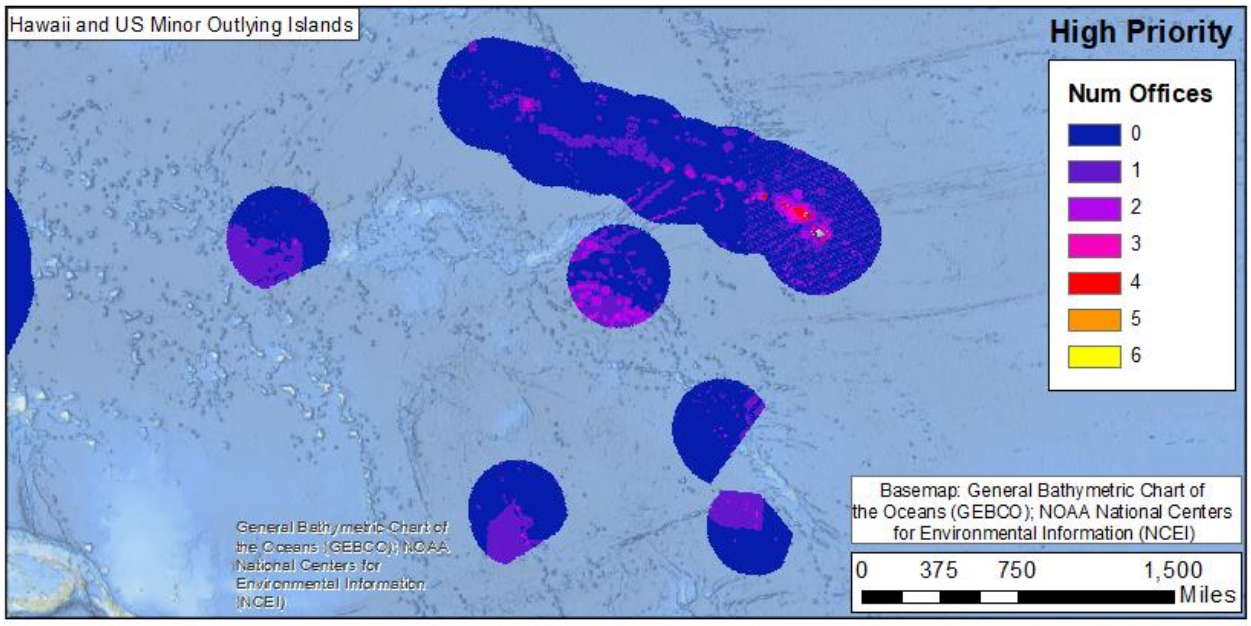

Figure 7. Number of respondents selecting cell as High Priority (Hawaii and Minor Outlying Islands).

3.1.2 Medium Priority

In the **Continental United States** (**Figure 8**), medium priority areas were more uniformly distributed. Three or more offices had medium priority interests off the coasts of South Carolina, Georgia, Texas, and Louisiana as well as in nearshore Pacific states. Additionally, multiple offices identified medium priority interests outside of Puget Sound in Washington.

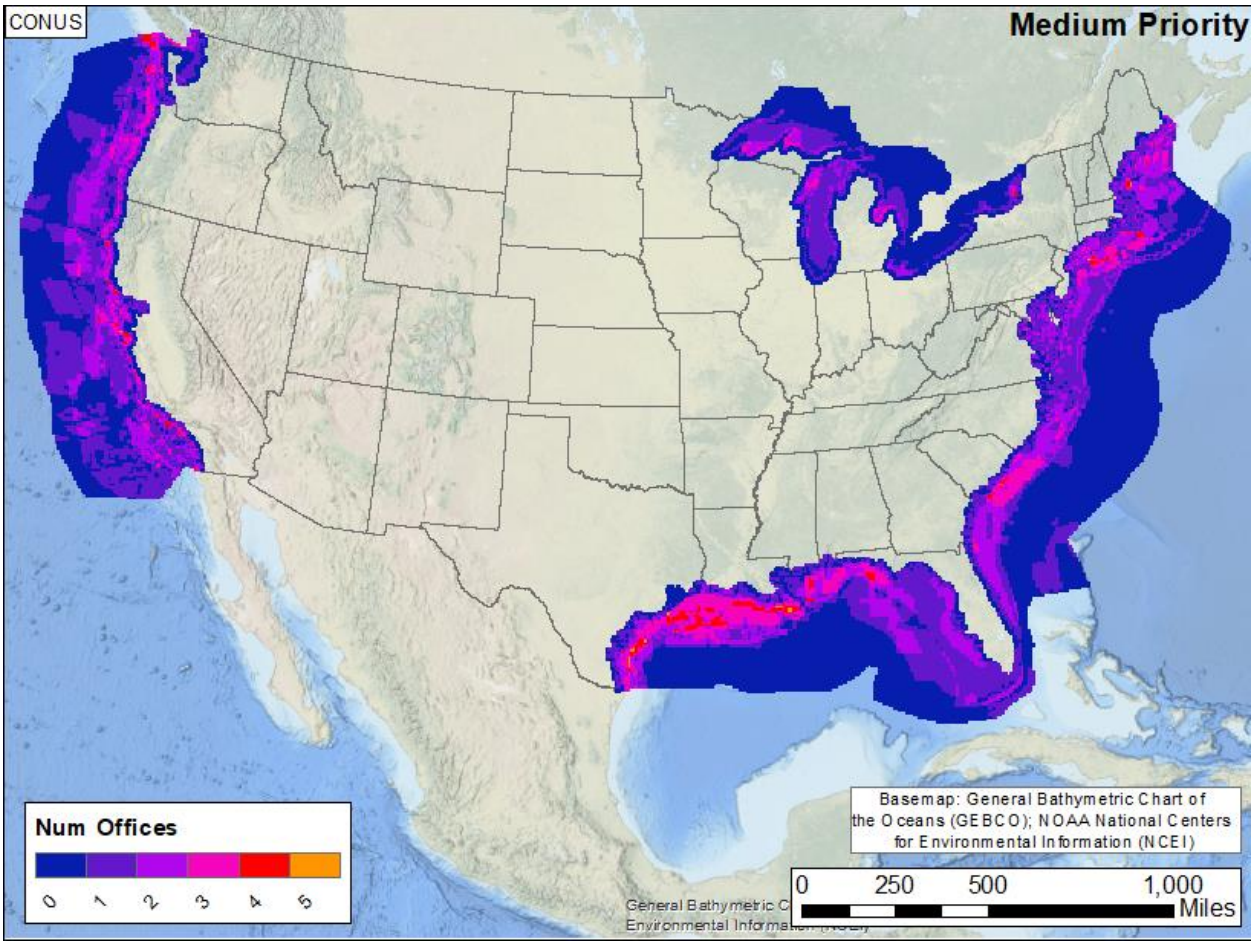

Figure 8. Number of respondents selecting cell as Medium Priority (Continental U.S.).

Figure 9 shows these results in **American Samoa**, **Guam** and the **Northern Mariana Islands**, and the **U.S. Caribbean**. In **American Samoa**, medium priorities were concentrated around Tutuila and the Manu'a Islands, as well as the Rose Atoll Marine National Monument. In **Guam** and the **Northern Mariana Islands**, medium priority areas could be found in varying locations across the EEZ. In the **U.S. Caribbean**, medium priority areas were concentrated in the far north and far south of the EEZ.

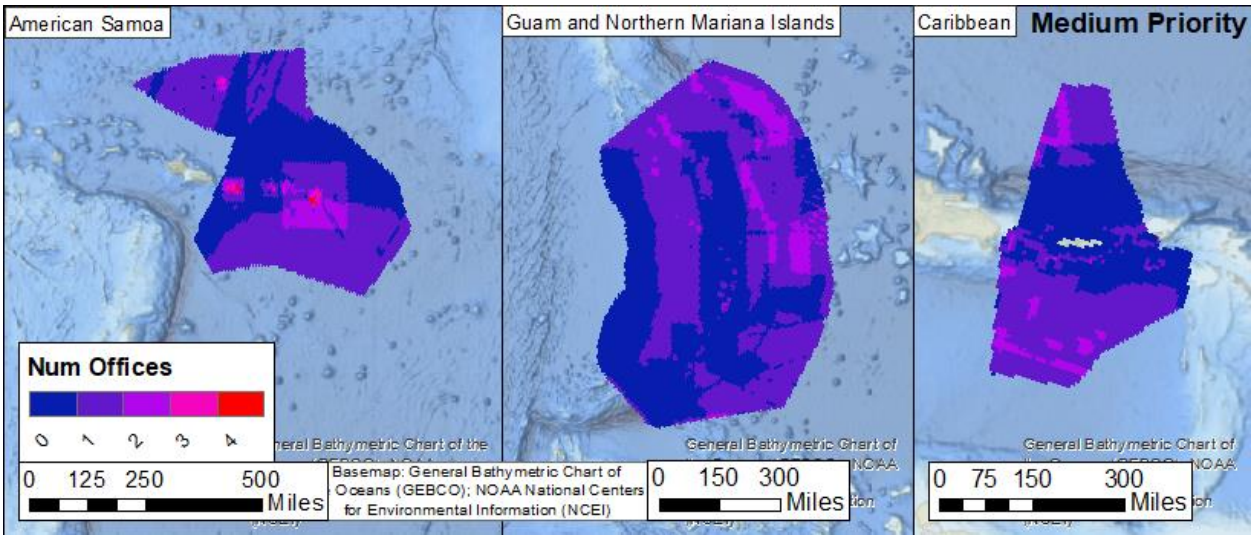

Figure 9. Number of respondents selecting cell as Medium Priority (American Samoa, Guam and Northern Mariana Islands, and U.S. Caribbean).

In **Alaska** (**Figure 10**), medium priority interests were distributed throughout the southeast, the Gulf of Alaska, and the Aleutian Islands, with Fisheries sub-sampling pattern lines cutting across Norton Sound and Kotzebue Sound.

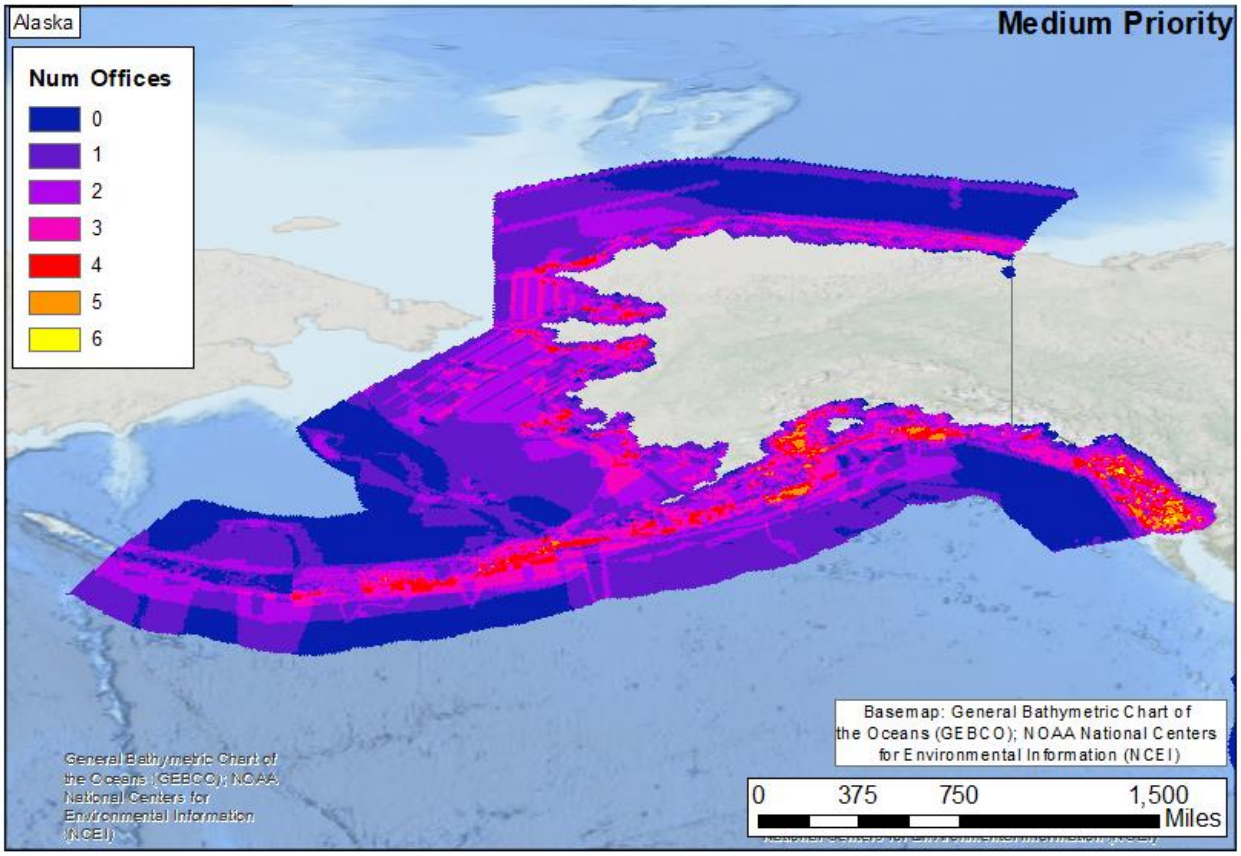

Figure 10. Number of respondents selecting cell as Medium Priority (Alaska).

In **Hawaii** (**Figure 11**), medium priorities were concentrated in a variety of areas, including far offshore to the extent of the EEZ, encompassing much of the Papahānaumokuākea Marine National Monument. In the **U.S. Minor Outlying Islands**, medium priorities were concentrated around Marine National Monuments around Johnston Atoll, Wake Island, and in the EEZ around Kingman Reef and Palmyra Atoll.

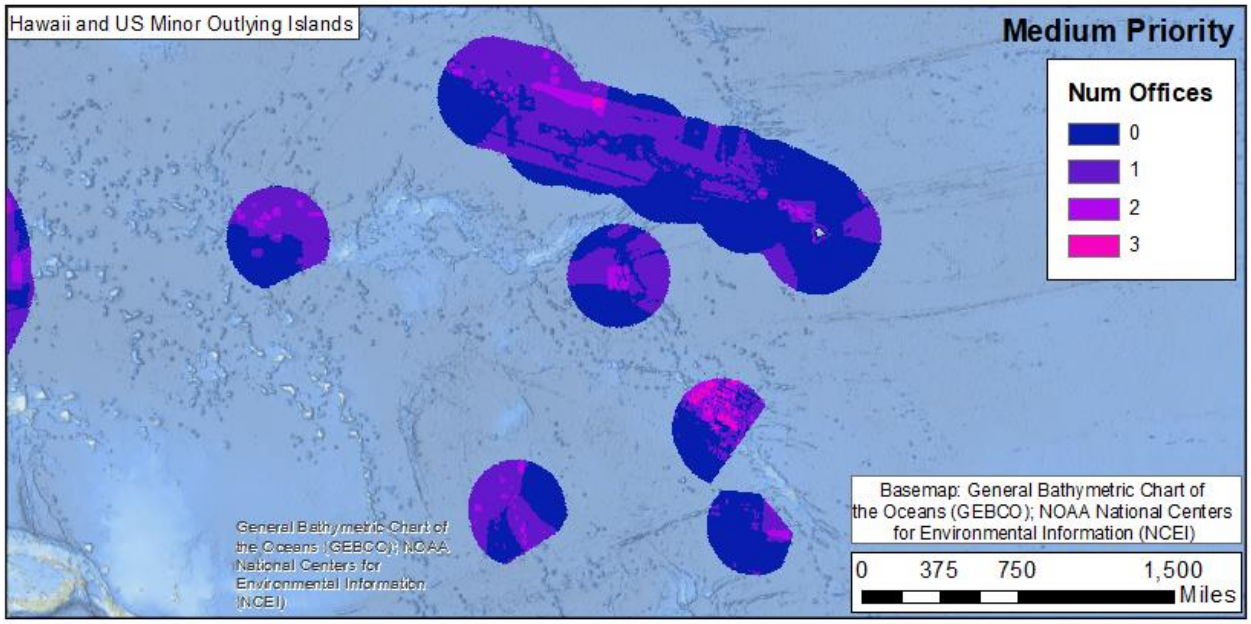

Figure 11. Number of respondents selecting cell as Medium Priority (Hawaii and Minor Outlying Islands).

3.1.3 Low Priority

In the **Continental United States** (**Figure 12**), low priority areas were distributed in many offshore locations. On the East Coast, these included areas on the continental shelf, particularly in New England. In the Gulf, this included the Florida continental shelf, as well as other offshore locations. On the West Coast, low priorities were most concentrated off the continental shelf, with noted interest on the Cascadia Basin down to the Gorda Escarpment.

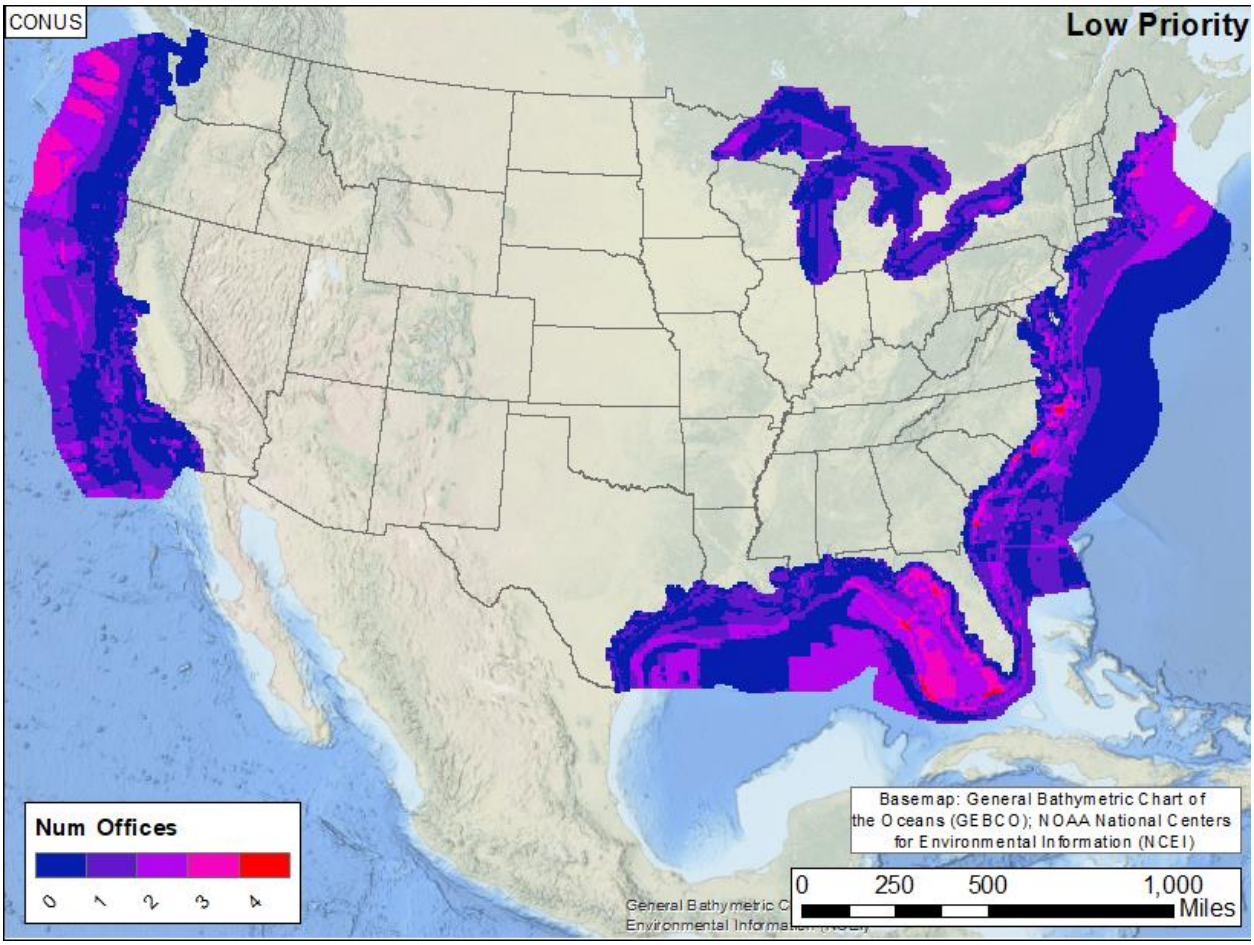

Figure 12. Number of respondents selecting cell as Low Priority (Continental U.S.).

Figure 13 shows these results in **American Samoa**, **Guam** and the **Northern Mariana Islands**, and the **U.S. Caribbean**. In **American Samoa**, low priorities were concentrated offshore, particularly north of the Samoan Islands. The outline around the Rose Atoll National Monument occurs because two offices identified their priorities in the Monument, with one of them selecting an area just slightly larger than the other. The first office was National Marine Sanctuaries (low priority, smaller box), and the second was the Office of Coast Survey (medium priority, slightly larger box). In **Guam** and the **Northern Mariana Islands**, low priority areas could be found in varying locations across the EEZ. In the **U.S. Caribbean**, low priority areas were concentrated in coastal and nearshore areas in Puerto Rico and the U.S. Virgin Islands.

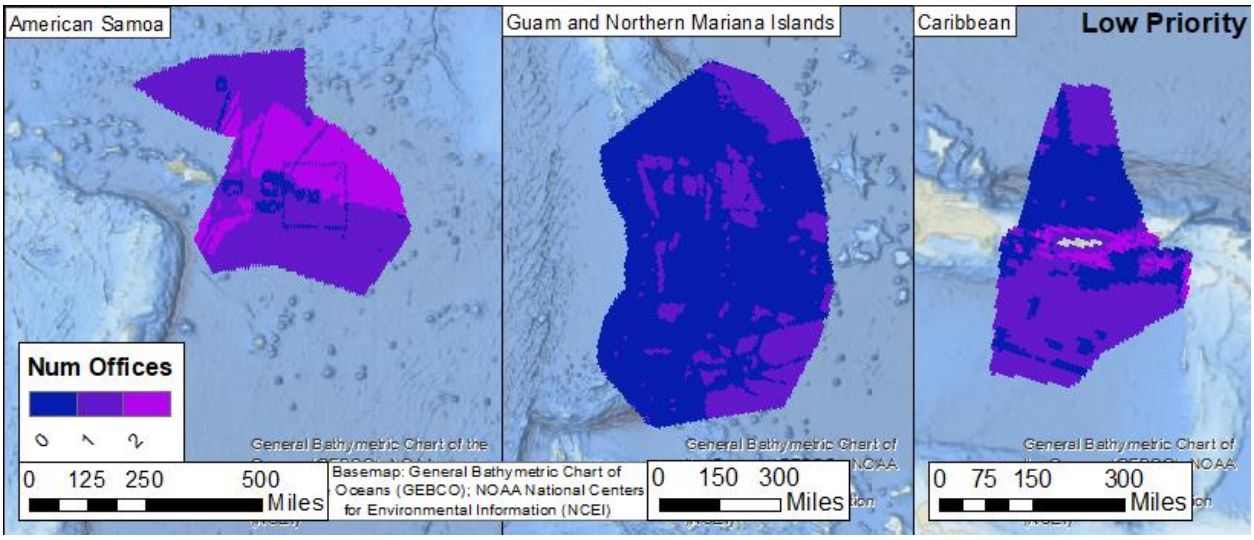

Figure 13. Number of respondents selecting cell as Low Priority (American Samoa, Guam and Northern Mariana Islands, and U.S. Caribbean).

In **Alaska** (**Figure 14**), low priority areas were concentrated offshore, particularly in the EEZ around the Aleutian Islands, the Bering Sea, and the Arctic Ocean.

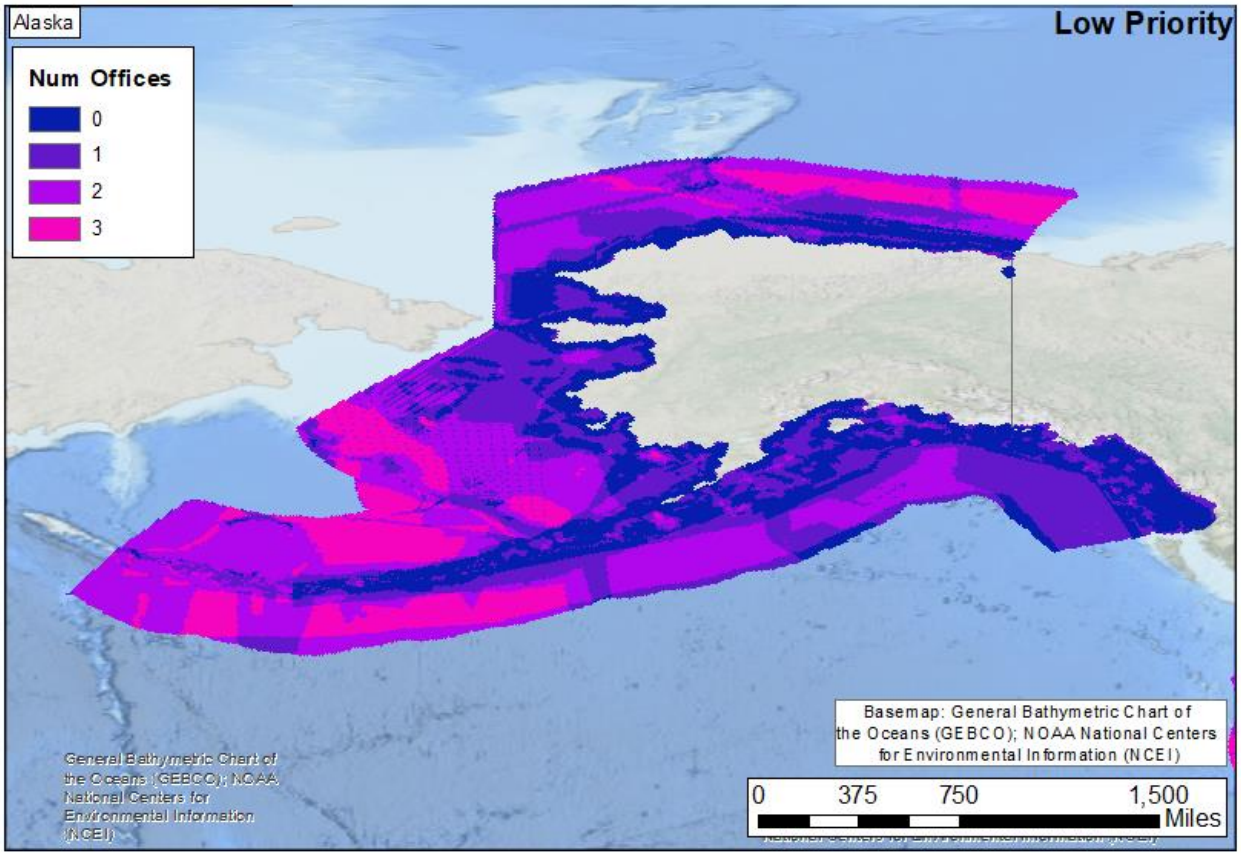

Figure 14. Number of respondents selecting cell as Low Priority (Alaska).

In **Hawaii** (**Figure 15**), low priorities were concentrated in the farthest extents of the EEZ, particularly in the Papahānaumokuākea Marine National Monument, excluding some areas already mapped by Okeanos and other mapping missions. In the **US Minor Outlying Islands**, low priorities were concentrated in the EEZ south of Kingman Reef and Palmyra Atoll, in the EEZ south of Jarvis Island, and in the EEZ northeast of Howland and Baker Islands.

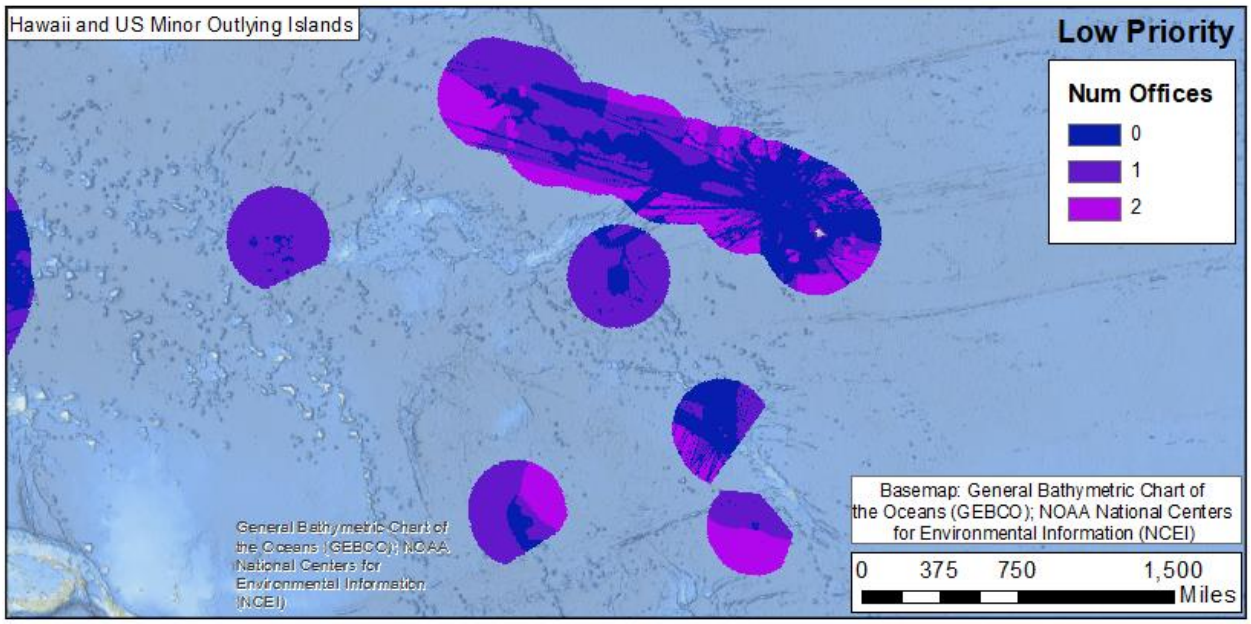

Figure 15. Number of respondents selecting cell as Low Priority (Hawaii and Minor Outlying Islands).

3.1.4 Any Priority

An "Any Priority" value was calculated that assessed whether or not a priority was entered into a cell at all—regardless of whether it was High, Medium, or Low. Each priority was given the same weight. The Any Priority indicator determined how many offices have selected a given cell as a priority at all, regardless of urgency, as collaboration opportunities can exist between offices and programs if they are both interested in mapping the same area, even if one of them has a more urgent need than the other (i.e. one office listed the area as High, and one office as Low).

In the **Continental United States** (**Figure 16**), general priorities could be found in multiple locations. The number of offices that prioritized a cell at all was high across the entire East Coast continental shelf, as well as the Florida continental shelf and in nearshore areas around the Gulf of Mexico, with particular interest in the Delaware and Chesapeake Bays, as well as the Florida Keys and coastal Gulf. On the West Coast, high numbers of respondents prioritized cells immediately off the coast, especially in Puget Sound and coastal California.

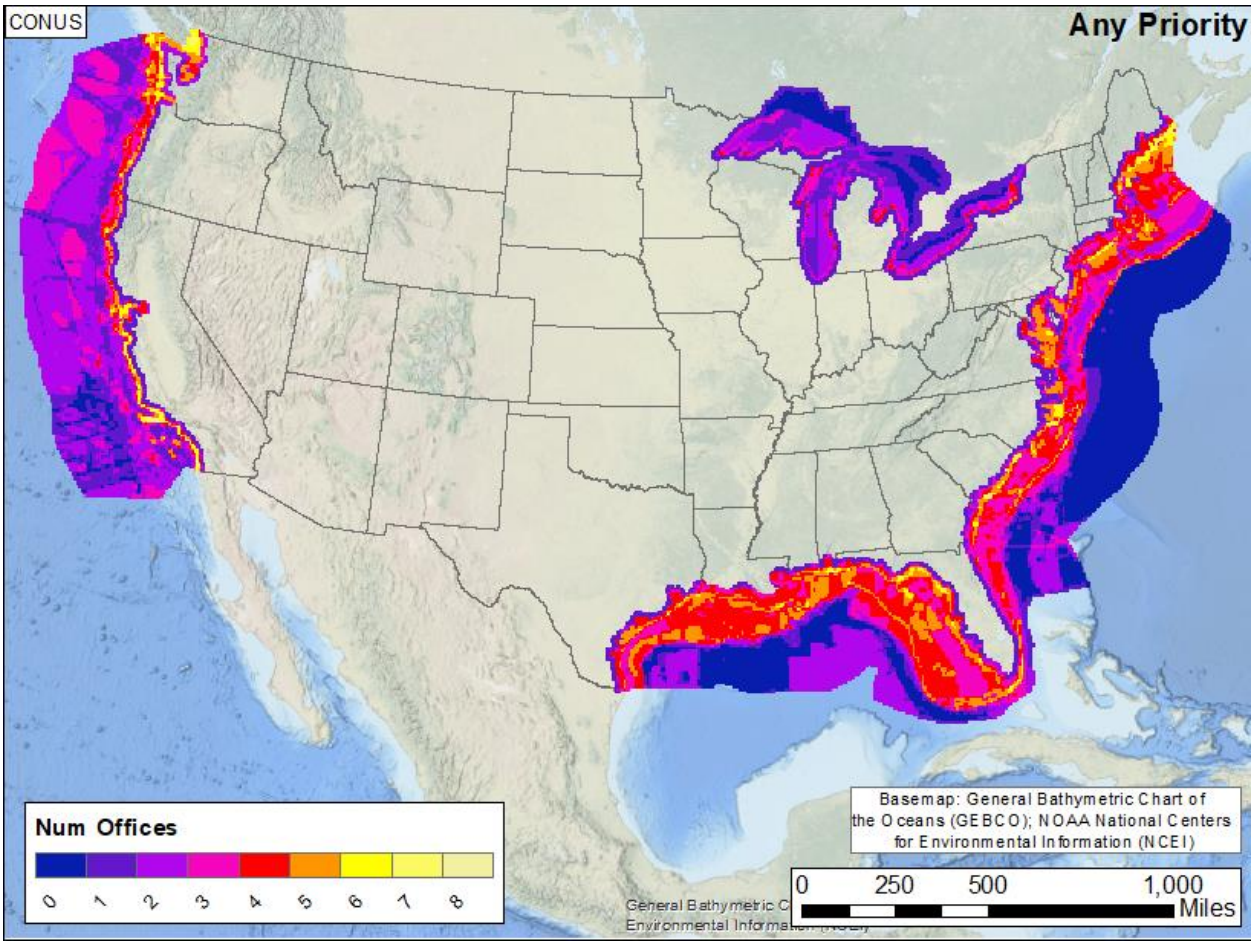

Figure 16. Number of respondents selecting cell as any priority (Continental U.S.).

Figure 17 shows these results in **American Samoa**, **Guam** and the **Northern Mariana Islands**, and the **U.S. Caribbean**. In **American Samoa**, most priorities were concentrated around Tutuila and the Manu'a Islands, as well as in the Rose Atoll National Monument. In **Guam** and the **Northern Mariana Islands**, priorities were concentrated along the islands, but also in many other locations around the EEZ. In the **U.S. Caribbean**, most priorities were concentrated on the coast, particularly in the U.S. Virgin Islands and southern Puerto Rico, which included high interest around the island of Vieques.

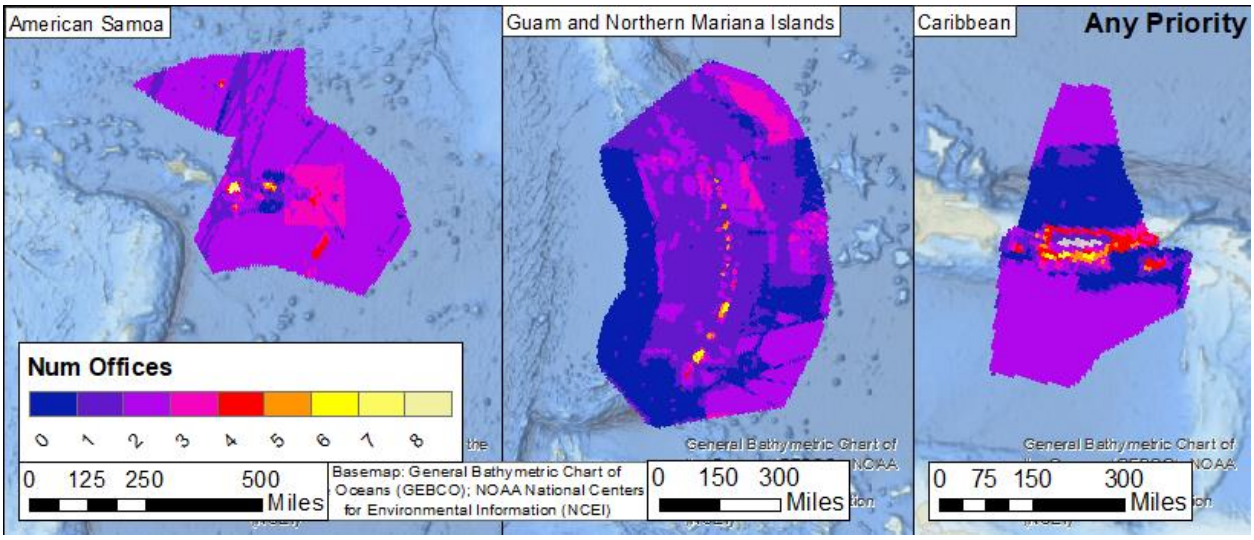

Figure 17. Number of respondents selecting cell as Any Priority (American Samoa, Guam and Northern Mariana Islands, and U.S. Caribbean).

In **Alaska** (**Figure 18**), general priorities were concentrated in coastal and nearshore areas, particularly in the southeast, Gulf of Alaska, Aleutian Islands, Bristol Bay, Kuskokwim Bay, and Norton and Kotzebue Sounds, with particular interest in the southeast and Gulf of Alaska.

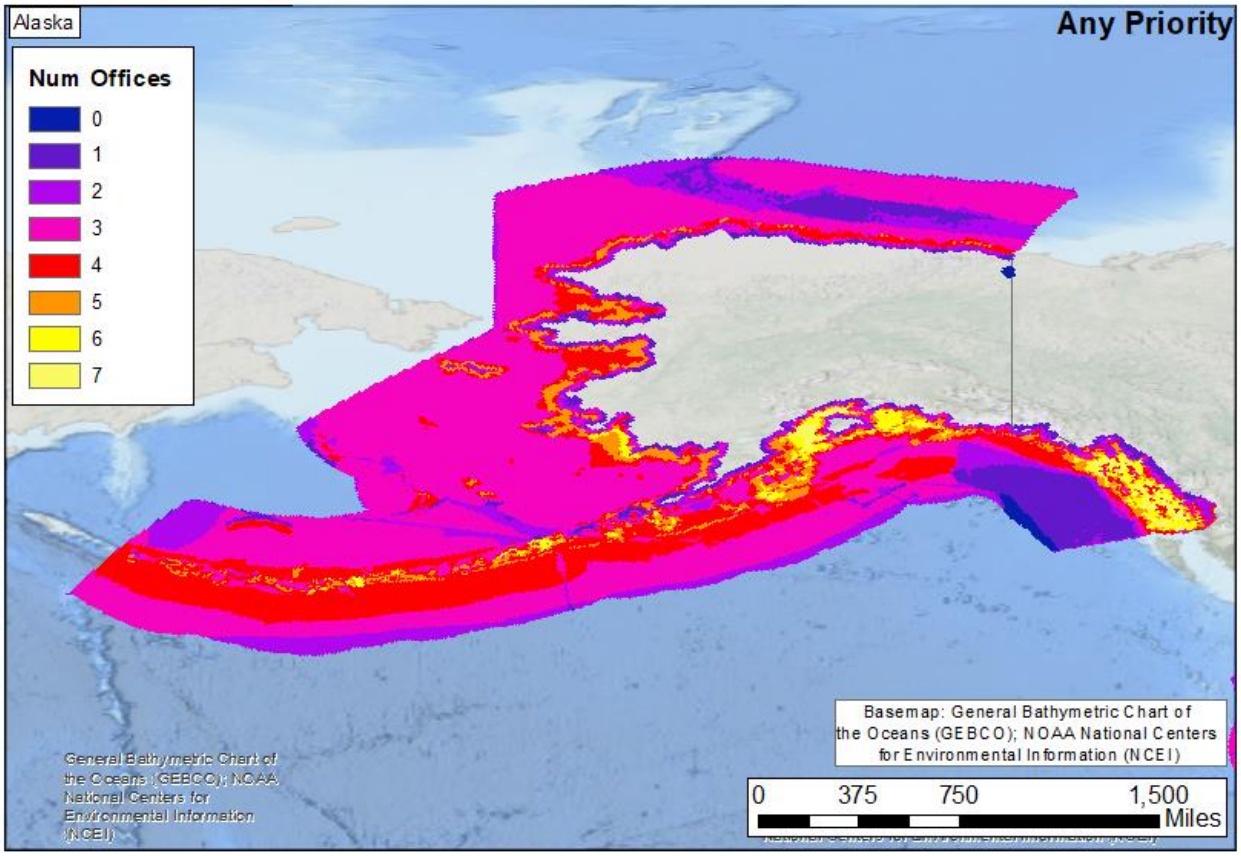

Figure 18. Number of respondents selecting cell as Any Priority (Alaska).

In **Hawaii** (**Figure 19**), general priorities were concentrated in nearshore areas, with particular interest around Maui, Moloka'i, Lanai, and O'ahu, as well as in the Papahānaumokuākea Marine National Monument. Respondents excluded some areas already mapped by Okeanos and other mapping missions. In the **US Minor Outlying Islands**, general priorities could be found throughout the EEZ of multiple islands.

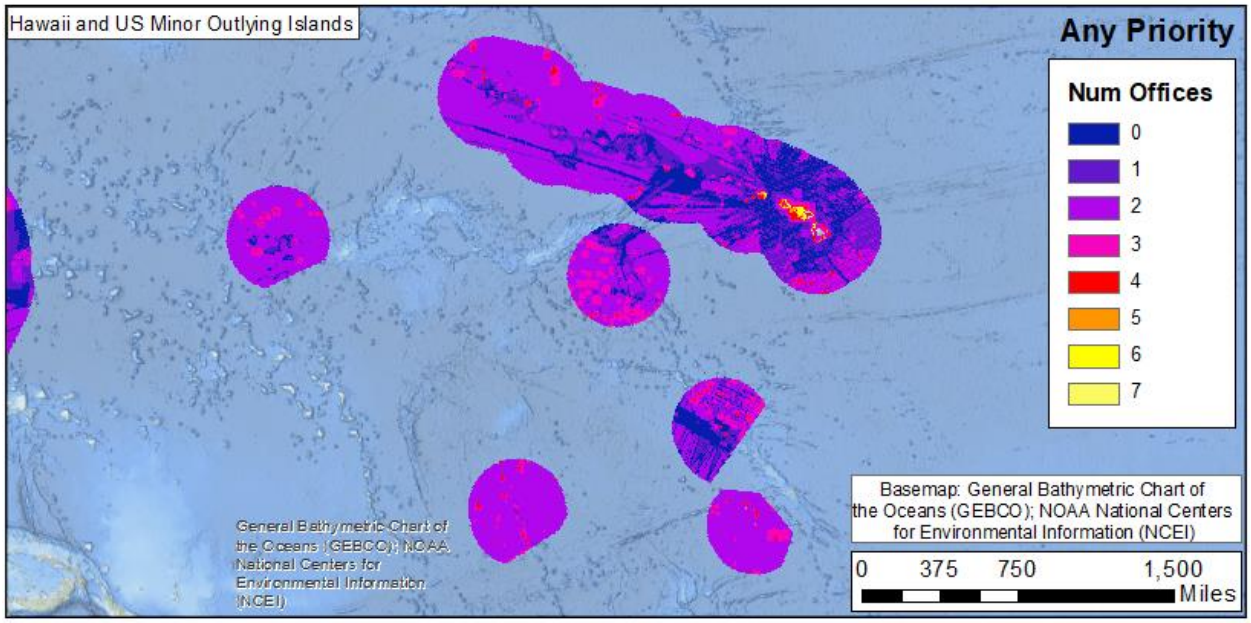

Figure 19. Number of respondents selecting cell as Any Priority (Hawaii and Minor Outlying Islands).

3.1.5 Weighted Priority

A Weighted Priority value was calculated by weighing and then summing all the High/Medium/Low values across offices. This gave an indicator of where there was the most mapping interest by providing higher weights to cells with higher numbers of High and Medium entries, as opposed to Low and None entries.

This is distinct from Any Priority, which only assesses how many offices selected a cell as High, Medium, or Low, and does not distinguish between the priority values. Weighted Priority does distinguish between the priority values, weighing High Priority more than Medium, Medium more than Low, and Low more than None, in order to assess both where multiple offices have mapping need, and where that need is most urgent.

Each priority value was given a weight. High Priority cells were given a weight of three (3), Medium Priority of two (2), Low Priority of one (1), and None of zero (0). It is worth noting that these weights are subjective. The purpose of the Weighted Priority indicator is not to make detailed statistical calculations, but rather to provide an easy-to-use visual method of determining where there is the highest mapping interest among offices.

In the **Continental United States** (**Figure 20**), weighted priorities were most evident in three areas: the Delaware Bay, the Chesapeake Bay, and in Puget Sound and coastal Washington state. Here, multiple offices identified cells as high priority, leading to high weighted priority scores.

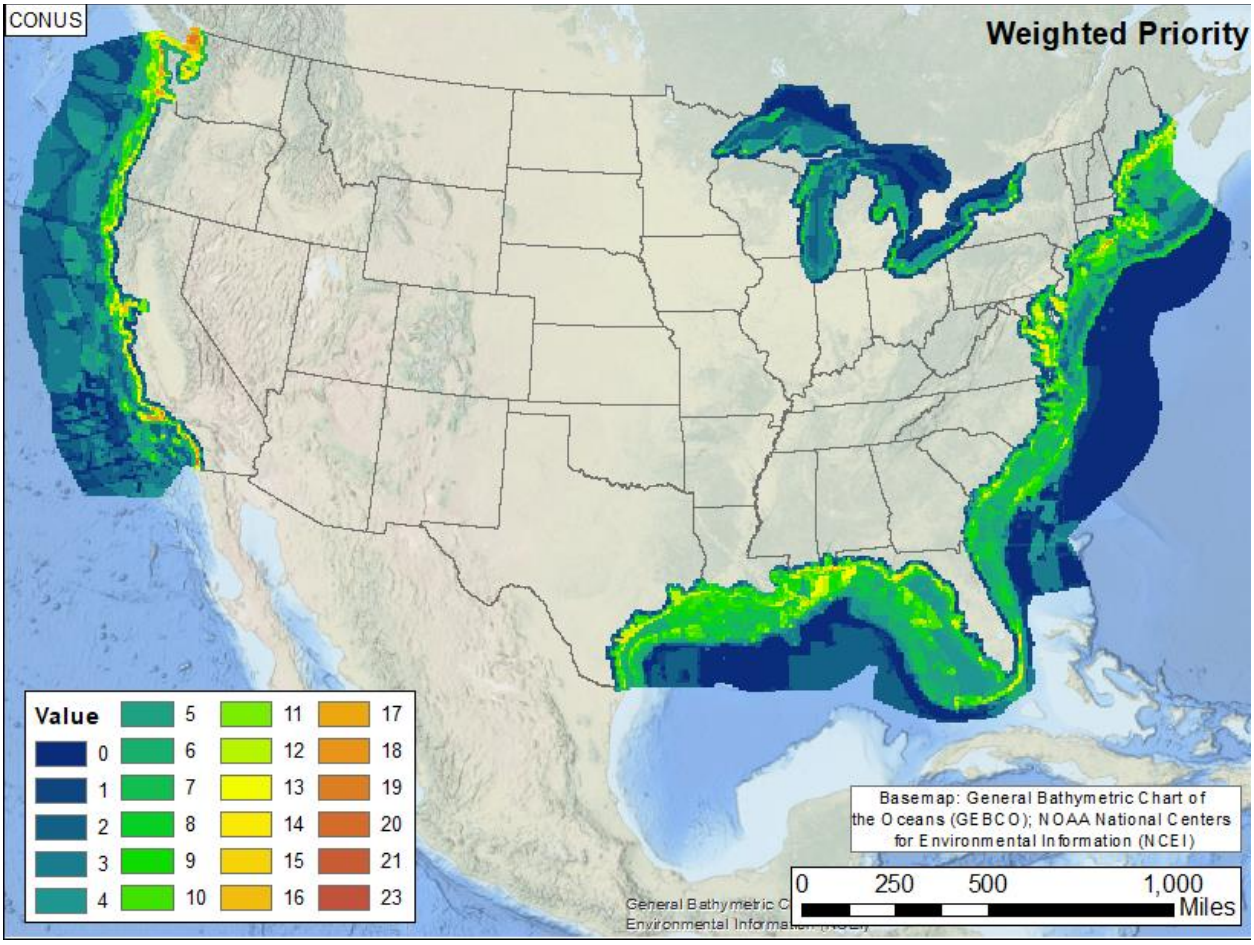

Figure 20. Weighted Priority (Continental U.S.).

Figure 21 shows these results in **American Samoa**, **Guam** and the **Northern Mariana Islands**, and the **U.S. Caribbean**. In **American Samoa**, areas that were given the highest priorities among the most number of offices were around Tutuila and the Manu'a Islands, as well as the Rose Atoll National Monument. In **Guam** and the **Northern Mariana Islands**, these areas were concentrated along the coasts as well as off the coasts up to 80-90 kilometers offshore in some locations. In the **U.S. Caribbean**, the most interest was concentrated along the coast, particularly in the U.S. Virgin Islands and southern Puerto Rico, which included high interest around the island of Vieques.

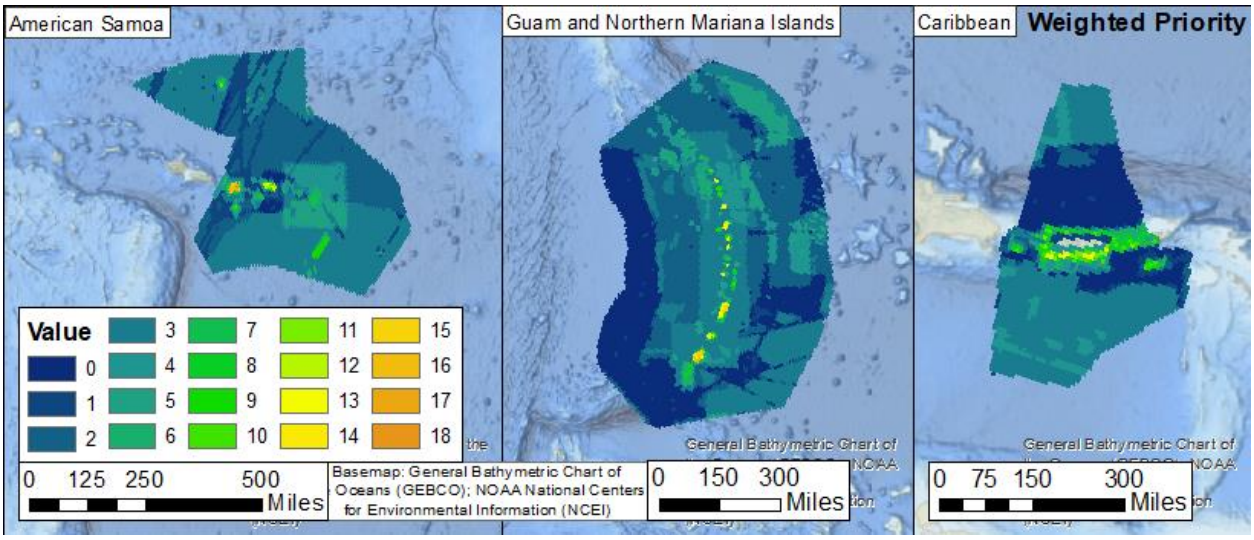

Figure 21. Weighted Priority (American Samoa, Guam and Northern Mariana Islands, and U.S. Caribbean).

In **Alaska** (**Figure 22**), the most mapping interest existed in the southeast and the Gulf of Alaska, but significant interest extended offshore in all regions, particularly along the Aleutian Islands and Kuskokwim Bay.

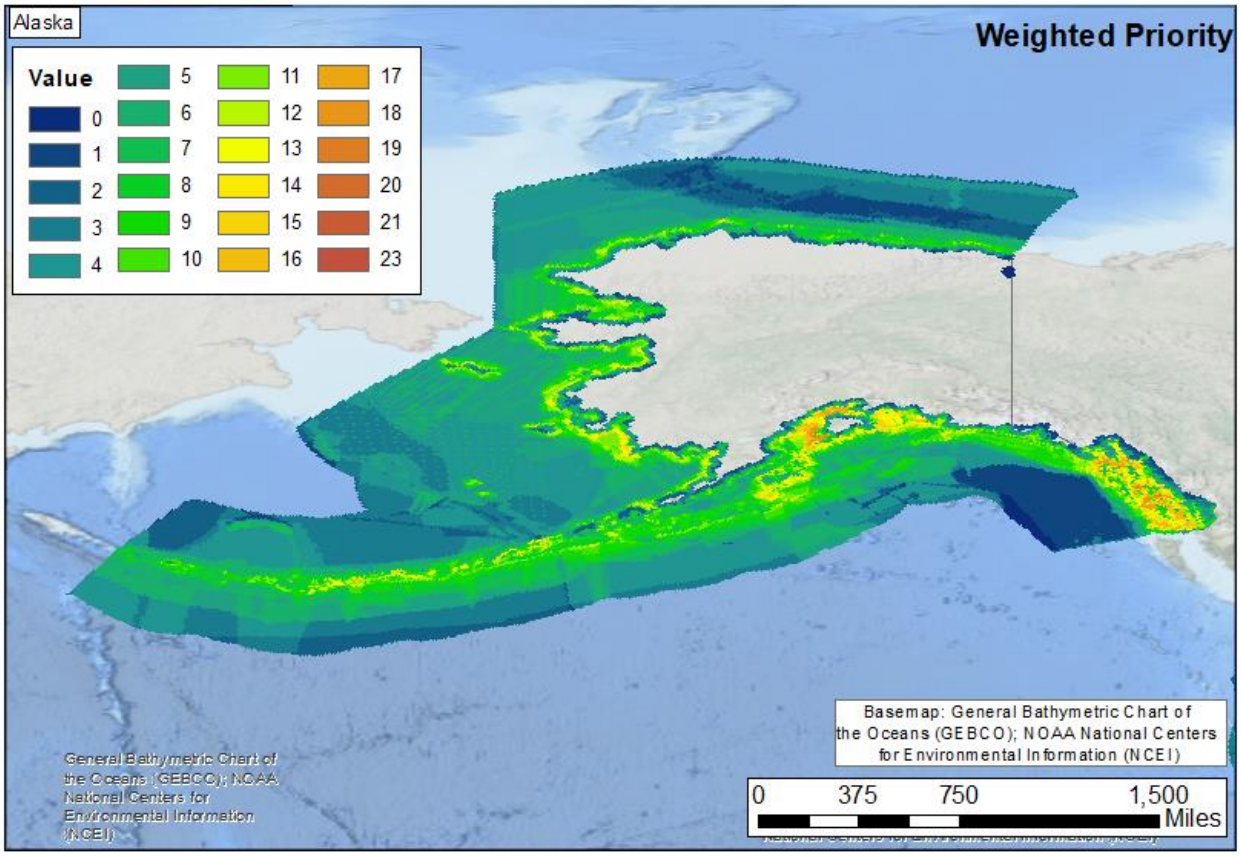

Figure 22. Weighted Priority (Alaska).

In **Hawaii** (**Figure 23**), areas of highest interest included nearshore areas, with particular interest around Maui, Moloka'i, Lanai, and O'ahu, as well as much of the Papahānaumokuākea Marine National Monument. In the **US Minor Outlying Islands**, areas with the highest weighted interest included the EEZ surrounding Howland and Baker Islands, as well as the EEZ surrounding Johnston Atoll and Jarvis Island.

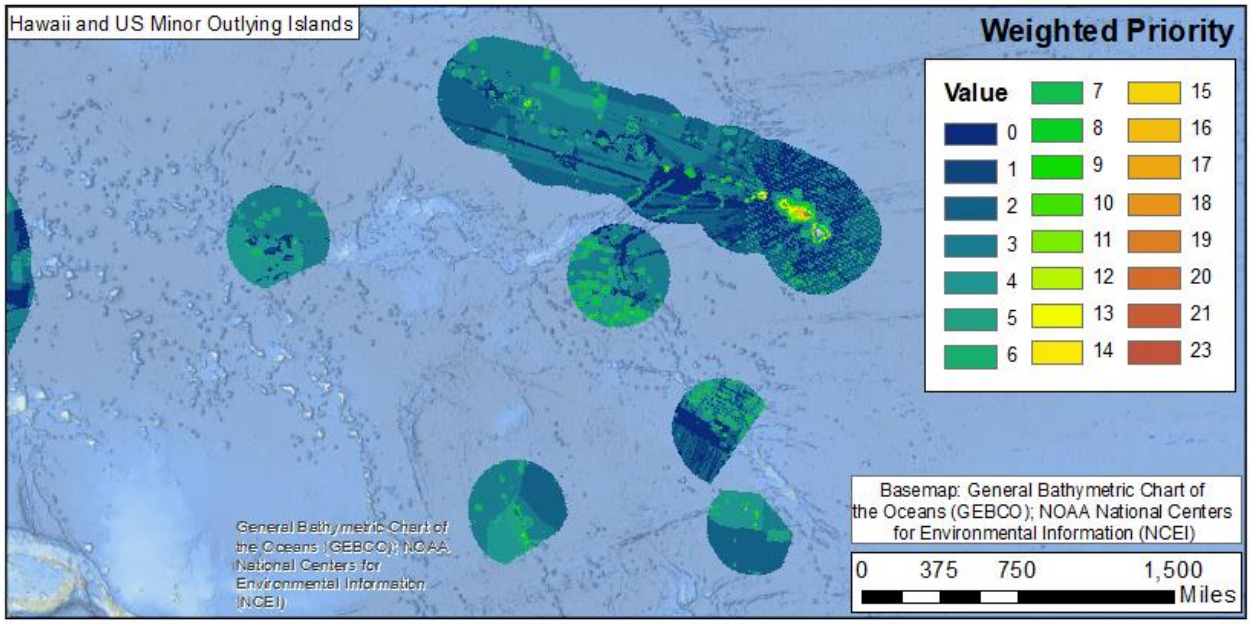

Figure 23. Weighted Priority (Hawaii and Minor Outlying Islands).

3.2 Justification

Respondents were allowed to enter up to three (3) justifications in each cell to identify *why* they had mapping interests in a given location. **Table 2** identifies each of the drop-down options for justification.

For the analysis, each justification was summed across offices for each cell. For a given justification J_a, all entries of J_a in a given cell, whether J_a was entered for the Primary, Secondary, or Tertiary Justification, were summed to gain an understanding of how many offices had the same justification in that cell.

For example, if one office gave Cell A a Primary Justification of Benthic Exploration, a Secondary Justification of Water Column Exploration, and a Tertiary Justification of Scientific Research, and a second office gave Cell A a Primary Justification of Water Column Exploration, a Secondary Justification of Benthic Exploration, and a Tertiary Justification of None (**Table 6**) the Benthic Exploration number for that cell would be two (2), the Water Column Exploration number for that cell would be two (2) and the Scientific Research number for that cell would be one (1) (**Table 7**).

This indicates that two (2) offices selected a Justification for this cell of Benthic Exploration, two (2) selected a Justification of Water Column Exploration, and one (1) selected a Justification of

Scientific Research. This indicator can help identify where offices have shared reasons for mapping need.

Table 6. Sample justifications for two offices across one cell.

	Office 1	**Office 2**
Primary Justification	Benthic Exploration	Water Column Exploration
Secondary Justification	Water Column Exploration	Benthic Exploration
Tertiary Justification	Scientific Research	None

Table 7. Sample justification sums for two offices across one cell (sums).

Justification	**Sum**
Benthic Exploration	2
Water Column Exploration	2
Scientific Research	1

Maps of these sums are available in **Appendix C**.

3.2.1 Unique Justifications

The number of unique justifications per cell was analyzed in order to determine which areas had the most diverse mapping interest, with the most varied reasons for why offices wanted mapping data there. To determine this, a geospatial tool asked the following for each justification criterion:

1. Was Justification J_a entered for this cell?
    a. If so, add one (1) to the unique justification total.
    b. If not, add zero (0).

If a specific justification was entered multiple times for that cell—for example, if multiple offices put the justification Scientific Research in a given cell—it was only counted once.

Taking the sample cell from above (see **Table 8** below), the calculation would run as follows:

Table 8. Sample justifications for two offices across one cell.

	Office 1	**Office 2**
Primary Justification	Benthic Exploration	Water Column Exploration
Secondary Justification	Water Column Exploration	Benthic Exploration
Tertiary Justification	Scientific Research	None

In this cell, two (2) offices entered the following justifications: Benthic Exploration, Water Column Exploration, and Scientific Research. Thus, the number of unique justifications would be three (3): Benthic Exploration, Water Column Exploration, and Scientific Research. Note that Benthic Exploration and Water Column Exploration are not counted twice, even though they were entered twice, because the tool is only checking for unique justifications in order to assess where there is varied mapping interest.

Across the **Continental United States** (**Figure 24**), unique justifications were highest in a number of locations. This included sections of the continental shelf off the East Coast, particularly in New England and the nearshore southeast. In the Gulf of Mexico, this included the Florida Keys and southern Texas, and on the West Coast this included significant nearshore areas, with particular interest in Puget Sound.

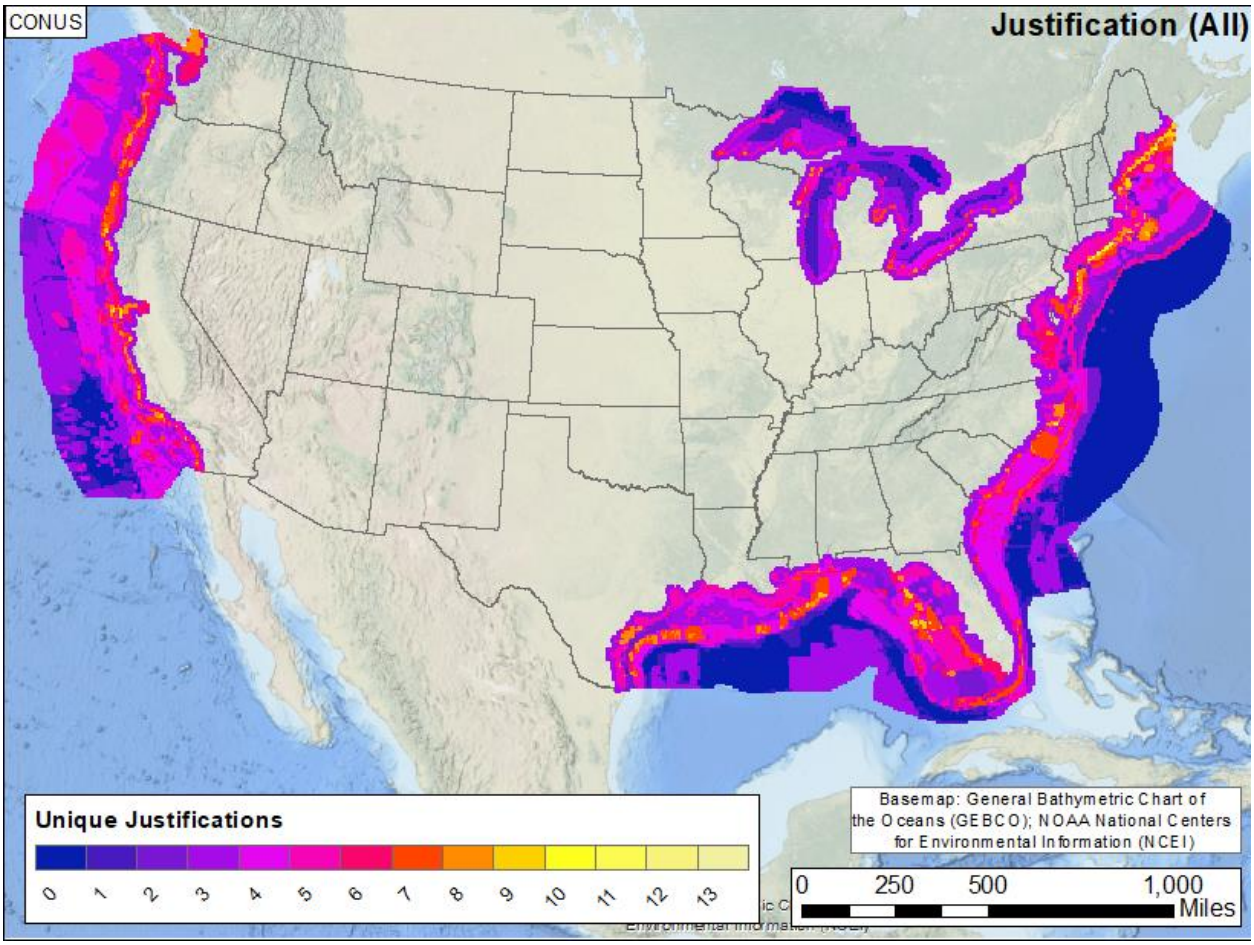

Figure 24. Unique Justifications (Continental U.S.).

Figure 25 shows these results in **American Samoa**, **Guam** and the **Northern Mariana Islands**, and the **U.S. Caribbean**. In **American Samoa**, the most varied justifications could be seen around Tutuila, the Manu'a Islands, and the Rose Atoll National Monument. In **Guam** and the **Northern Mariana Islands**, varied mapping interests could be found in many locations throughout the EEZ, including on the coasts, and particularly along the eastern extent of the EEZ. In the **U.S. Caribbean**, the most varied mapping interests were concentrated on the coasts, particularly in the U.S. Virgin Islands and southern Puerto Rico, which included high interest around the island of Vieques.

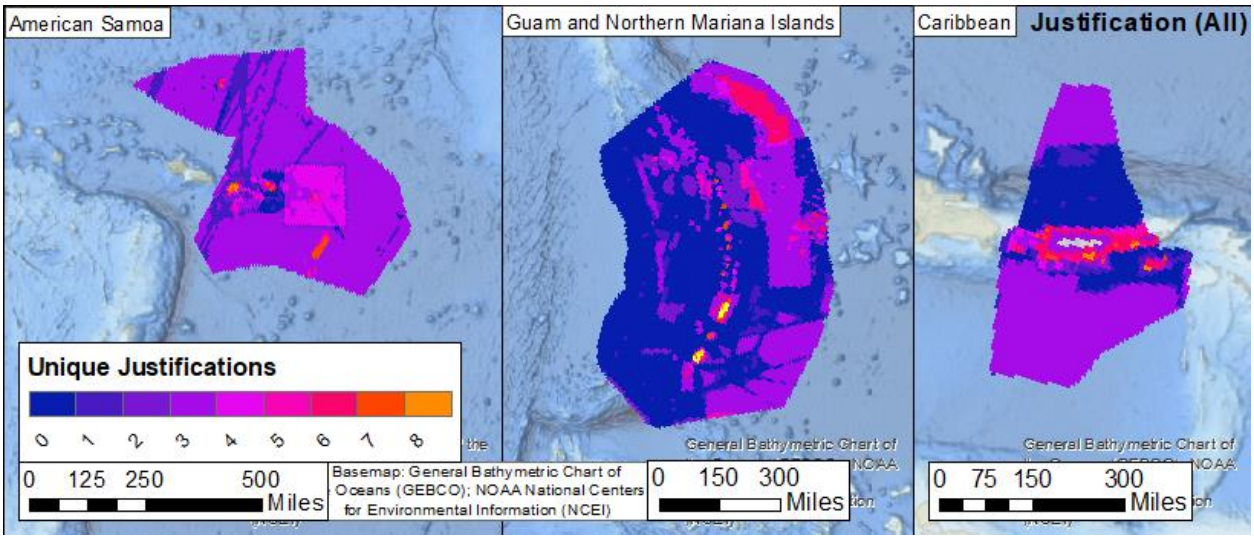

Figure 25. Unique Justifications (America Samoa, Guam and Northern Mariana Islands, and U.S. Caribbean).

In **Alaska** (**Figure 26**), the most varied mapping justifications could be found in the Gulf of Alaska and in the Aleutian Islands, both in coastal areas and over 300 kilometers offshore in some locations.

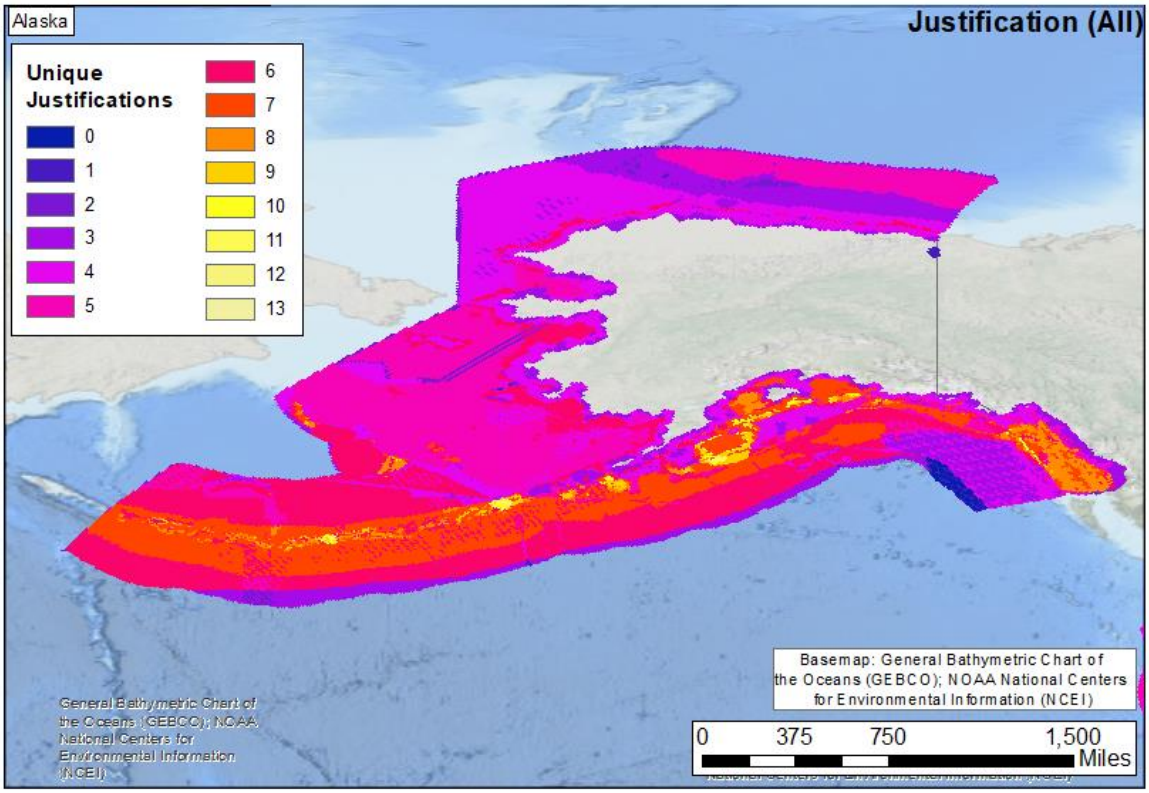

Figure 26. Unique Justifications (Alaska).

In **Hawaii** (**Figure 27**), regions with the most varied mapping justifications included nearshore areas, with particular interest around Maui, Moloka'i, Lanai, and O'ahu, as well as much of the Papahānaumokuākea Marine National Monument. In the **US Minor Outlying Islands**, areas with the most varied mapping justifications included the EEZ surrounding Howland and Baker Islands, the EEZ surrounding Jarvis Island, and the EEZ surrounding Johnston Atoll.

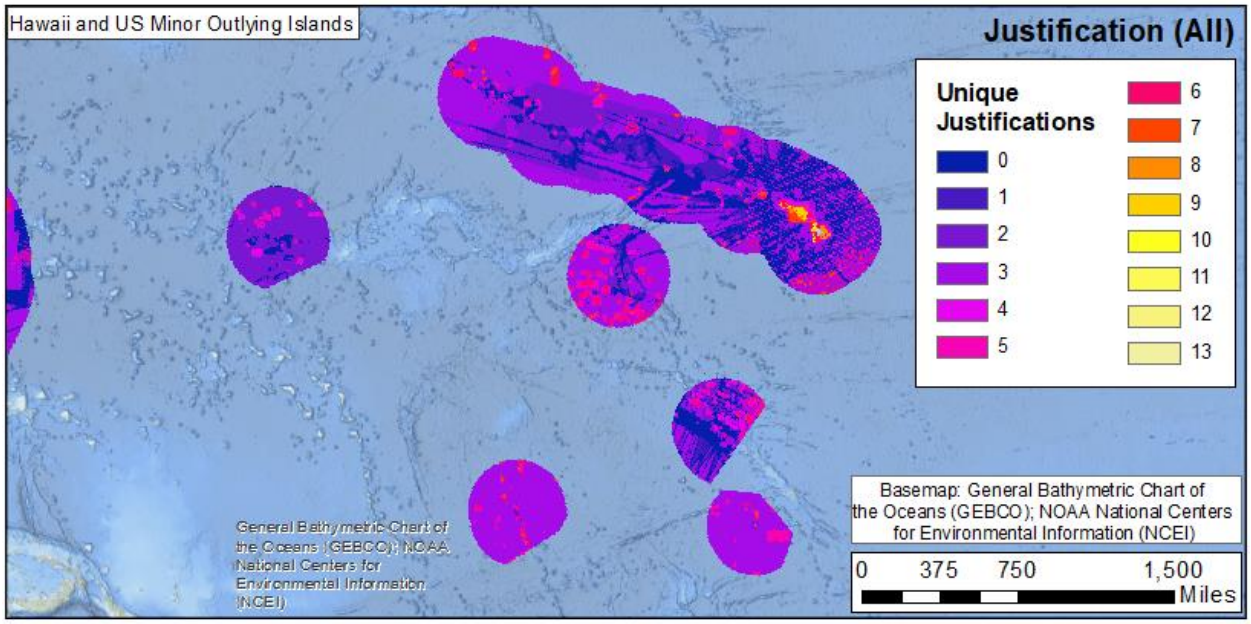

Figure 27. Unique Justifications (Hawaii and Minor Outlying Islands).

3.2.2 Frequency by Region

A frequency plot was generated that identified the most common justifications for each of the seven (7) regions, and for the entire U.S. EEZ (and Canadian Great Lakes) as a whole. The frequency plot incorporated all justifications regardless of whether they were Primary, Secondary, or Tertiary. Justifications not included in this plot were General Knowledge Gap (the default for Primary Justification) and None.

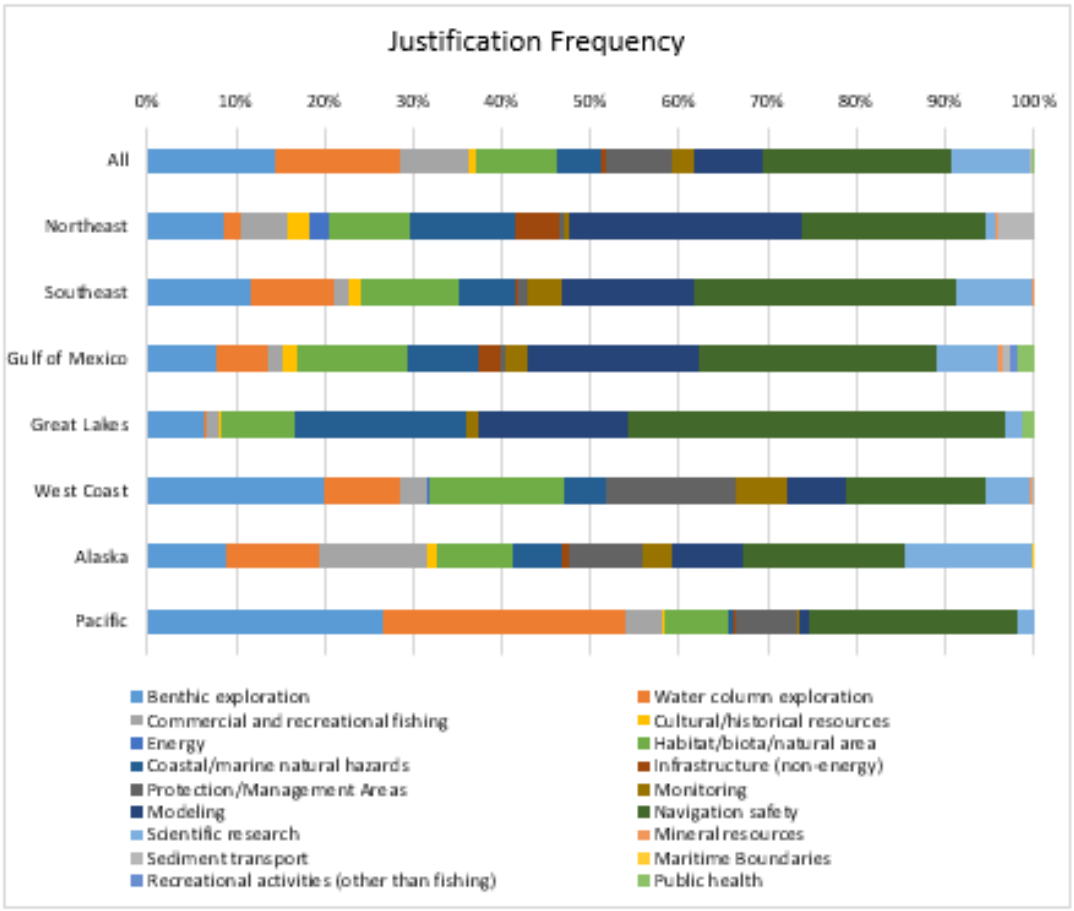

Figure 28. Justification frequency by region.

Note that the region Great Lakes includes the Canadian Great Lakes up to twenty (20) kilometers inland.

Figure 28 reveals a number of interesting trends. Across all regions, Benthic Exploration, Water Column Exploration, Modeling and Navigation Safety were some of the most frequently-selected justifications. The **Northeast**, **Southeast**, **Gulf of Mexico** and **Great Lakes** all had high interest in Modeling and Navigation Safety combined. The **Northeast** had higher interest than any other region in Sediment Transport, with 5% of responses going to this justification. In some regions, Navigation Safety alone represented over 30% of justifications. In the **Great Lakes**, Navigation Safety comprised over 40% of justifications, but in **Alaska** it was less than 20%. In the **West Coast**, justifications were more varied, with no single justification representing more than 20% of responses; Benthic Exploration was the most common justification in this region. The **Pacific** is noteworthy for having three (3) justifications combined represent almost 80% of the distribution: Benthic Exploration, Water Column Exploration, and Navigation Safety.

3.3 Map Product

Respondents were allowed to enter up to three (3) map products in each cell to identify *what* data products they wanted in a given location. **Table 3** identifies each of the drop-down options for map product.

For the analysis, each map product was summed across offices for each cell. For a given map product P_a, all entries of P_a in a given cell—whether P_a was entered for the Primary, Secondary, or Tertiary Map Product—were summed to gain an understanding of how many offices had the same map product in that cell.

For example, if one office gave Cell A a Primary Map Product of Elevation, a Secondary Map Product of Backscatter Intensity, and a Tertiary Map Product of Nautical Map and Chart Products, and a second office gave Cell A a Primary Map Product of Backscatter Intensity, a Secondary Map Product of Elevation, and a Tertiary Map Product of None (**Table 9**) the Elevation number for that cell would be two (2), the Backscatter Intensity number for that cell would be two (2) and the Nautical Map and Chart Products number for that cell would be one (1) (**Table 10**).

This indicates that two (2) offices selected a Map Product for this cell to be Elevation, two (2) selected a Map Product of Backscatter Intensity, and one (1) selected a Map Product of Nautical Map and Chart Products. This indicator can help identify where offices have shared data needs.

Table 9. Sample map products for two offices across one cell.

	Office 1	**Office 2**
Primary Justification	Elevation	Backscatter Intensity
Secondary Justification	Backscatter Intensity	Elevation
Tertiary Justification	Nautical Map and Chart Products	None

Table 10. Sample map product sums for two offices across one cell (sums).

Map Products	**Sum**
Elevation	2
Backscatter Intensity	2
Nautical Map and Chart Products	1

Maps of these sums are available in **Appendix D**.

3.2.1 Unique Map Products

The number of unique map products per cell was analyzed in order to determine which areas had the most diverse data needs, with the most varied data products requested. To determine this, a geospatial tool was run that asked the following for each map product criterion:

1. Was Map Product P_a entered for this cell?
    a. If so, add one (1) to the unique map product total.
    b. If not, add zero (0).

If a specific map product was entered multiple times for that cell—for example, if multiple offices put Map Product Elevation in a given cell—it was only counted once.

Taking the sample cell from above (see **Table 11** below), the calculation would run as follows:

Table 11. Sample map products for two offices across one cell.

	Office 1	**Office 2**
Primary Justification	Elevation	Backscatter Intensity
Secondary Justification	Backscatter Intensity	Elevation
Tertiary Justification	Nautical Map and Chart Products	None

In this cell, two (2) offices entered the following map products: Elevation, Backscatter Intensity, and Nautical Map and Chart Products. Thus, the number of unique map products would be three (3): Elevation, Backscatter Intensity, and Nautical Map and Chart Products. Note that Elevation and Backscatter Intensity are not counted twice, even though they were entered twice, because the tool is only checking for unique map products in order to assess where there are varied data needs.

Across the **Continental United States** (**Figure 29**), unique map products were highest in a number of locations. This included sections of the continental shelf off the East Coast, particularly in the Delaware and Chesapeake Bays. In the Gulf of Mexico, this included coastal Louisiana and southern Texas. On the West Coast, map products were varied throughout most nearshore and offshore regions, with particular interest in the Channel Islands, coastal Washington, and Puget Sound.

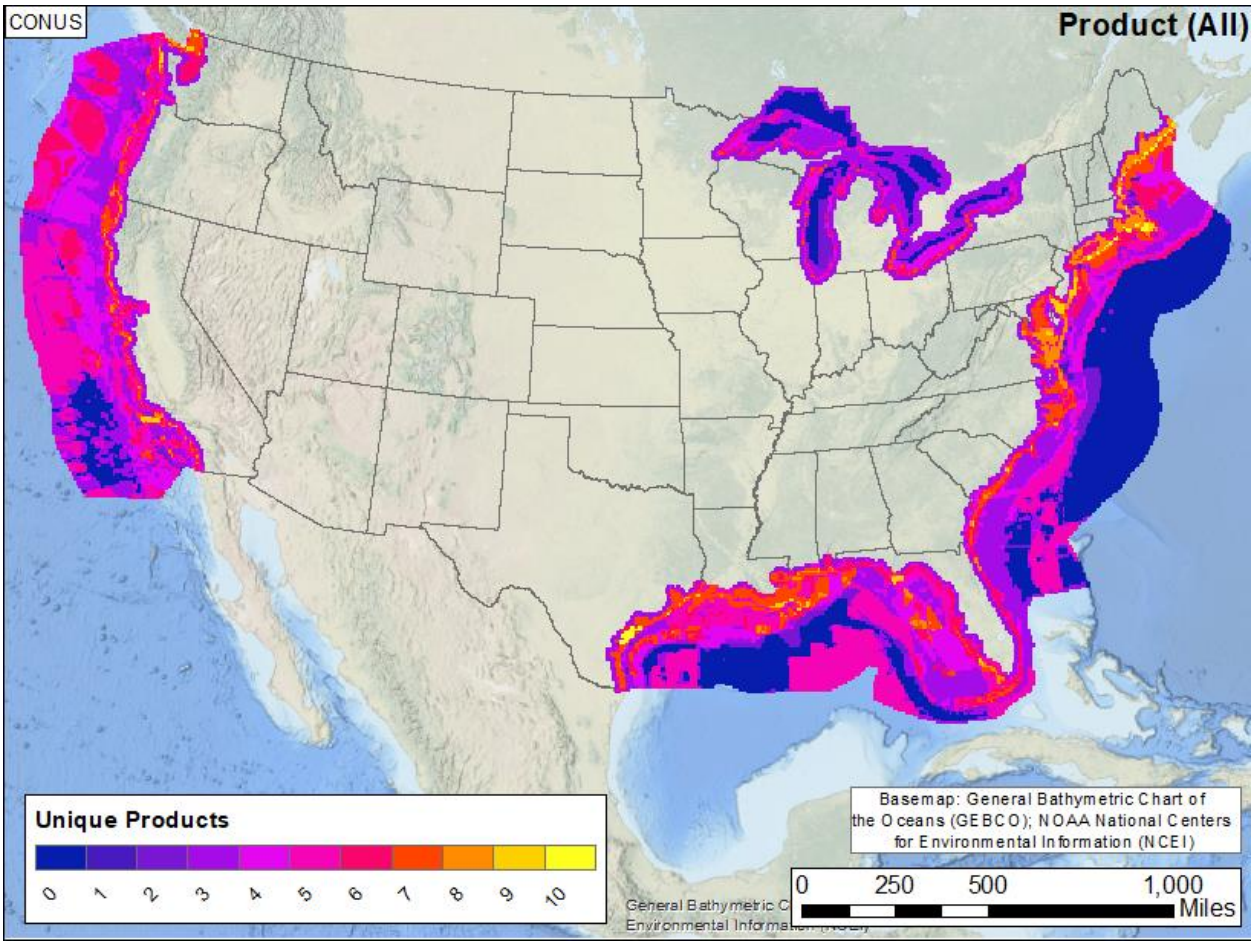

Figure 29. Unique Map Products (Continental U.S.).

Figure 30 shows these results in **American Samoa**, **Guam** and the **Northern Mariana Islands**, and the **U.S. Caribbean**. In **American Samoa**, the most varied map products could be seen around Tutuila and the Manu'a Islands, but a variety of map products were requested across the EEZ. In **Guam** and the **Northern Mariana Islands**, varied map products were requested in many locations throughout the EEZ, including on the coasts. In the **U.S. Caribbean**, the most varied map product needs were concentrated on the coasts, particularly in the U.S. Virgin Islands and southern Puerto Rico, which included high interest around the island of Vieques. Map product needs were also diverse in the far northern and far southern extents of the EEZ.

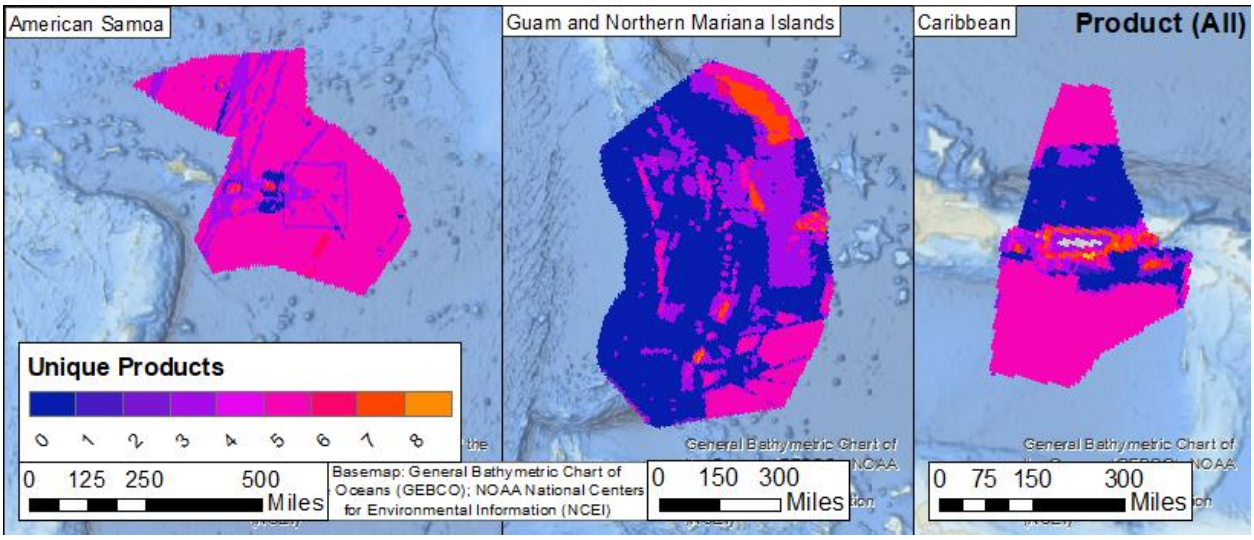

Figure 30. Unique Map Products (America Samoa, Guam and Northern Mariana Islands, and U.S. Caribbean).

In **Alaska** (**Figure 31**), diverse map products were requested almost universally across the state, with particular interest in the southeast, the Gulf of Alaska, and the Aleutian Islands. However, at least four (4) different map products were requested across almost the entire Alaskan EEZ, with the exception of the offshore southeast region.

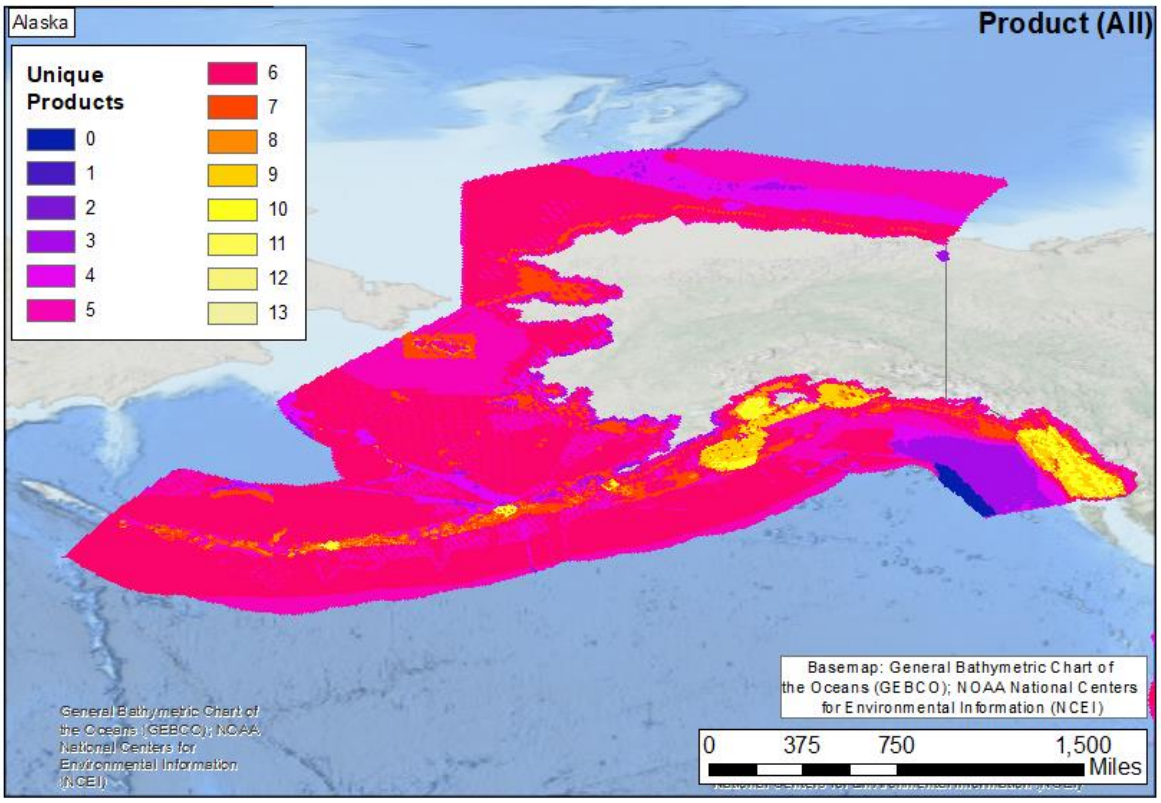

Figure 31. Unique Map Products (Alaska).

In **Hawaii** (**Figure 32**), regions with the most varied map product needs included nearshore areas, with particular interest around Maui, Moloka'i, Lanai, and O'ahu, as well as much of the Papahānaumokuākea Marine National Monument. In the **US Minor Outlying Islands**, areas with the most varied map product needs included the EEZ surrounding Howland and Baker Islands, the EEZ surrounding Jarvis Island, and the EEZ surrounding Johnston Atoll.

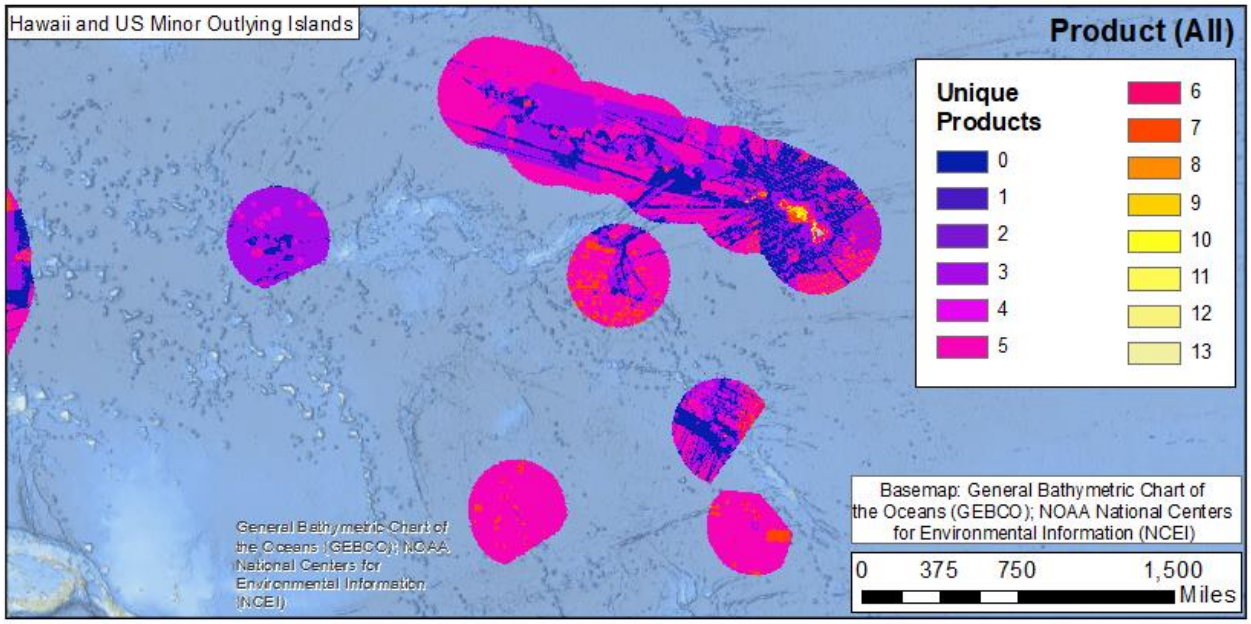

Figure 32. Unique Map Products (Hawaii and Minor Outlying Islands).

3.3.2 Frequency by Region

A frequency plot was generated that identified the most common map products for each of the seven (7) regions, and for the entire U.S. EEZ (and Canadian Great Lakes) as a whole. The frequency plot incorporated all map products regardless of whether they were Primary, Secondary, or Tertiary. The Map Product option None was not included in this graph.

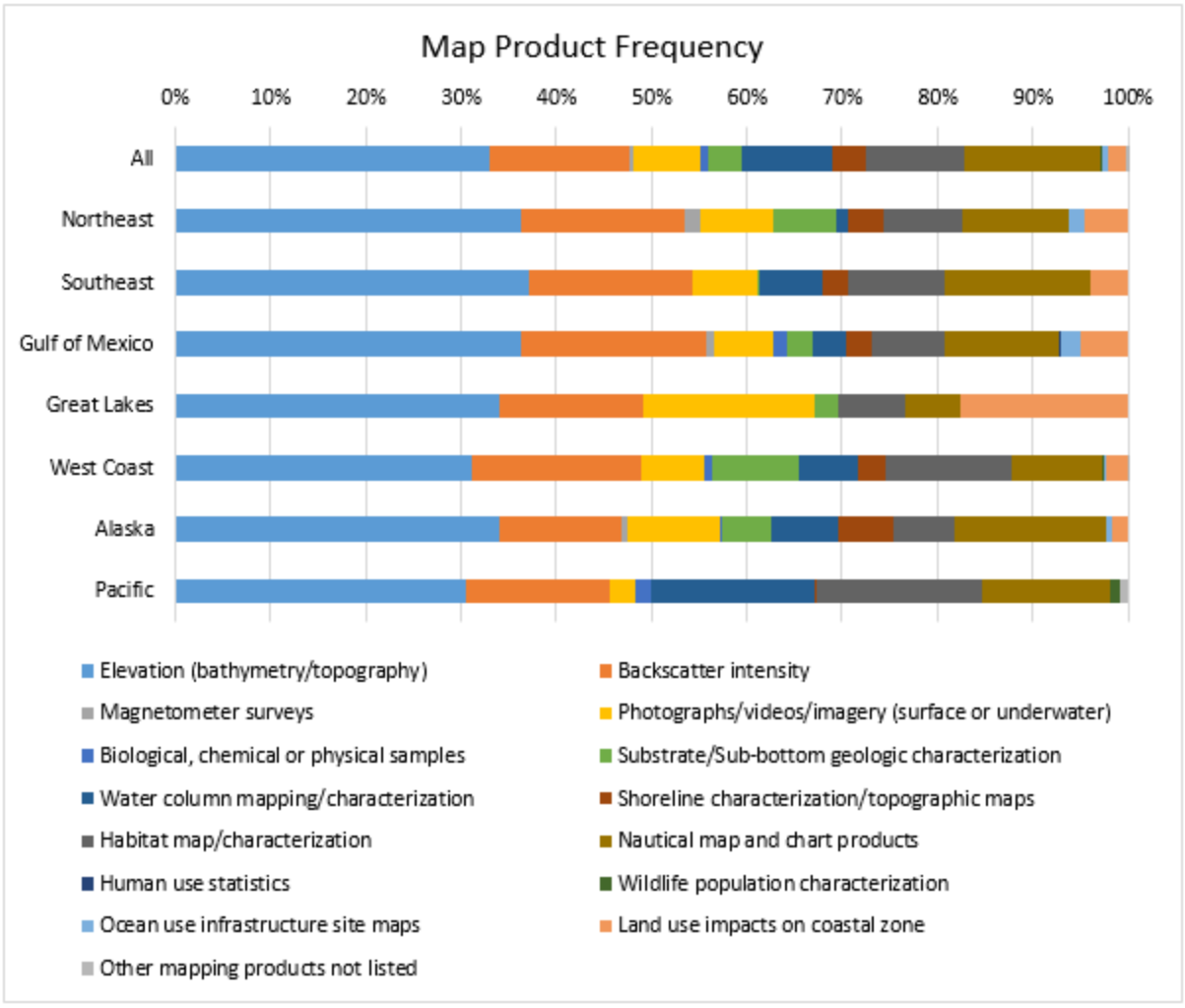

Figure 33. Map product frequency by region.

Note that the region Great Lakes includes the Canadian Great Lakes up to twenty (20) kilometers inland.

Figure 33 reveals a number of interesting trends. Among all regions, Elevation and Backscatter Intensity were the most-requested map products, taking up over 50% of the distribution in the **Northeast**, **Southeast**, and **Gulf of Mexico**. For the most part, map products were represented at similar frequencies across regions, with a few exceptions. Though in most regions Land Use Impacts was contained to around 5% or less of responses, in the **Great Lakes**, this number shot up to almost 20%, indicating high interest in products assessing coastal impacts from terrestrial activities. The same can be said for Photographs/Videos/Imagery, which was represented at around 10% or less in all regions except the **Great Lakes**, where the proportion was nearly 20%. **Alaska** and the **West Coast** had similar proportions for most map products, though in **Alaska** offices showed more interest in Elevation, Photographs/Videos/Imagery, and Nautical Map and Chart Products. In the **Pacific**, five (5) map products took up nearly 100% of the distribution: Elevation,

Backscatter Intensity, Water Column Mapping/Characterization, Habitat Map/Characterization and Nautical Map and Chart Products, with interest in Habitat Map/Characterization much higher than in other regions.

4. CONCLUSION

The NOAA Nationwide Spatial Priorities Study was conducted from February 2020 to February 2021. The study explored priority mapping areas among different NOAA programs within the National Marine Fisheries Service, the National Ocean Service, the National Weather Service, and the Office of Oceanic and Atmospheric Research. Study results helped to identify where there were shared mapping interest across the U.S. EEZ (and Canadian Great Lakes). The study allowed Interagency Working Group on Ocean and Coastal Mapping (IWG-OCM) partners to see where there were overlaps in requirements so that resources could be allocated efficiently. With this data, acquisition planners will be better able to identify where there are shared mapping needs so that they can coordinate on mapping missions and projects, potentially sharing funding, ship time, or other mapping resources in order to meet the goal "map once, use many times."

The analysis revealed a number of trends. High interest among multiple offices was concentrated in places like Puget Sound, the Delaware and Chesapeake Bays, and bays and sounds throughout Alaska, the Aleutian Islands, and Pacific Marine National Monuments. Nearshore and coastal areas reflected the highest interest, but multiple offices reported interests throughout the continental shelf, particularly on the East Coast. Multiple offices also had offshore interests in the Pacific—including Alaska, the West Coast, and all Pacific Islands incorporated into the study.

The analysis also identified that top mapping justifications were Benthic Exploration, Water Column Exploration, Modeling and Navigation Safety across all regions, though there was some variation; likewise, the top map products requested were Elevation and Backscatter Intensity, though some regions also noted specific high interest in other map products, such as Land Use Impacts.

Data from this study will be shared publicly on the interagency U.S. Mapping Coordination website to assist in planning and coordination activities. Future runs of the spatial priorities study will identify mapping priorities and interests across federal agencies and regional partners, which will then also be shared on the U.S. Mapping Coordination website.

5. DATA ACCESS

Data from this study can be accessed through the following methods:

Online Maps

Results layers and the original priority grids submitted by each office can be viewed on IOCM's U.S. Mapping Coordination site (https://www.seasketch.org/#projecthomepage/5272840f6ec5f42d210016e4) under the subheading **Spatial Priorities Study: NOAA**.

Data Download

File geodatabases of the results layers and the original priority grids submitted by each office can be acquired by emailing Karen Gouws (karen.gouws@noaa.gov).

GIS File Attribute Descriptions

Below are descriptions of what data can be found in each field (column) of each results layer. Each results layer is a raster file with the following three (3) field names. **Table 12** shows the field names and descriptions for results layers, and **Table 13** shows the field names and descriptions for submission layers.

Table 12. Field names and descriptions for results layers.

Field Name	Description
OBJECTID *	A unique ID for each row in the table
Value	For Justification_All: The number of unique justifications entered for that cell For Product_All: The number of unique map products entered for that cell For Priority_Weighted: The weighted priority value (High = 3, Medium = 2, Low = 1, None = 0), for that cell For all other layers: The number of offices that entered that cell as a given priority, justification, or map product; for example, in Justification_BenthicExploration, this represents the number of offices that entered a justification of "Benthic Exploration" for that cell.
Count	The count of cells in the raster layer that share the same value. When summed across all rows, it should add up to 136,511, the total number of cells in the grid.

Table 13. Field names and descriptions for submission layers.

Field Name	Field Alias	Description
OBJECTID	OBJECTID	A unique ID for each row in the table
Priority	Priority	Priority level (High, Medium, Low, or None)
Coins	Coins	Coin value. *All coin values are zero because this study did not use the coin method*. Instead, this study used the High/Medium/Low method (above). This column is a holdover from prior spatial priorities studies.
Justification1	Primary Justification	Justification selection. Full drop-down menu list is available in **Table 2**.
Justification2	Secondary Justification	Justification selection. Full drop-down menu list is available in **Table 2**.
Justification3	Tertiary Justification	Justification selection. Full drop-down menu list is available in **Table 2**.
Product1	Primary Map Product	Map product selection. Full drop-down menu list is available in **Table 3**.
Product2	Secondary Map Product	Map product selection. Full drop-down menu list is available in **Table 3**.
Product3	Tertiary Map Product	Map product selection. Full drop-down menu list is available in **Table 3**.
Driver	Driver	Driver (legislative, executive, program, etc) selection. Full drop-down menu list is available in **Table 4**.
Resolution	Horizontal Resolution	Horizontal resolution selection. This describes the desired spatial resolution of the output data. Full drop-down menu list is available in **Table 5**.
Reg_Ocea	Reg_Ocea	Region codes for Ocean: **0** = Non-ocean or terrestrial cell **1** = Ocean cell **10** = Cell is within 10 kilometers of shoreline, on the landward side **20** = Cell is within 20 kilometers of shoreline, on the landward side These codes were used as filtering methods within the application, filtering all the cells in the grid so that *only* ocean cells, cells within 10 km of shoreline, and cells within 20 km of shoreline display in the application.

Field Name	Field Alias	Description
		Terrestrial cells (**0**) existed in the original grid and may be used in future priorities studies in non-ocean areas.
Reg_Nort	Reg_Nort	Region codes for Northeast: **0** = Not in region **1** = In region
Reg_Sout	Reg_Sout	Region codes for Southeast: **0** = Not in region **1** = In region
Reg_Gulf	Reg_Gulf	Region codes for Gulf of Mexico: **0** = Not in region **1** = In region
Reg_Lake	Reg_Lake	Region codes for Great Lakes: **0** = Not in region **1** = In region
Reg_West	Reg_West	Region codes for the West Coast (WA, OR, CA): **0** = Not in region **1** = In region
Reg_Alsk	Reg_Alsk	Region codes for Alaska: **0** = Not in region **1** = In region
Reg_Pcfc	Reg_Pcfc	Region codes for Pacific (Hawaii, U.S. Minor Outlying Islands, American Samoa, Guam, and Northern Mariana Islands): **0** = Not in region **1** = In region
Reg_Cari	Reg_Cari	Region codes for U.S. Caribbean (Puerto Rico and U.S. Virgin Islands): **0** = Not in region **1** = In region *Note: This region was combined with the Southeast region in the NOAA study, but will be separate in future studies.*
Reg_Cent	Reg_Cent	Region codes for Central U.S.: **0** = Not in region **1** = In region *Note: This region is terrestrial only, and was not included in this study. Terrestrial cells (**0**) existed in the original grid and may be used in future priorities studies in non-ocean areas.*

Field Name	Field Alias	Description
Grid_ID	Grid_ID	A unique six-digit identifier for each grid cell, in text format. Each cell will have the same Grid_ID and Cell_ID.
Cell_ID	Cell_ID	A unique six-digit identifier for each grid cell, in number format. Each cell will have the same Grid_ID and Cell_ID.
LayerName	LayerName	The name of the submission layer. This will be in the following format: NOAA2020_LineOffice_ProgramOffice.

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Buja, K. and J. Christensen. 2019. Spatial Prioritization Widget: A Tool to Identify Mapping Priorities. Available online: https://coastalscience.noaa.gov/project/spatial-prioritization-widget/ (Accessed 5 April, 2021).

Costa, B., K. Buja, M. Kendall, B. Williams, J. Kraus. 2019. Prioritizing Areas for Future Seafloor Mapping, Research, and Exploration Offshore of California, Oregon, and Washington (NOAA Technical Memorandum NOS NCCOS 264). DOI: 10.25923/wa5c-vn25. Available online: https://repository.library.noaa.gov/view/noaa/22029 (Accessed 5 April, 2021).

Florida Fish and Wildlife Commission, Fish and Wildlife Research Institute, 2020. Florida Coastal Mapping Program Hub. Available online: https://fcmap-myfwc.hub.arcgis.com (Accessed 29 June, 2021).

Kendall, M.S., K. Buja, C. Menza, S. Gandulla, and B. Williams. 2020. Priorities for Lakebed Mapping in Lake Huron's Thunder Bay National Marine Sanctuary (NOAA Technical Memorandum NOS NCCOS 276). DOI: https://doi.org/10.25923/qyrf-tq71. Available online: https://coastalscience.noaa.gov/project/lakebed-mapping-in-thunder-bay-national-marine-sanctuary-lake-huron/ (Accessed 5 April, 2021).

Kraus, J., B. Williams, S.D. Hile, T. Battista, and K. Buja. 2020. Prioritizing Areas for Future Seafloor Mapping and Exploration in the U.S. Caribbean (NOAA Technical Memorandum NOS NCCOS 286). DOI: https://doi.org/10.25923/w6v3-ha50. Available online: https://repository.library.noaa.gov/view/noaa/28177 (Accessed 5 April, 2021).

Kumle, M., and J.R. Overbeck. 2021. 2019 Alaska Coastal Mapping Prioritization Survey. Available online: https://aoos.org/wp-content/uploads/2019-AK-Coastal-Mapping-Prioritization-Survey-final-web.pdf (Accessed 17 May, 2021).

McConnaughey, R. A., S. S. Intelmann, J. L. Pirtle, S. G. Lewis, and K. R. Mabry. 2020. National Ocean Mapping, Exploration and Characterization (NOMEC) NOAA Fisheries – Alaska Response (AFSC Processed Rep. 2020-05,). DOI: https://doi.org/10.25923/ctfy-5c83 Available online: https://repository.library.noaa.gov/view/noaa/26366 (Accessed 5 April, 2021).

APPENDIX A: PARTICIPATING OFFICES

All participating offices, along with email contacts for each participant, are provided below in **Table 14**.

In addition to people listed on this table, a large number of people from both inside and outside of NOAA contributed to this study, either by refining criteria menus, beta-testing the application, providing reference data, or (NOAA personnel) assisting with submissions.

Note: Organizations with a "Submission" entry of "No" were contacted, and decided that they either had no mapping priorities, their mapping priorities were adequately covered by other offices or agencies, or declined to provide data for other reasons.

Table 14. List of participating program offices with contact information.

#	Line Office	Program Office	Contacts	Sub-mission*
1	NMFS	Fisheries Science Centers and Regional Offices	Curt.Whitmire@noaa.gov, Diana.Watters@noaa.gov, aimee.keller@noaa.gov, david.huff@noaa.gov, kelly.andrews@noaa.gov, blake.feist@noaa.gov, correigh.greene@noaa.gov, elizabeth.clarke@noaa.gov, joe.bizzarro@noaa.gov, rebecca.miller@noaa.gov, Bob.McConnaughey@noaa.gov, Steve.Intelmann@noaa.gov, Victoria.Kentner@noaa.gov, Dave.Packer@noaa.gov, Vince.Guida@noaa.gov, Michael.Parke@noaa.gov, todd.kellison@noaa.gov, matthew.johnson@noaa.gov, jodi.pirtle@noaa.gov, Steve.Lewis@noaa.gov, john.stadler@noaa.gov, yvonne.dereynier@noaa.gov, elizabeth.gaar@noaa.gov, shanna.dunn@noaa.gov, james.selleck@noaa.gov, matt.goldsworthy@noaa.gov, bryant.chesney@noaa.gov, Heidi.Hirsh@noaa.gov, Malia.Chow@noaa.gov, David.Stevenson@noaa.gov, Victoria.Kentner@noaa.gov	Yes
2	NMFS	Chesapeake Bay Office	Jay.Lazar@noaa.gov, Bruce.Vogt@noaa.gov	Yes
3	NMFS	Deep Sea Coral Research & Technology Program	tom.hourigan@noaa.gov, heather.coleman@noaa.gov	No

#	Line Office	Program Office	Contacts	Sub-mission*
4	NOS	Center for Operational Oceanographic Products and Services	laura.rear.mclaughlin@noaa.gov, michael.michalski@noaa.gov	No
5	NOS	Marine Protected Areas	lauren.wenzel@noaa.gov, Mimi.Diorio@noaa.gov	No
6	NOS	National Marine Sanctuaries	tony.reyer@noaa.gov, jonathan.martinez@noaa.gov, valerie.brown@noaa.gov, allen.tom@noaa.gov, jenny.waddell@noaa.gov, sage.tezak@noaa.gov, danielle.lipski@noaa.gov, sophie.debeukelaer@noaa.gov, ryan.m.freedman@noaa.gov, phil.hartmeyer@noaa.gov, marissa.nuttall@noaa.gov, stephen.werndli@noaa.gov, alison.soss@noaa.gov, william.sassorossi@noaa.gov, michael.a.thompson@noaa.gov	Yes
7	NOS	Office for Coastal Management	Joshua.Murphy@noaa.gov, Jamie.Carter@noaa.gov, John.McCombs@noaa.gov, Tarice.Taylor@noaa.gov, brandon.krumwiede@noaa.gov, thomas.j.moore@noaa.gov, ross.winans@noaa.gov	Yes

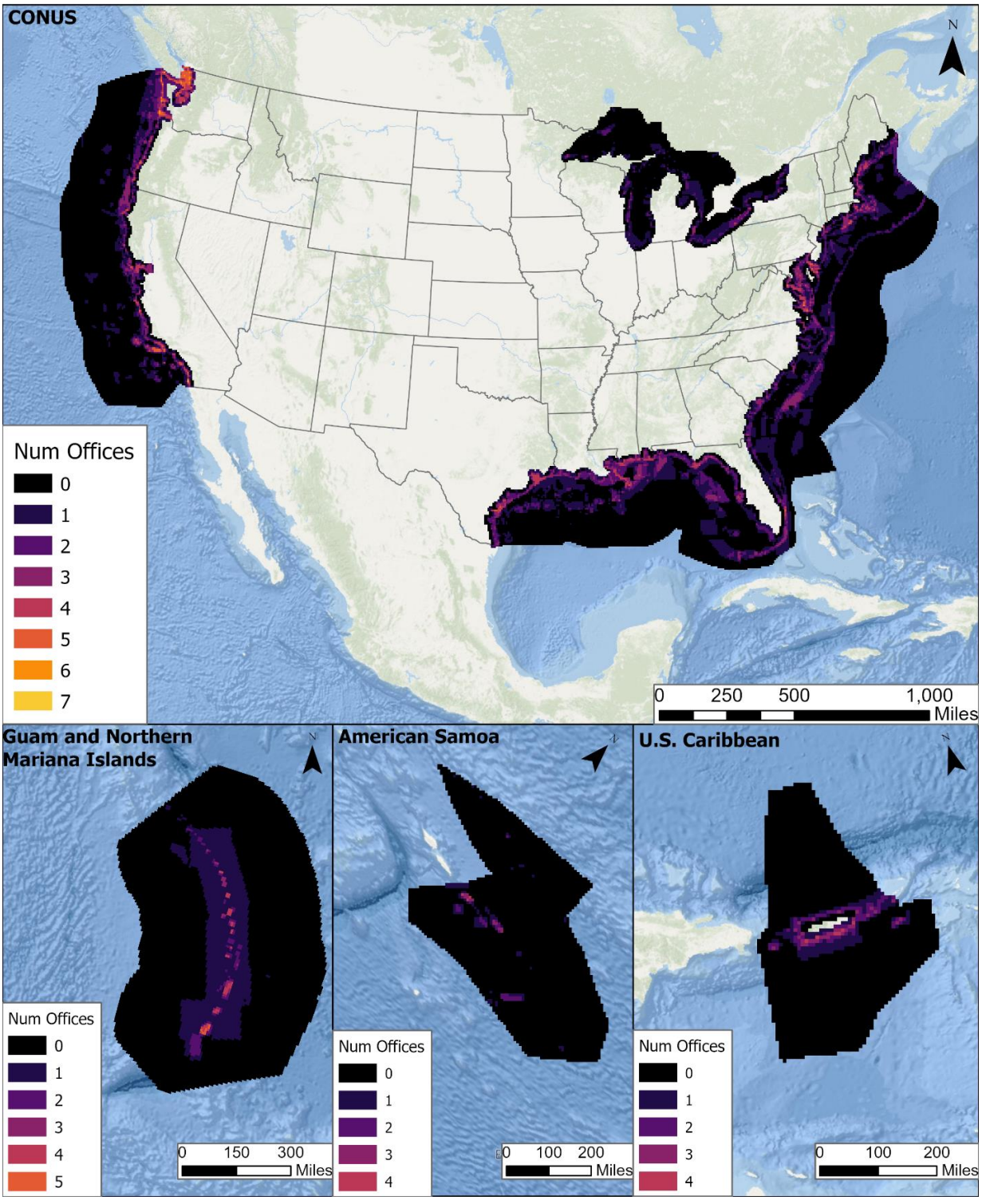
#	Line Office	Program Office	Contacts	Sub-mission*
8	NOS	Office for Coastal Management (NERRS)	Nina.garfield@noaa.gov, Kuyeda@trnerr.org, malmeida@trnerr.org, jacobaman@wellsnerr.org, sjbaird@alaska.edu, suebickford@wellsnerr.org, Eric.Brunden@dcnr.alabama.gov, Catherine.Callahan@doit.nh.gov, Jeffrey.A.Carter@dep.state.fl.us, scott.eastman@floridadep.gov, charlie@elkhornslough.org, rfuller@padillabay.gov, nina.garfield@noaa.gov, habeck@marine.rutgers.edu, bhohman@eriecounty.oh.gov, keary.howley@state.or.us, Sarah.Johnston@dcnr.alabama.gov, KinsellaJ@dnr.sc.gov, lerbergs@vims.edu, rmrobinson3@alaska.edu, Sebastian.Mejia@dnr.state.oh.us, milton.jbnerr@gmail.com, parrishd@vims.edu, Jonathan.Pitchford@dmr.ms.gov, jen@baruch.sc.edu, hannah.ramage@wisc.edu, james.rassman@mass.gov, jill.schmid@dep.state.fl.us, jenni.schmitt@state.or.us, sshull@padillabay.gov, siegel@sfsu.edu, chris.snow@maryland.gov, caitlin.m.snyder@dep.state.fl.us, rachel.stevens@wildlife.nh.gov, suttonh@uncw.edu, katie.swanson@utexas.edu, Rebecca.Swerida@maryland.gov, upchurchs@dnr.sc.gov, Suzanne.VanParreren@dnr.ga.gov, robin@nbnerr.org, Christina.Whiteman@delaware.gov, amwoolfolk@gmail.com, alice.yeates@state.or.us	Yes
9	NOS	Office of Coast Survey	james.j.miller@noaa.gov, corey.allen@noaa.gov, martha.herzog@noaa.gov, lucy.hick@noaa.gov, northeast.navmanager@noaa.gov, kyle.ward@noaa.gov, florida.navmanager@noaa.gov, tim.osborn@noaa.gov, texas.navmanager@noaa.gov, jeffrey.ferguson@noaa.gov, crescent.moegling@noaa.gov, greatlakes.navmanager@noaa.gov, alaska.navmanager@noaa.gov, crescent.moegling@noaa.gov	Yes

#	Line Office	Program Office	Contacts	Sub-mission*
10	NOS	UNH Joint Hydrographic Center	Andy.armstrong@noaa.gov, Glen.rice@noaa.gov, Katrina.wylie@noaa.gov	Yes
11	NWS	Tsunami Program	michael.angove@noaa.gov, ian.sears@noaa.gov, kelly.stroker@noaa.gov	Yes
12	NWS	Tropical Program	Jessica.Schauer@noaa.gov, Jamie.r.rhome@noaa.gov, arthur.taylor@noaa.gov, joel.cline@noaa.gov	Yes
13	NWS	Water Resources Services Branch/Office of Water Prediction	victor.hom@noaa.gov, cayla.dean@noaa.gov, mary.mullusky@noaa.gov, donna.page@noaa.gov	Yes
14	NWS	Office of Observations	kevin.schrab@noaa.gov, mark.b.miller@noaa.gov	No
15	OAR	Ocean Exploration and Research	caitlin.adams@noaa.gov, rachel.medley@noaa.gov	Yes
16	OAR	Pacific Marine Environmental Laboratory	jeff.beeson@noaa.gov, Susan.merle@noaa.gov	Yes

APPENDIX B: PRIORITY MAPS

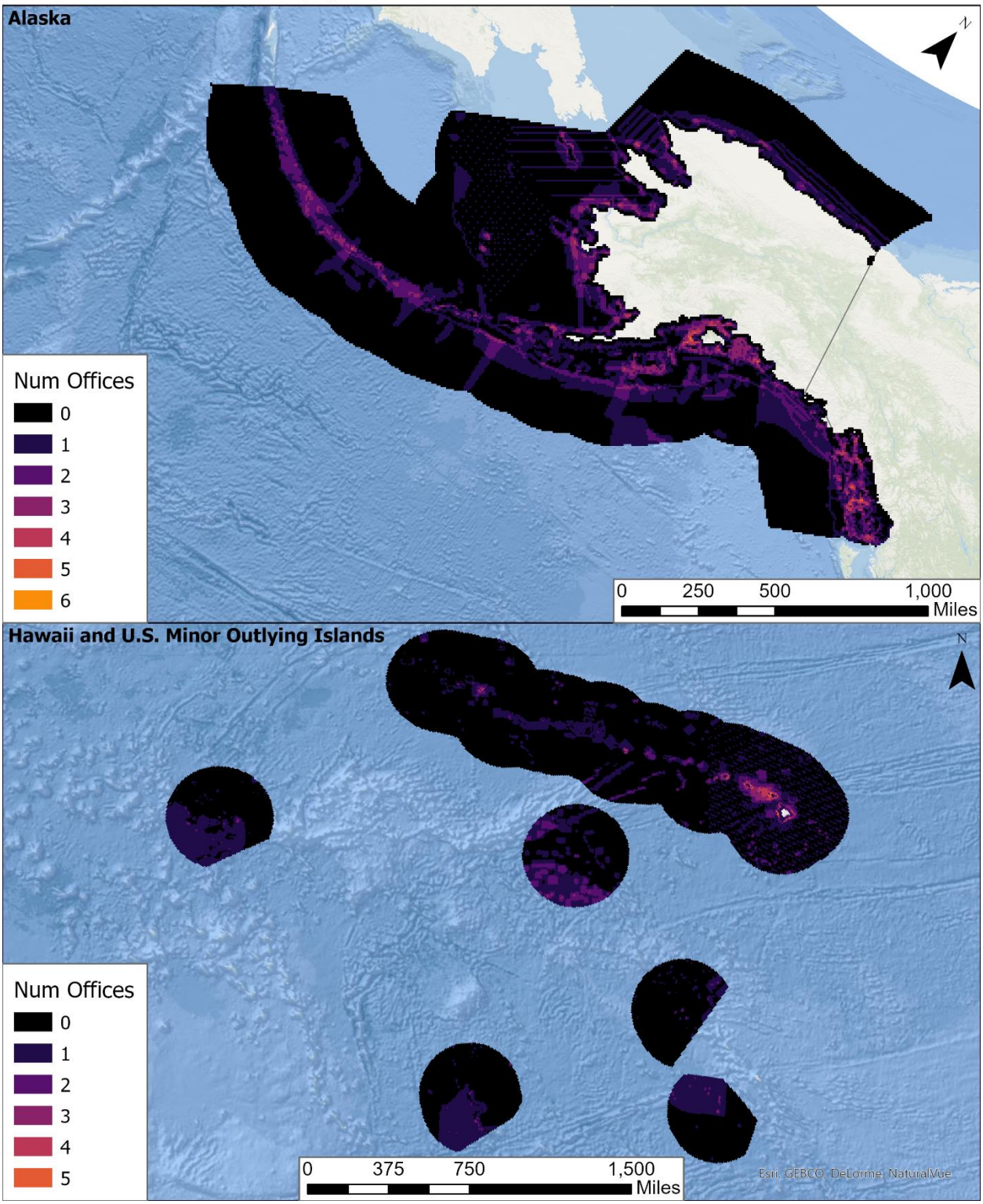
High Priority

Continental U.S., Guam and Northern Mariana Islands, American Samoa, and U.S. Caribbean



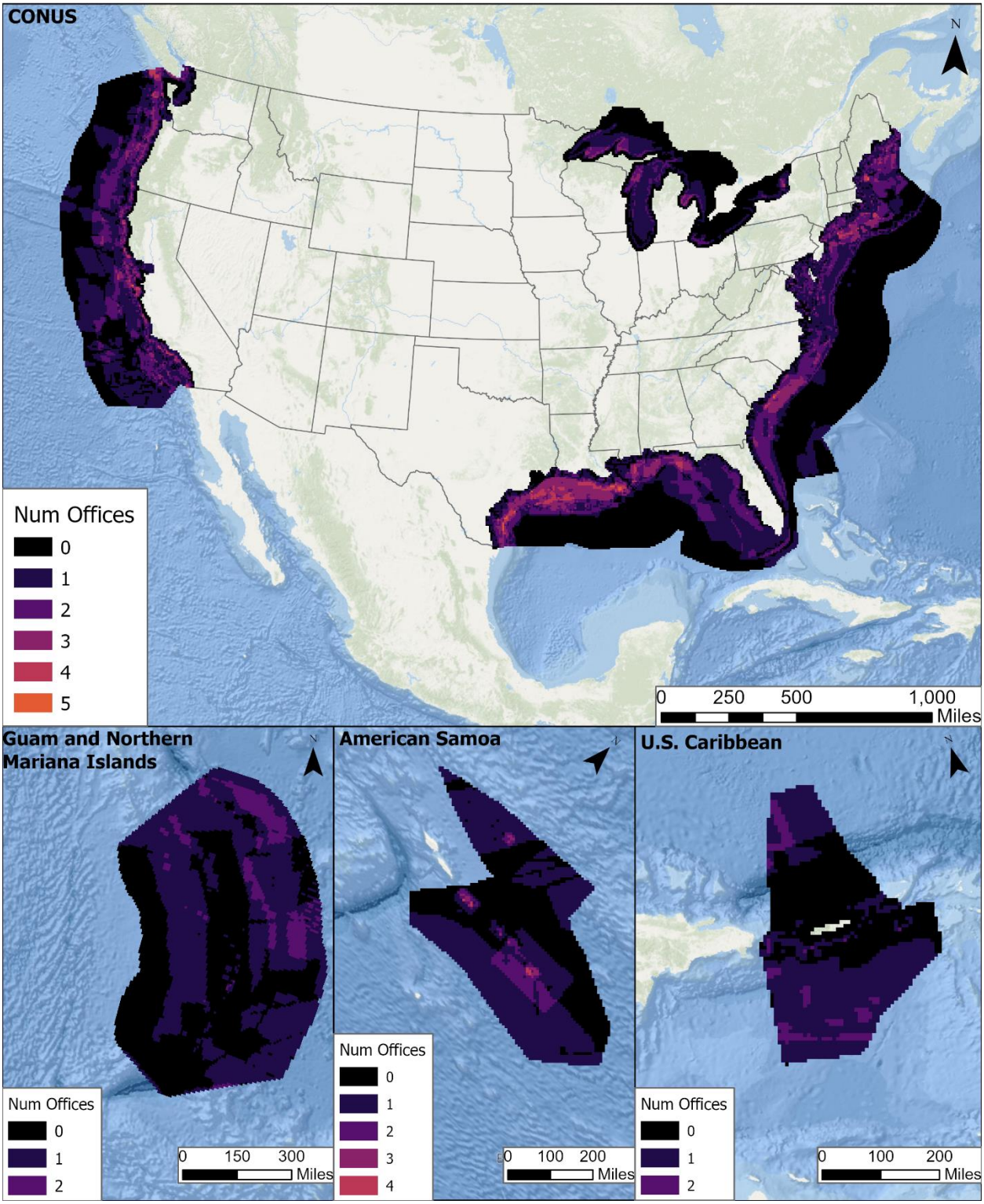
High Priority

Alaska, Hawaii, and U.S. Minor Outlying Islands



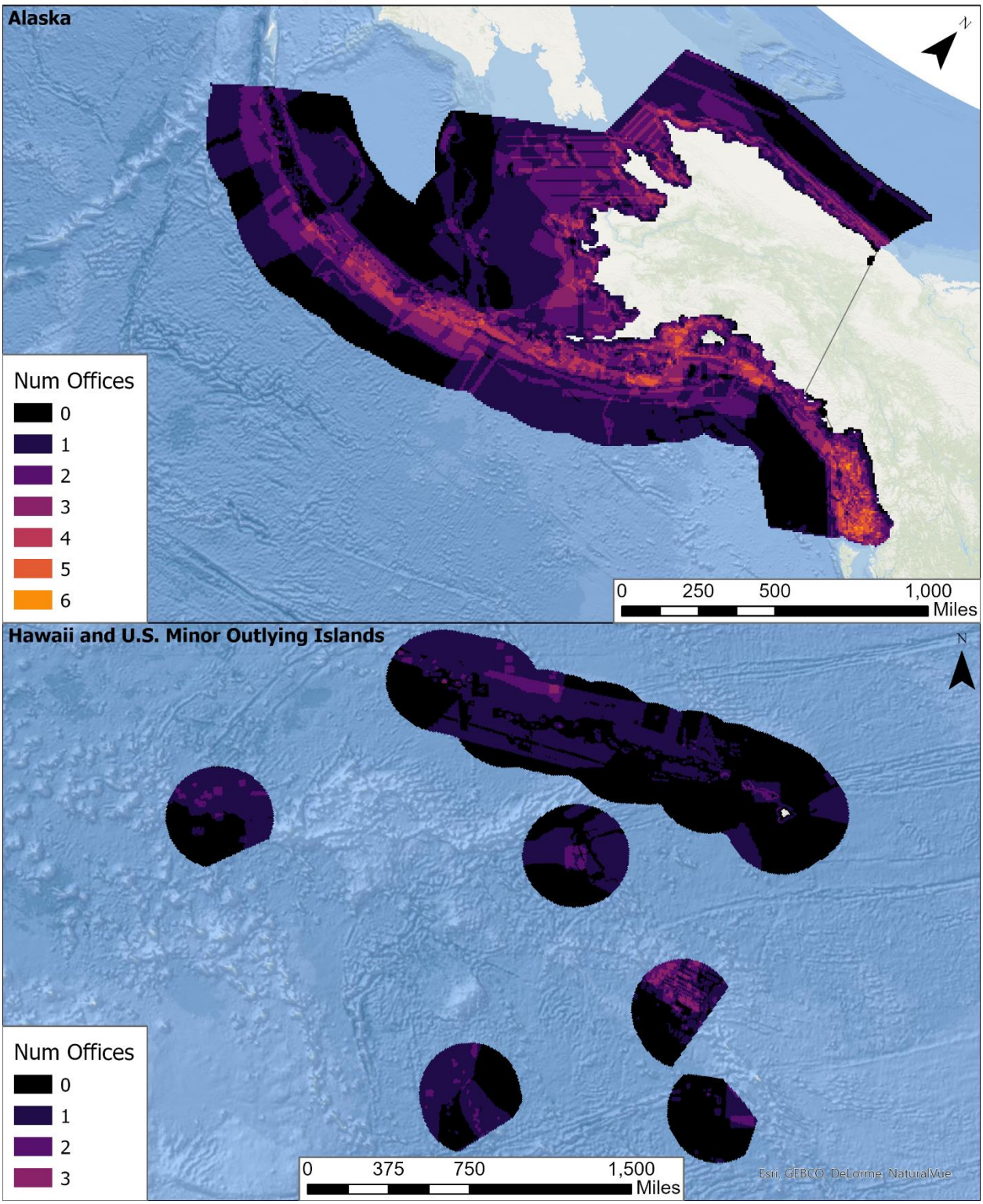
Medium Priority

Continental U.S., Guam and Northern Mariana Islands, American Samoa, and U.S. Caribbean



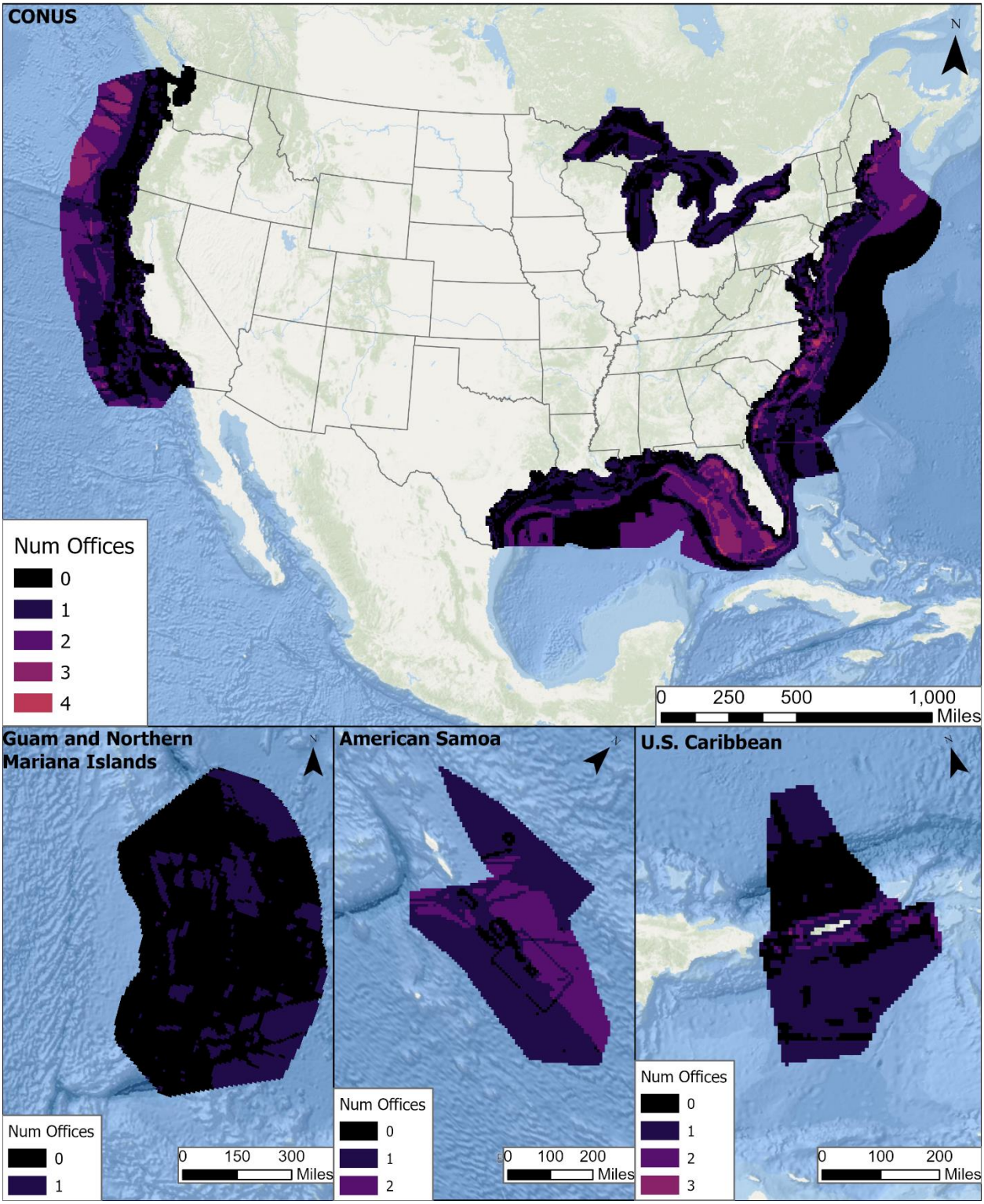
Medium Priority

Alaska, Hawaii, and U.S. Minor Outlying Islands



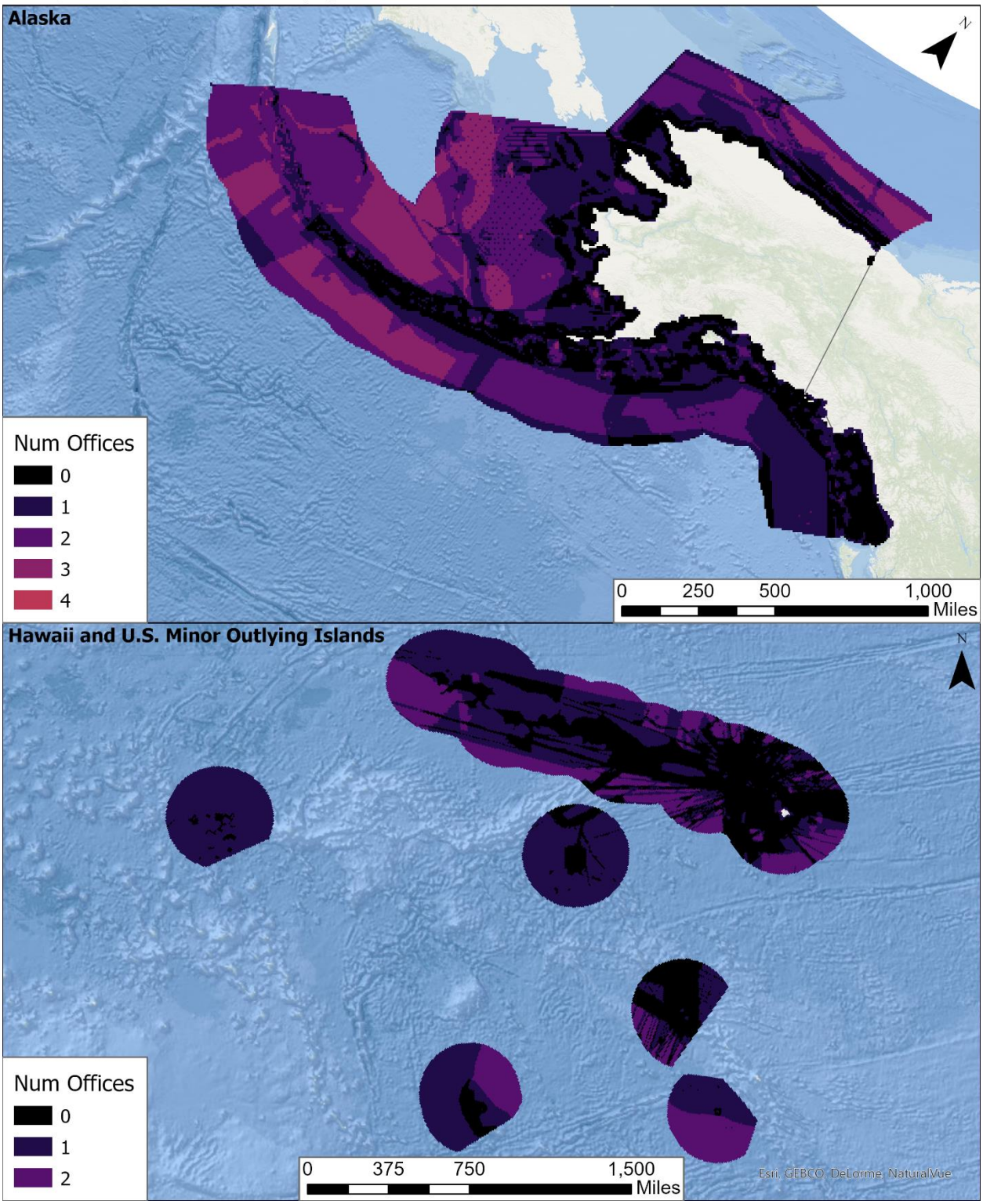
Low Priority

Continental U.S., Guam and Northern Mariana Islands, American Samoa, and U.S. Caribbean



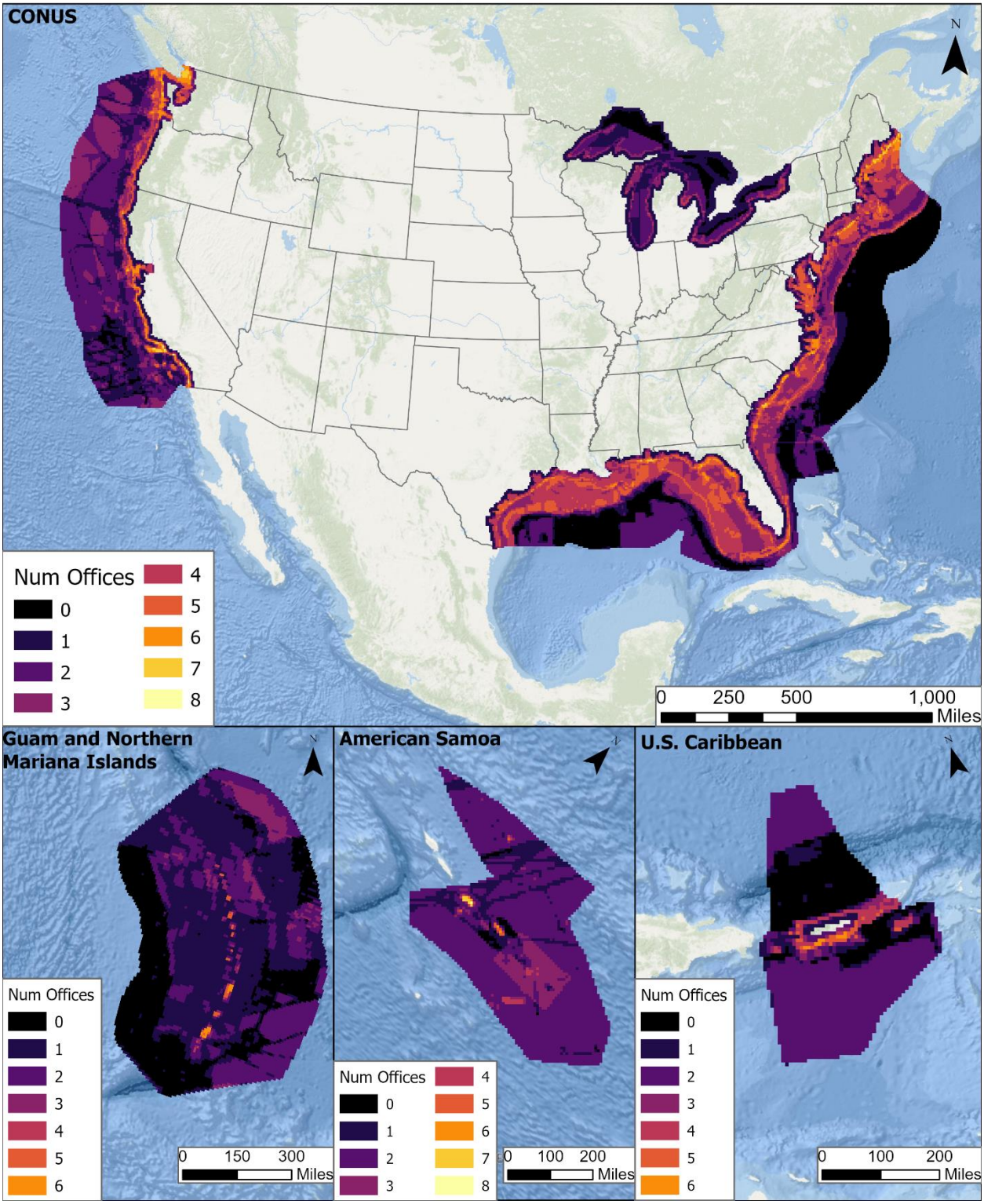
Low Priority

Alaska, Hawaii, and U.S. Minor Outlying Islands



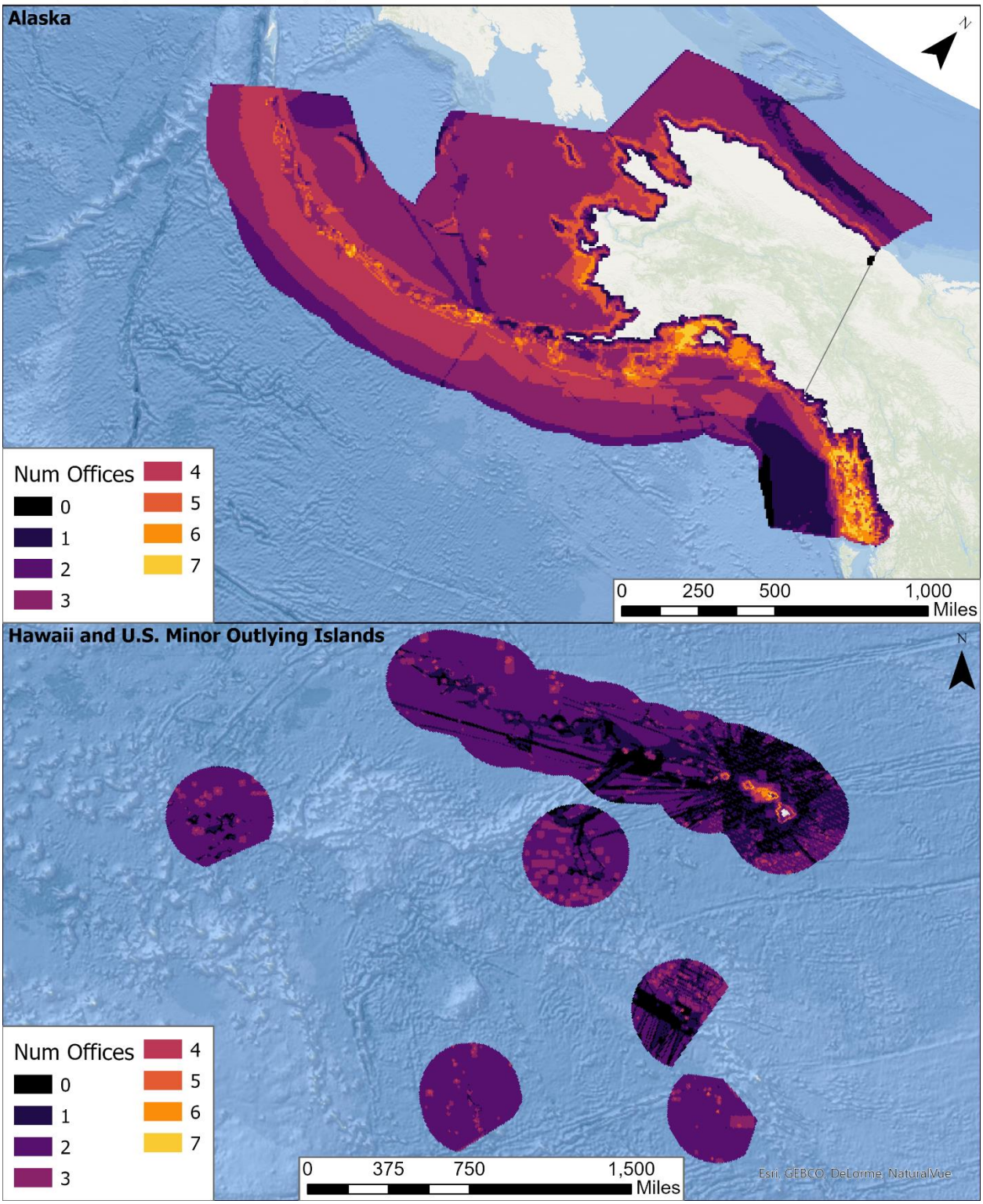
Any Priority

Continental U.S., Guam and Northern Mariana Islands, American Samoa, and U.S. Caribbean



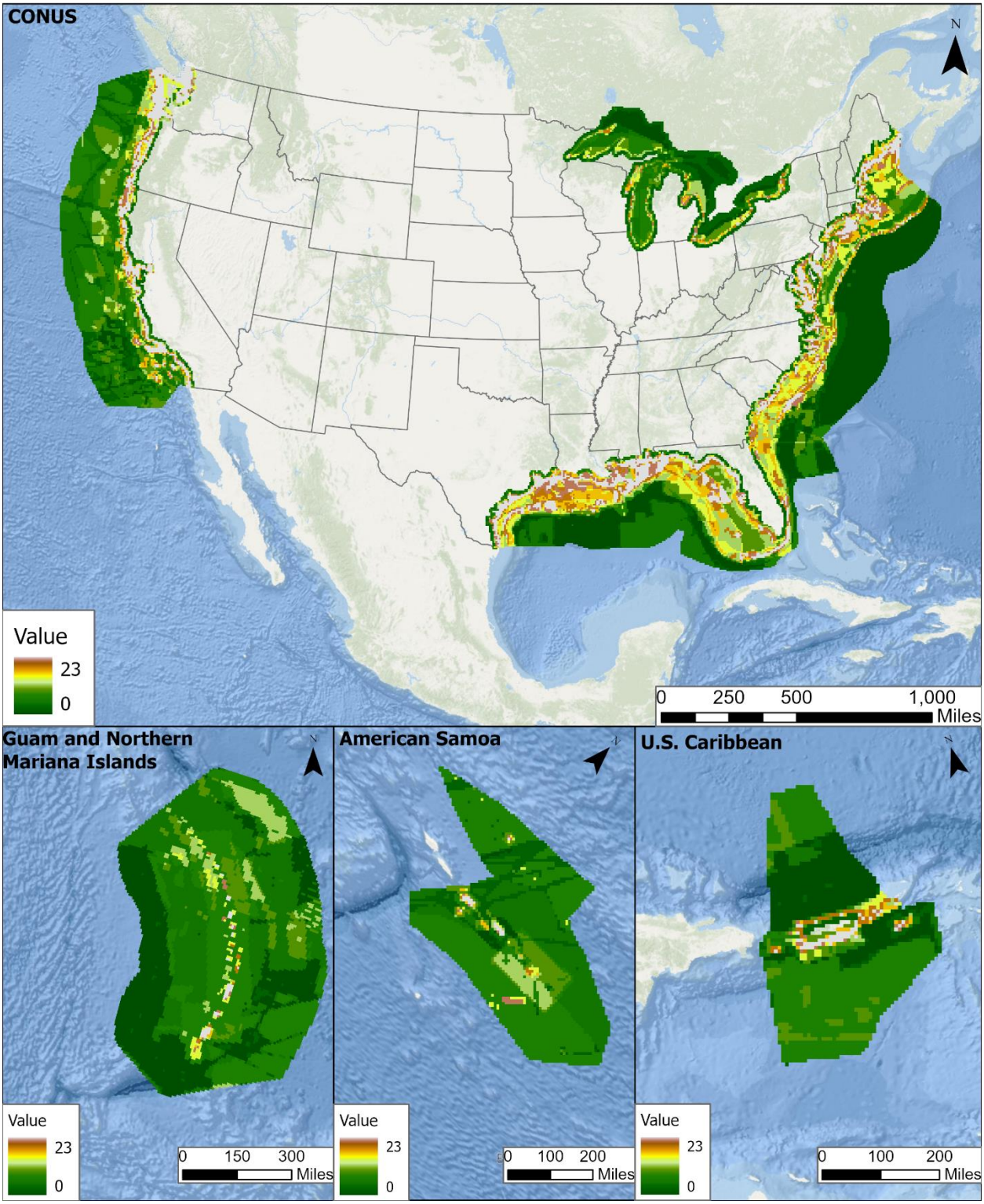
Any Priority

Alaska, Hawaii, and U.S. Minor Outlying Islands



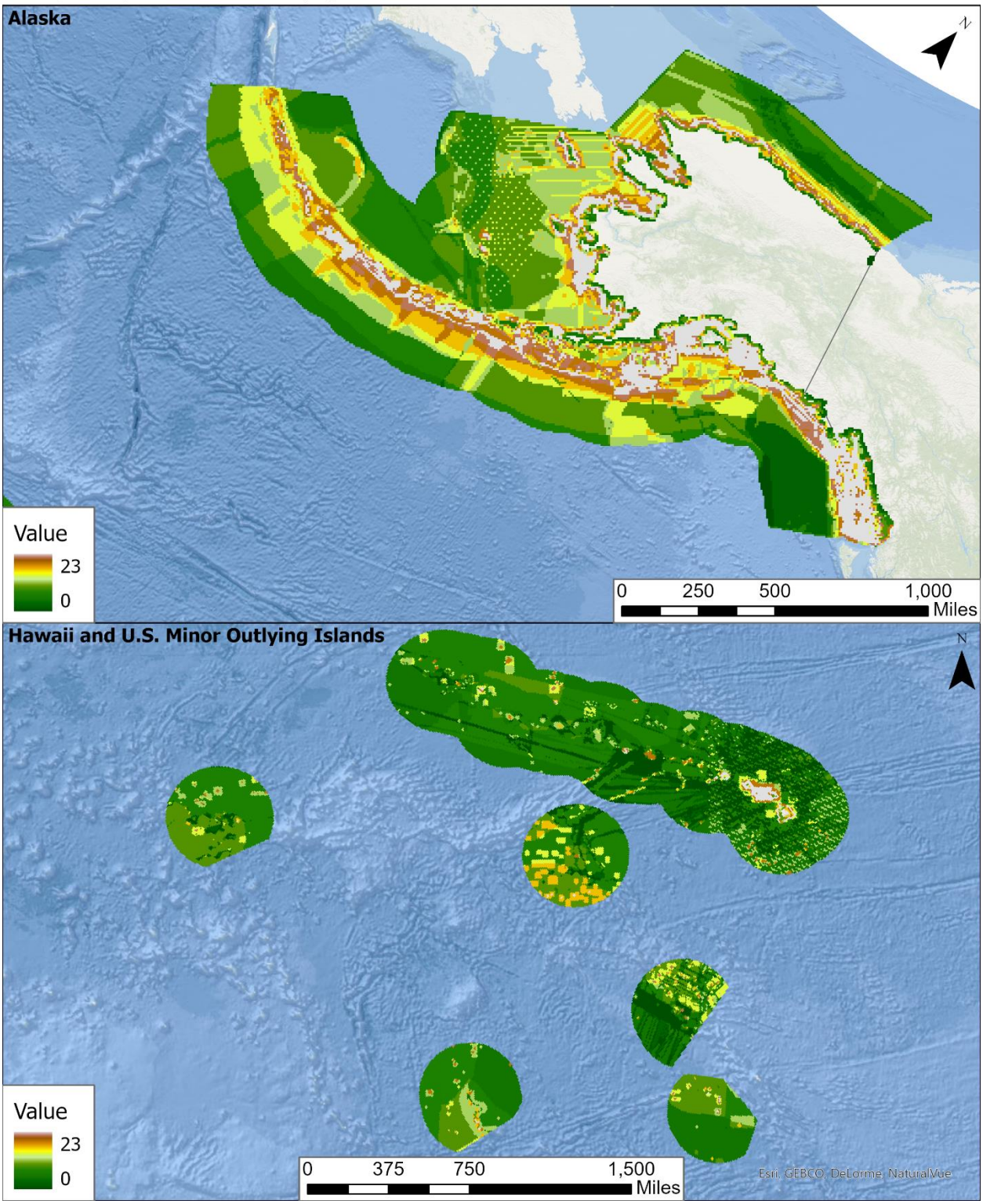
Weighted Priority

Continental U.S., Guam and Northern Mariana Islands, American Samoa, and U.S. Caribbean



Weighted Priority

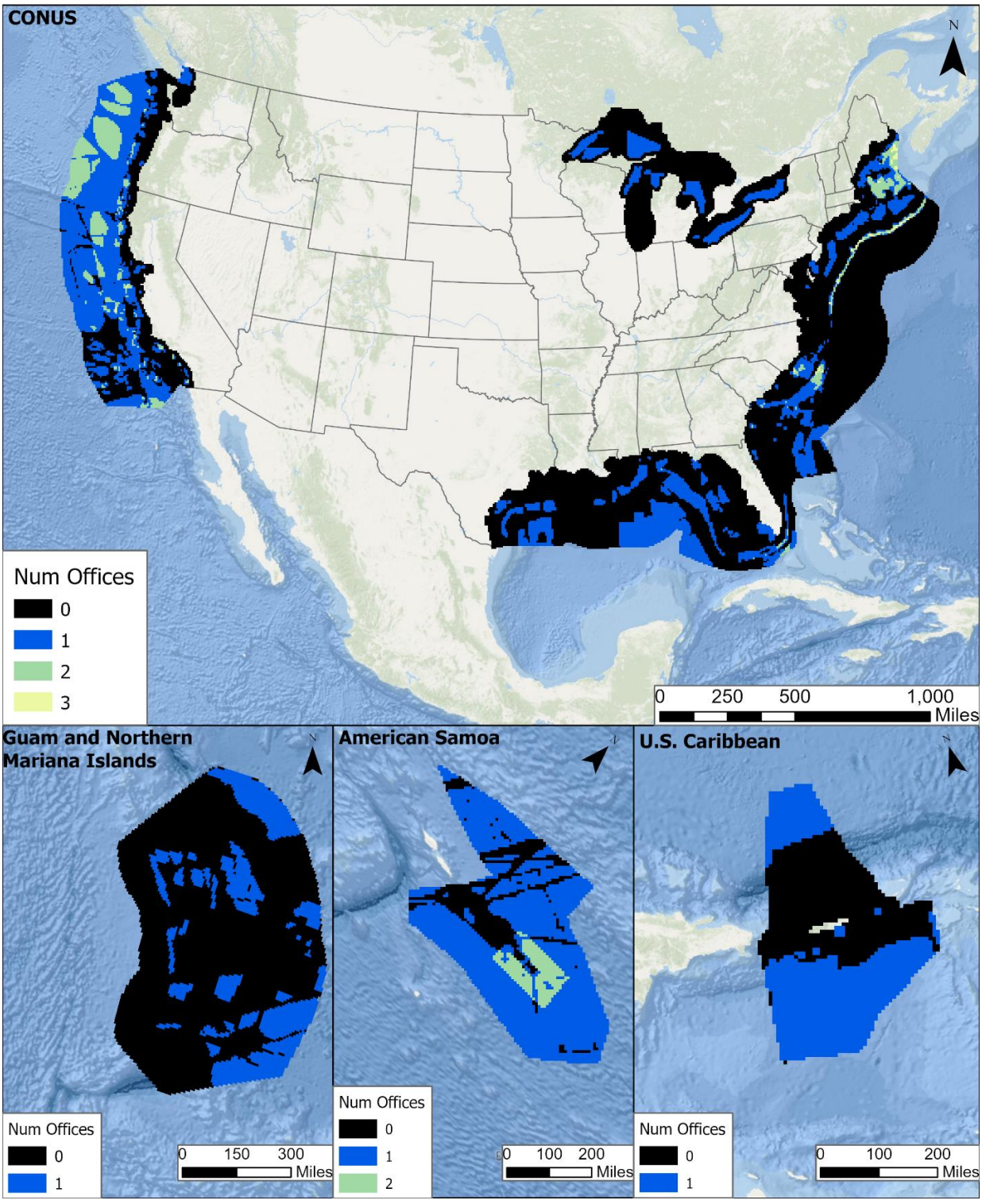
Alaska, Hawaii, and U.S. Minor Outlying Islands



APPENDIX C: JUSTIFICATION MAPS

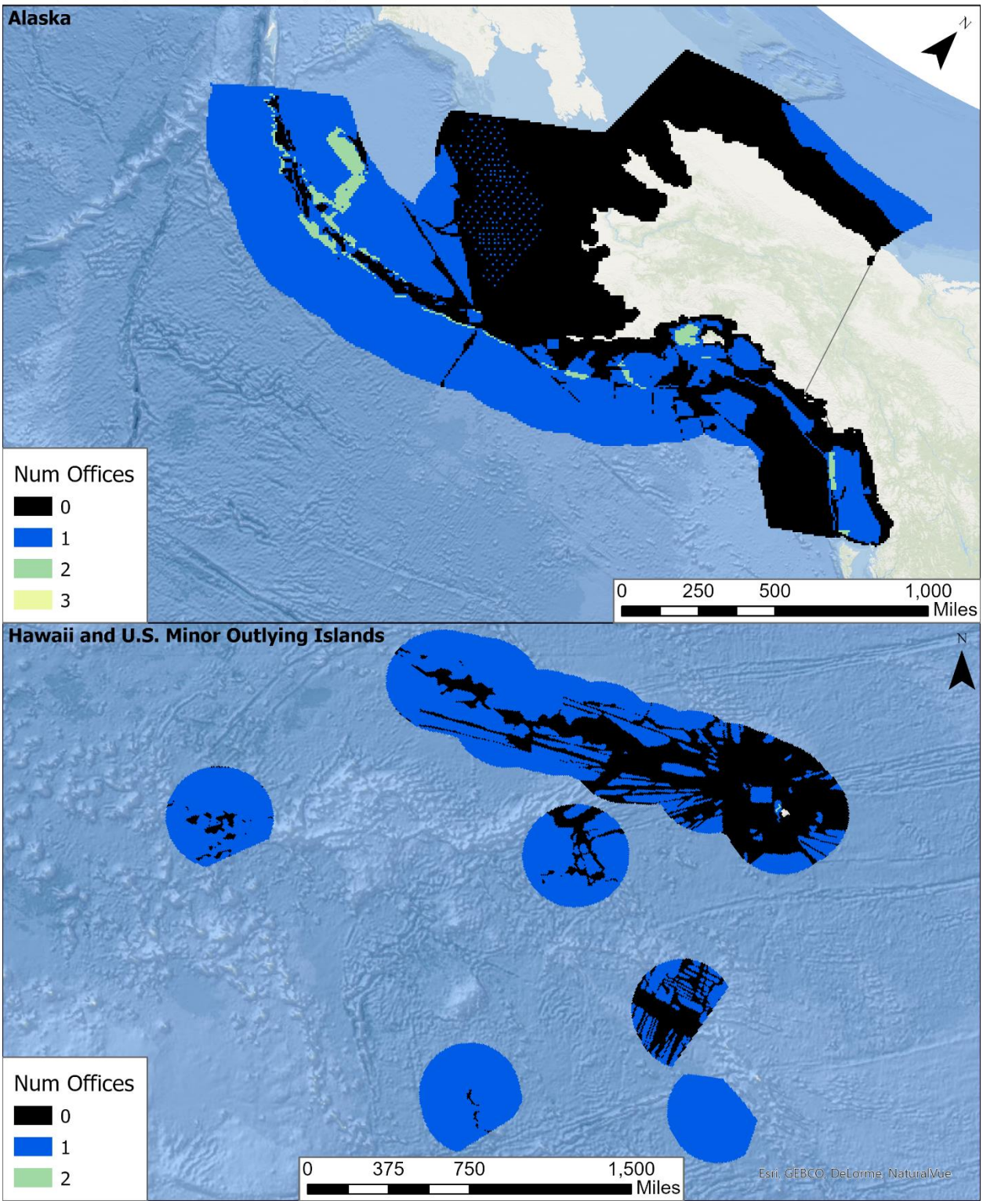
Benthic Exploration

Continental U.S., Guam and Northern Mariana Islands, American Samoa, and U.S. Caribbean



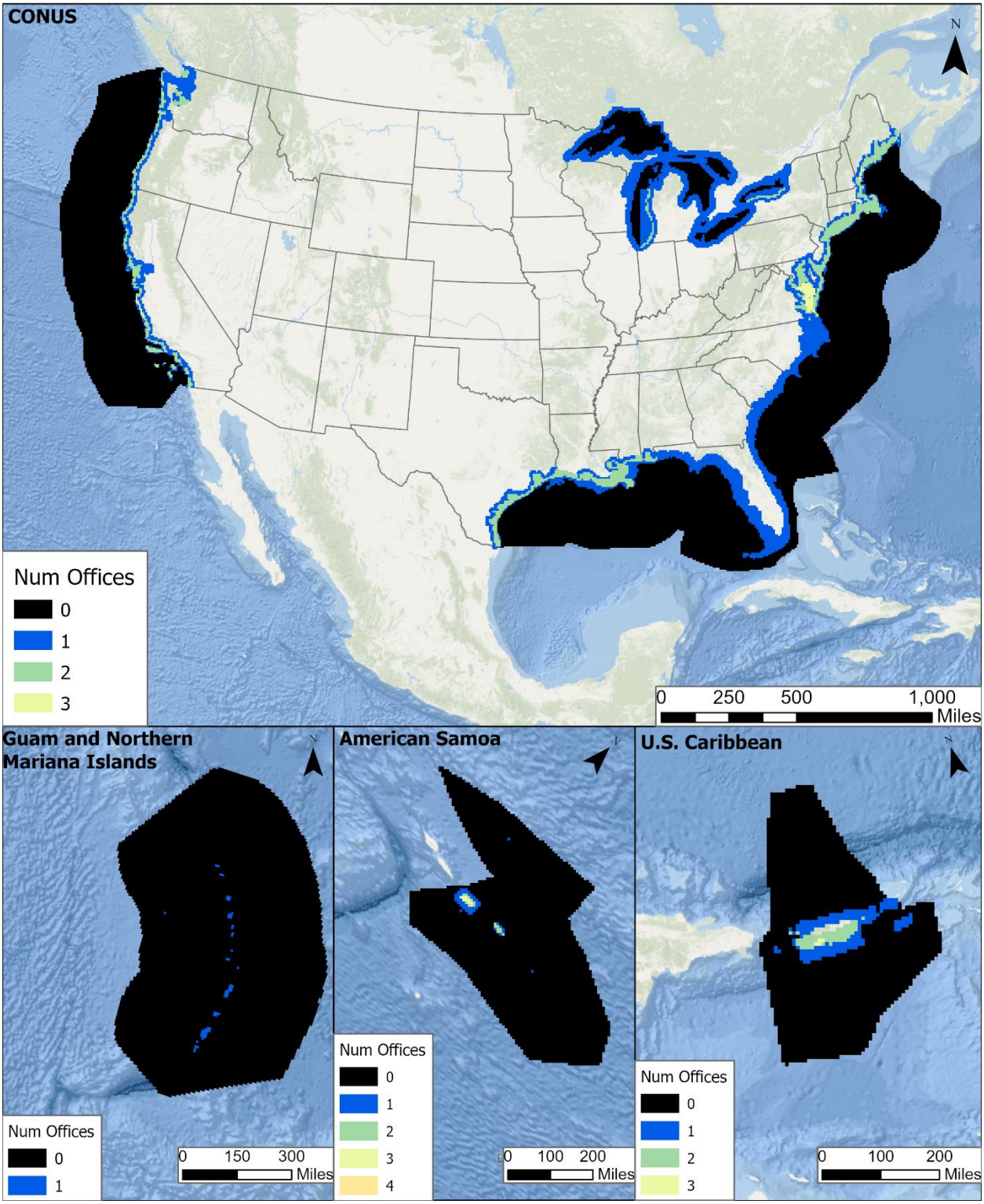
Benthic Exploration

Alaska, Hawaii, and U.S. Minor Outlying Islands



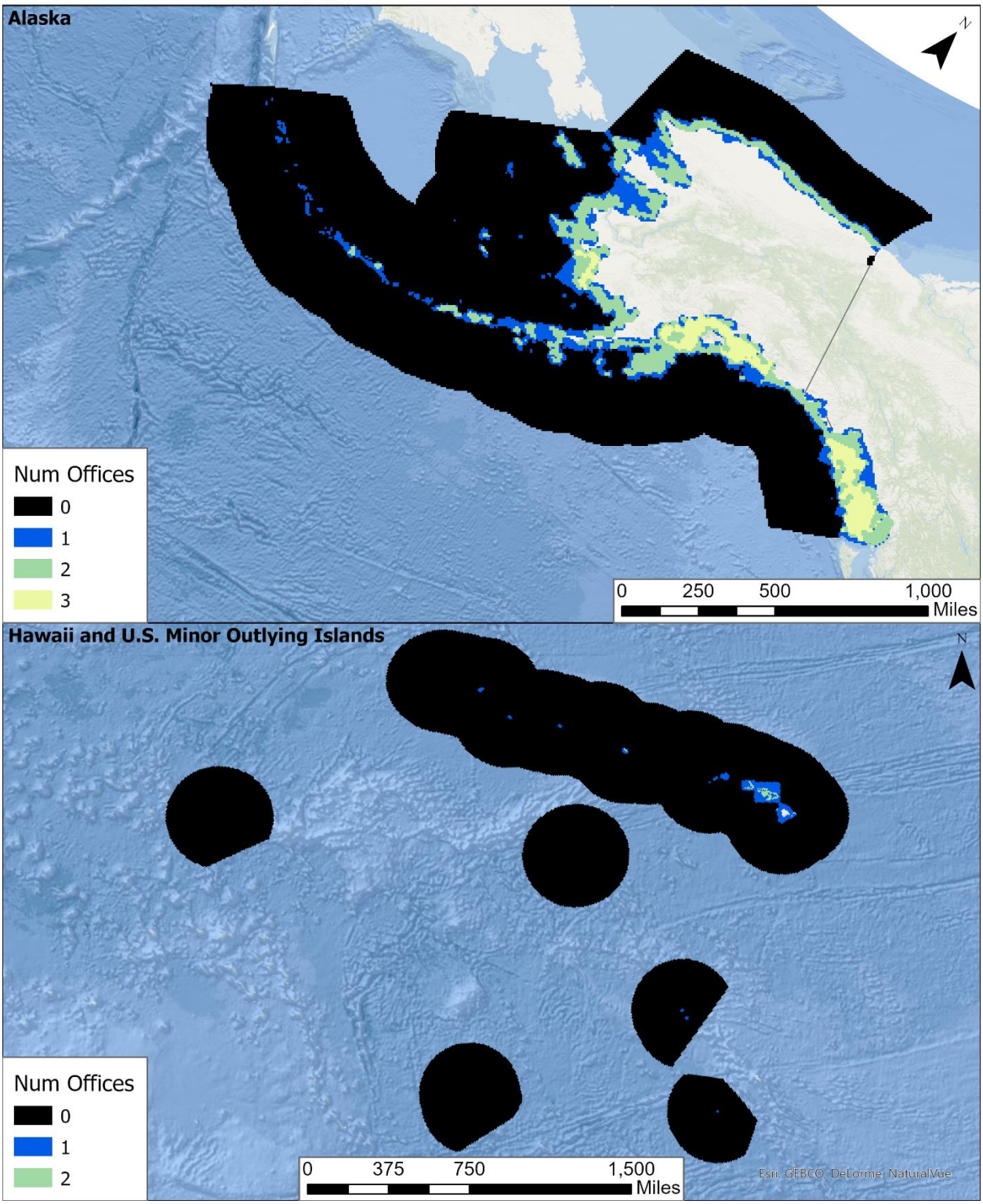
Coastal, Marine, Natural Hazards

Continental U.S., Guam and Northern Mariana Islands, American Samoa, and U.S. Caribbean



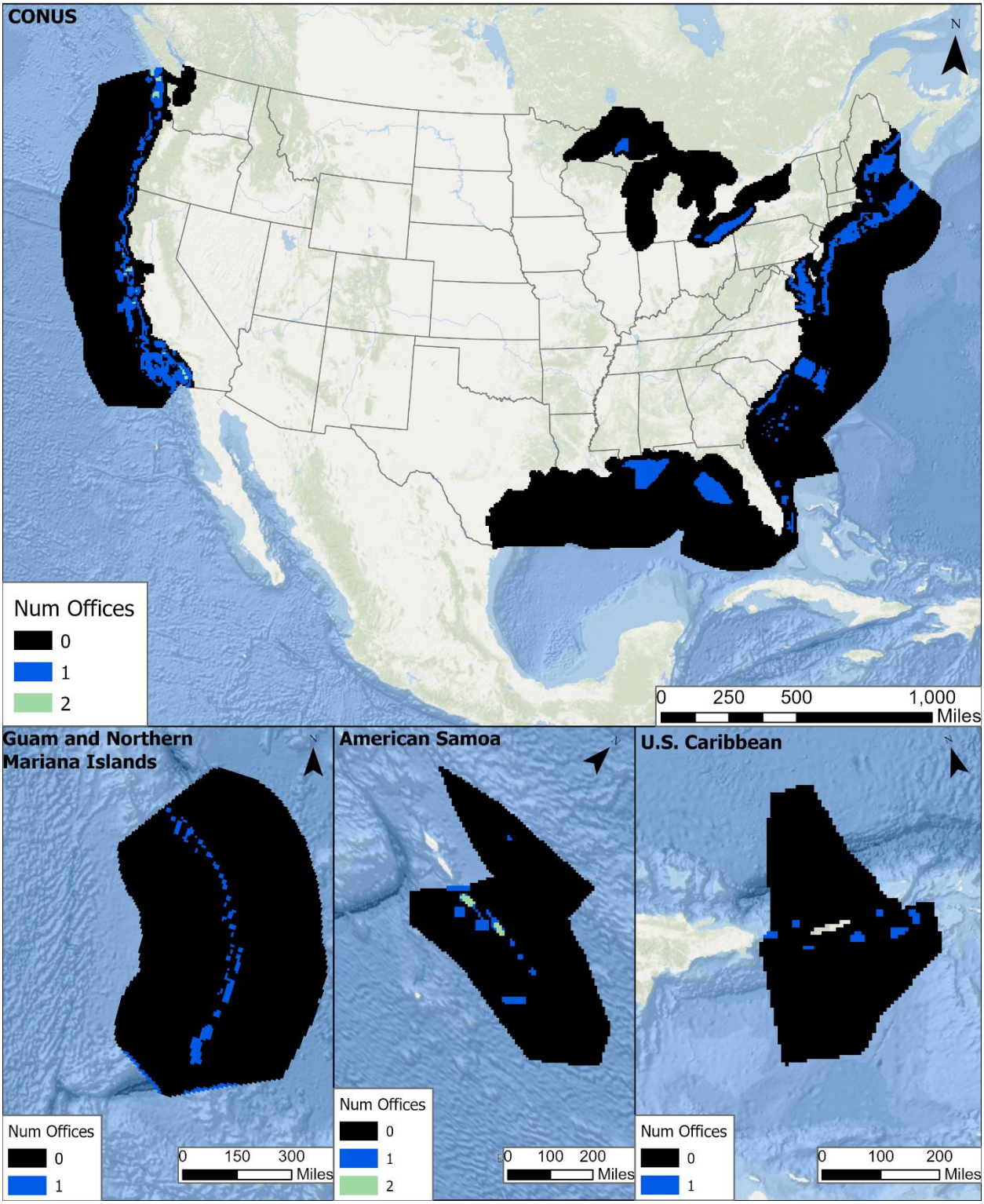
Coastal, Marine, Natural Hazards

Alaska, Hawaii, and U.S. Minor Outlying Islands



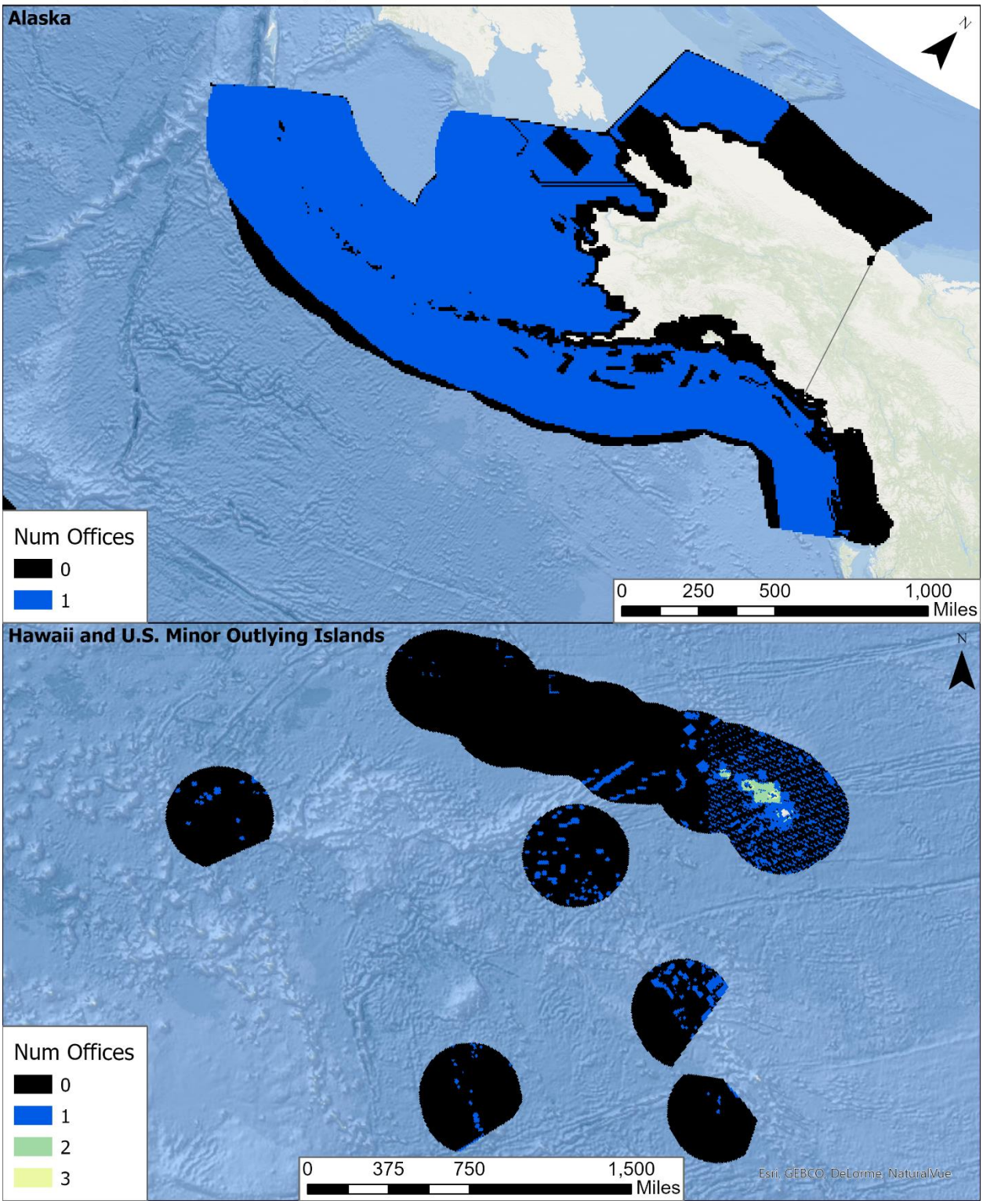
Commercial and Recreational Fishing

Continental U.S., Guam and Northern Mariana Islands, American Samoa, and U.S. Caribbean



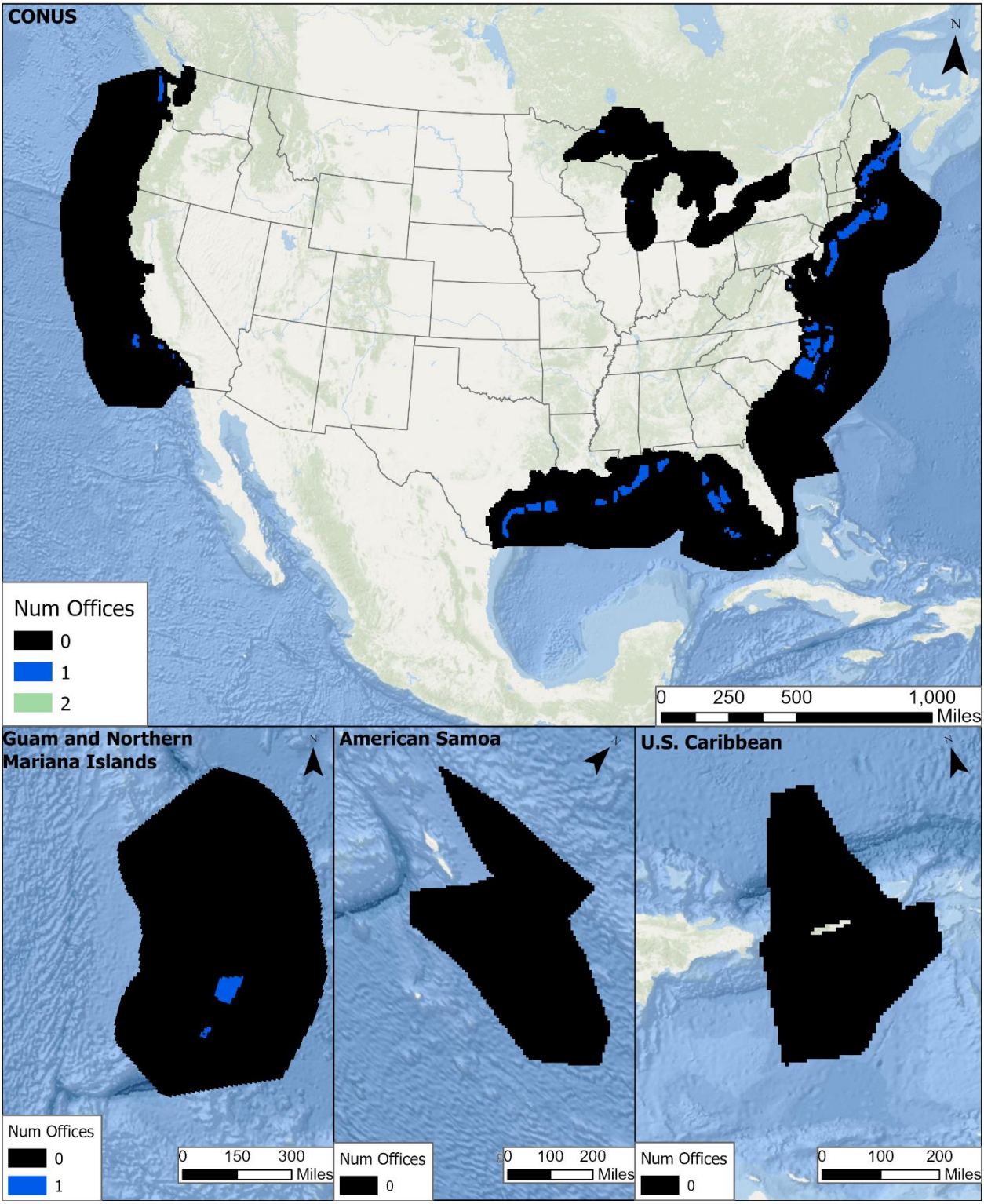
Commercial and Recreational Fishing

Alaska, Hawaii, and U.S. Minor Outlying Islands



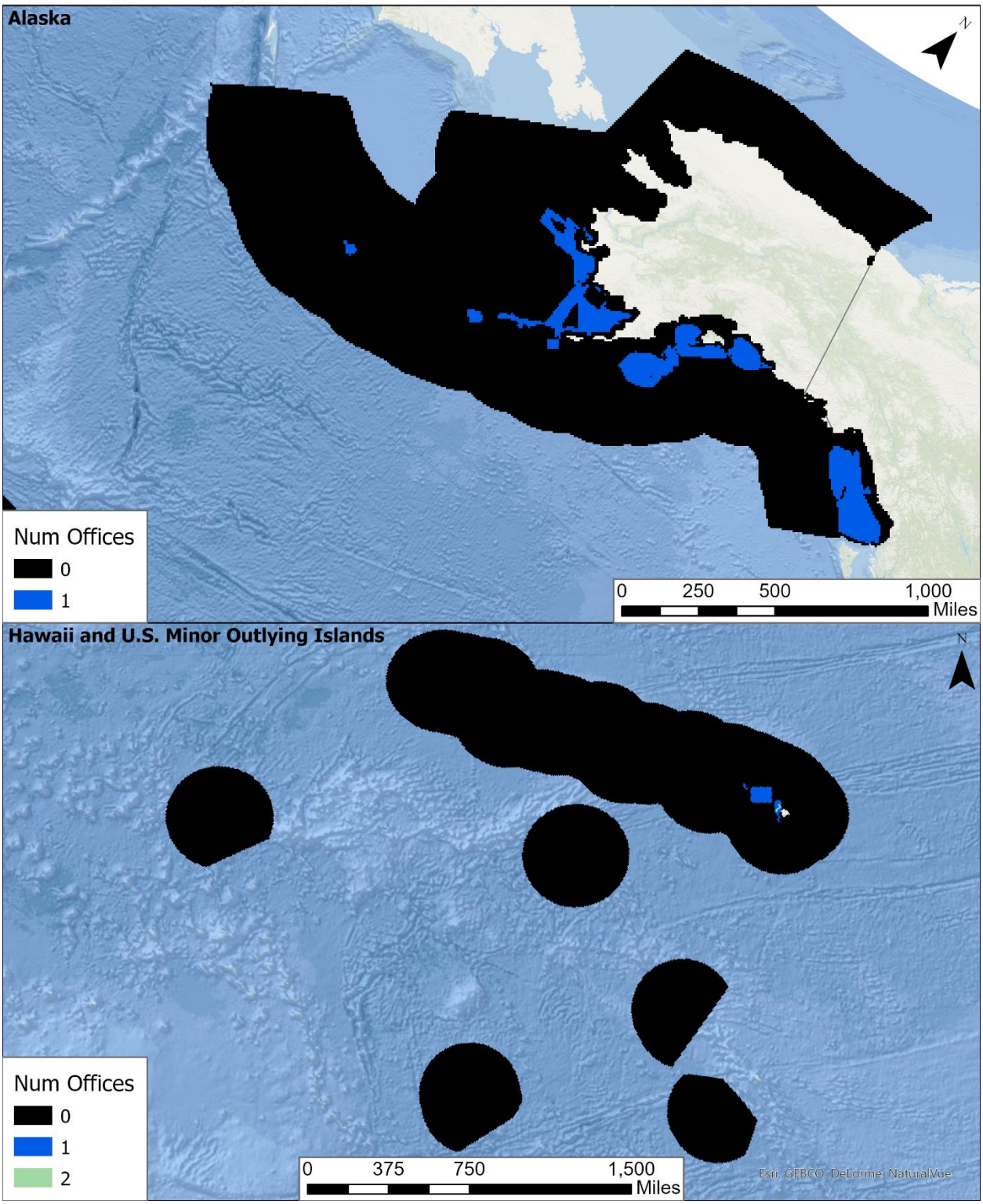
Cultural and Historical Resources

Continental U.S., Guam and Northern Mariana Islands, American Samoa, and U.S. Caribbean



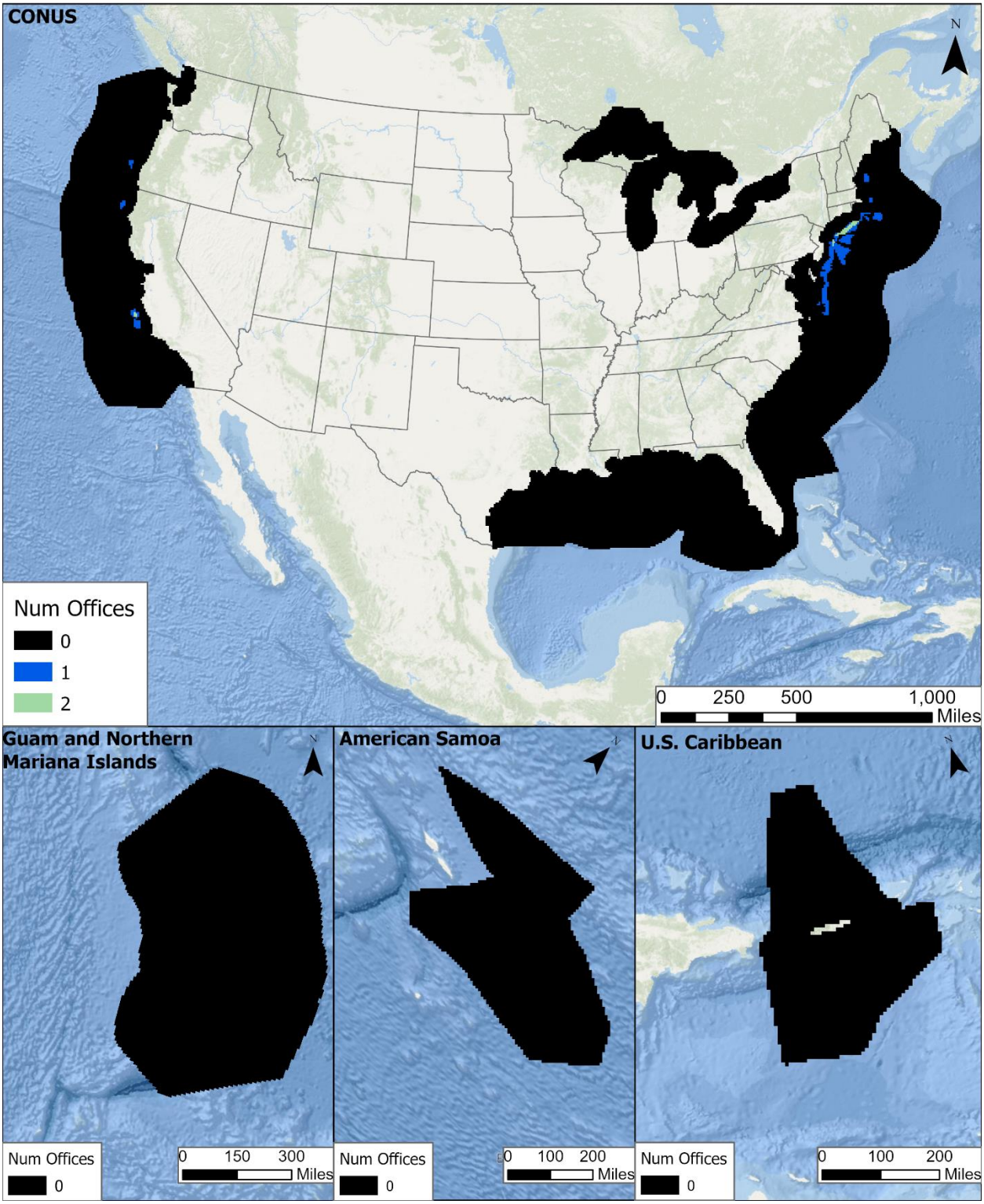
Cultural and Historical Resources

Alaska, Hawaii, and U.S. Minor Outlying Islands



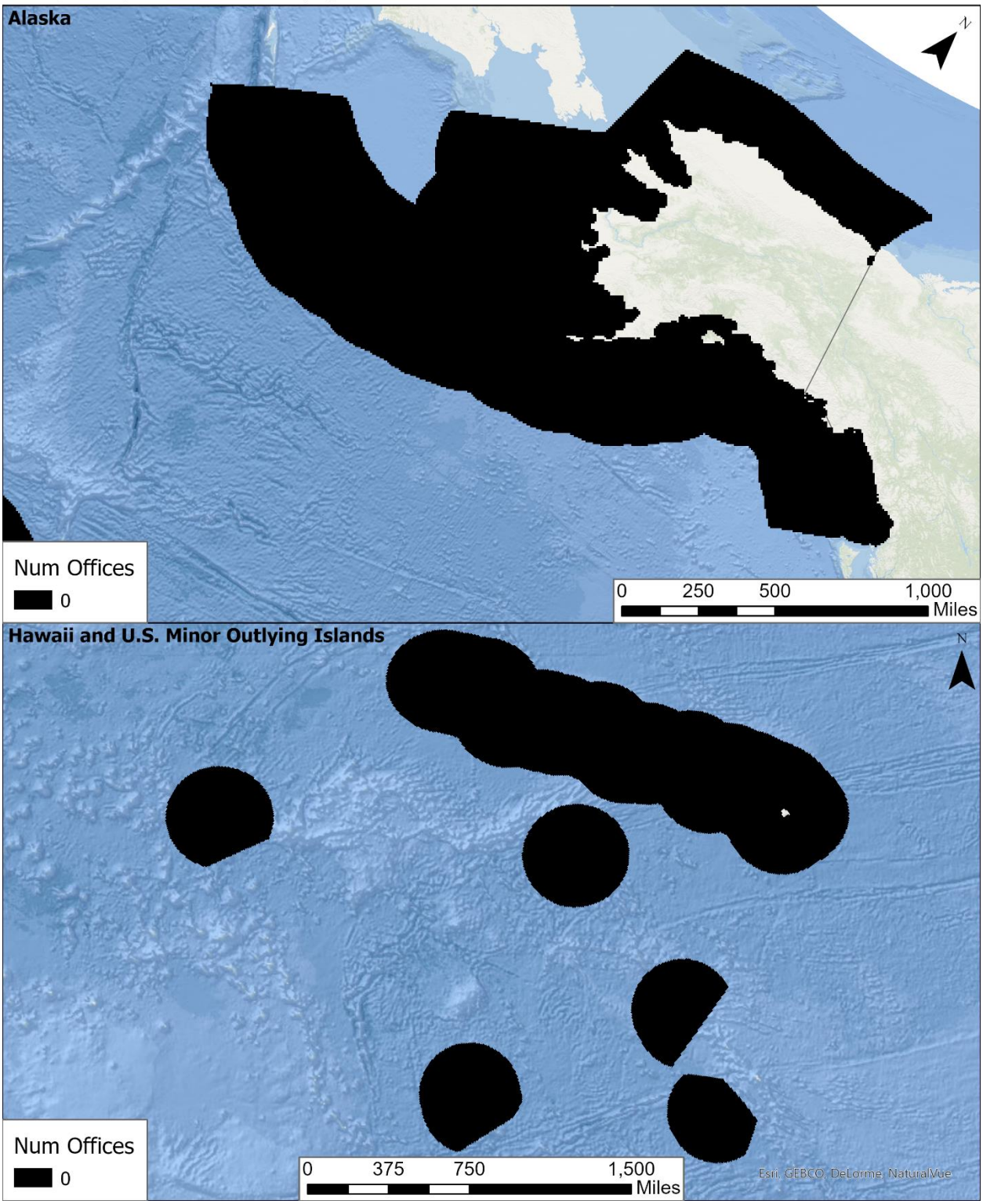
Energy

Continental U.S., Guam and Northern Mariana Islands, American Samoa, and U.S. Caribbean



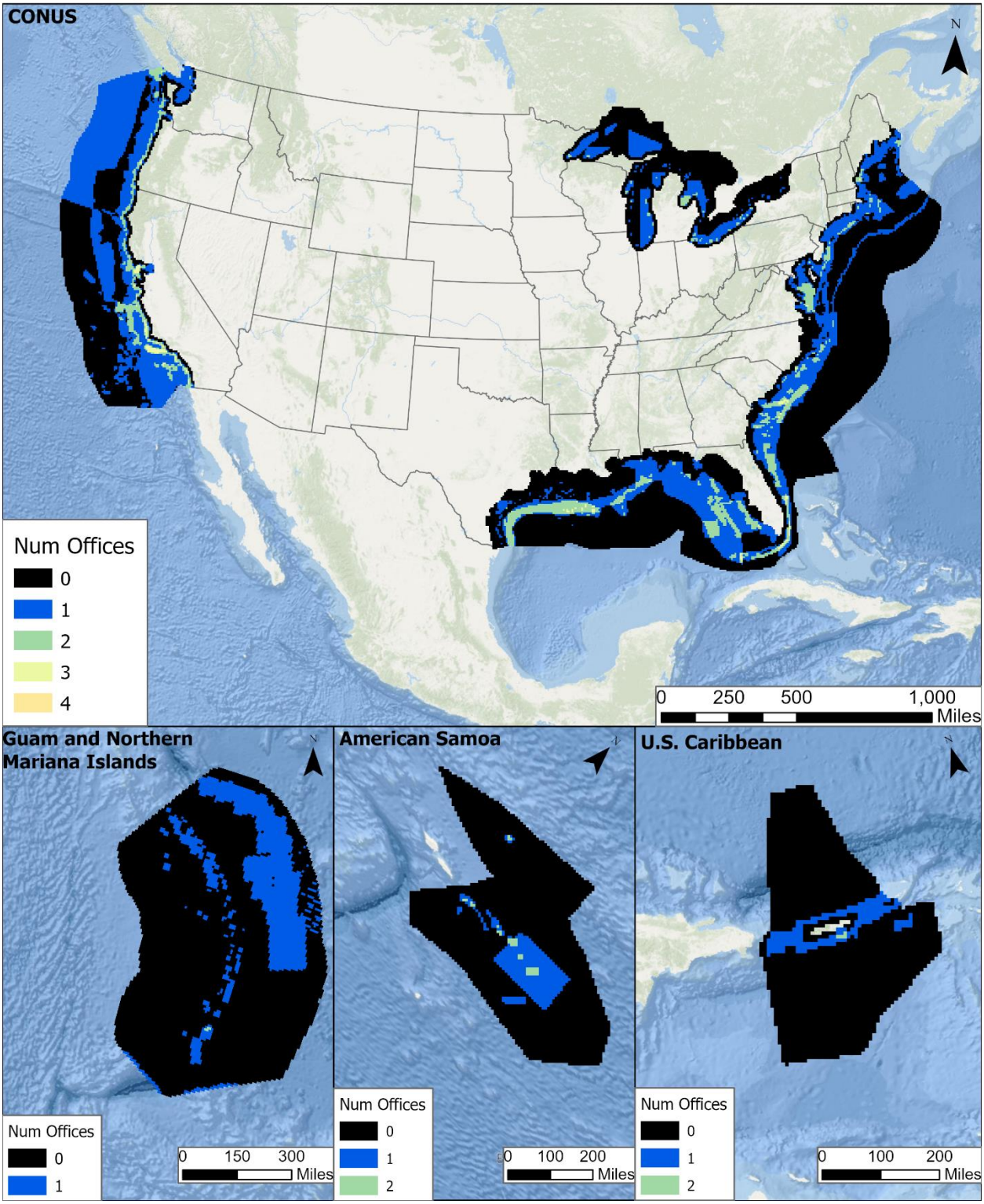
Energy

Alaska, Hawaii, and U.S. Minor Outlying Islands



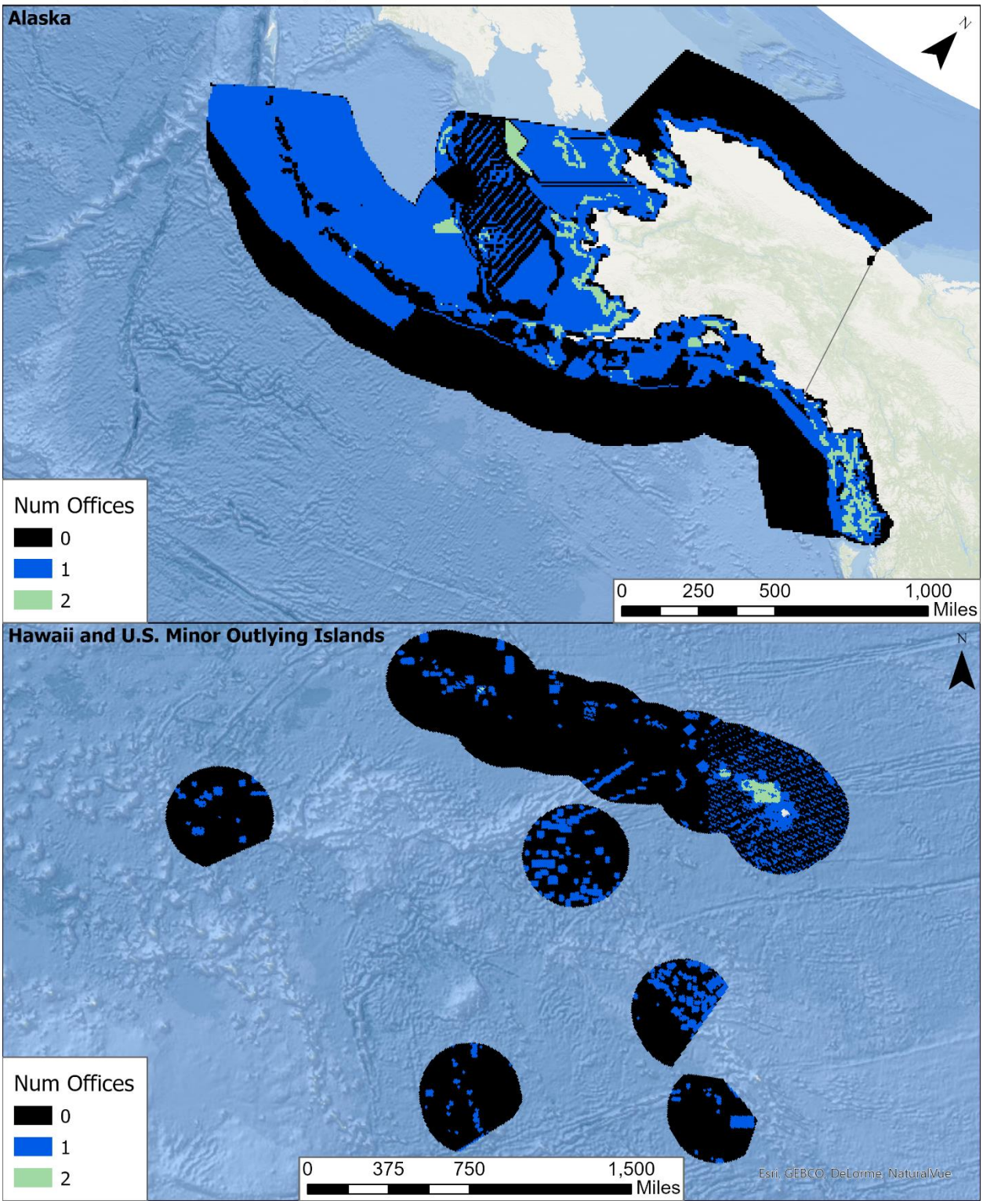
Habitat and Biota Natural Area

Continental U.S., Guam and Northern Mariana Islands, American Samoa, and U.S. Caribbean



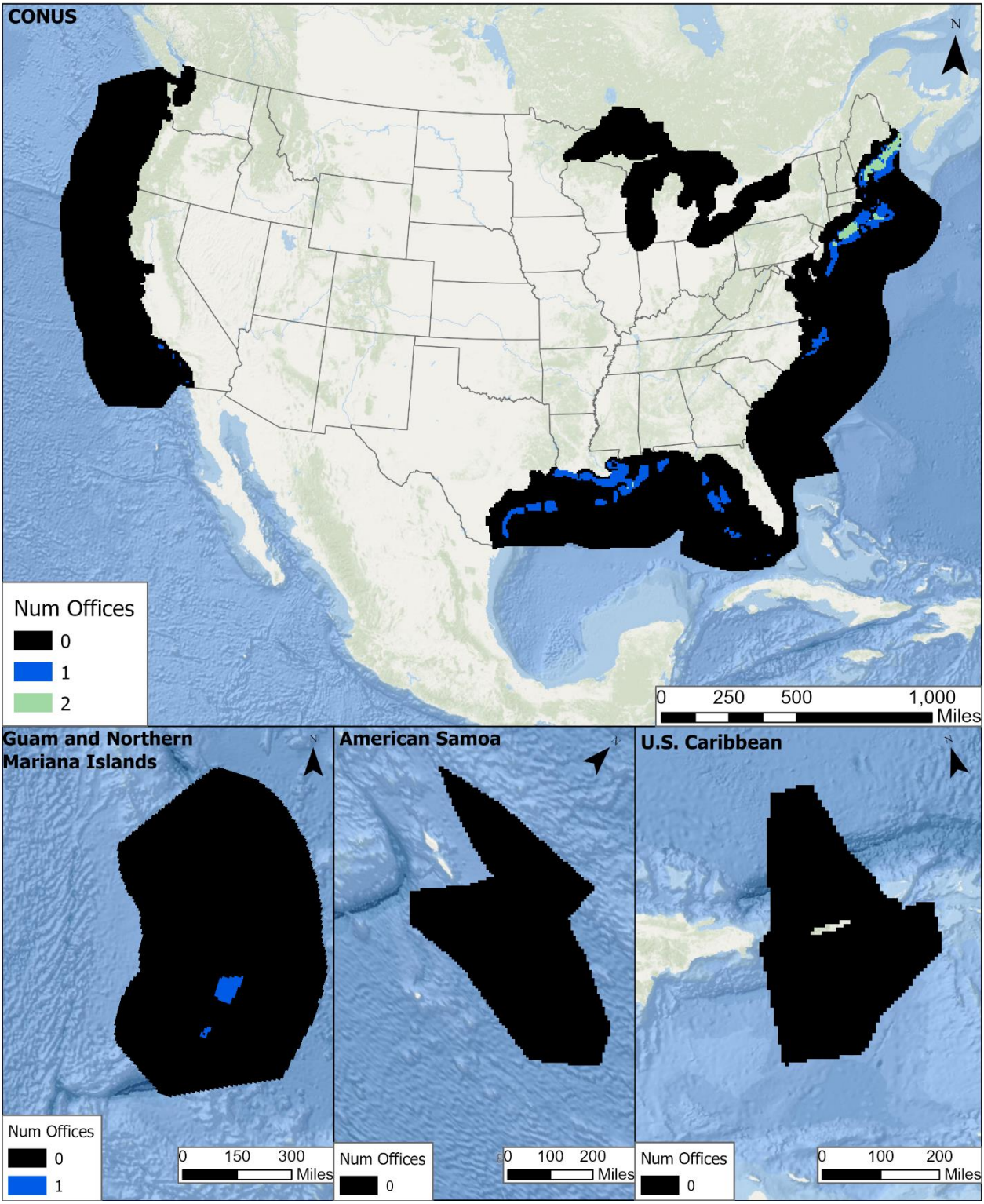
Habitat and Biota Natural Area

Alaska, Hawaii, and U.S. Minor Outlying Islands



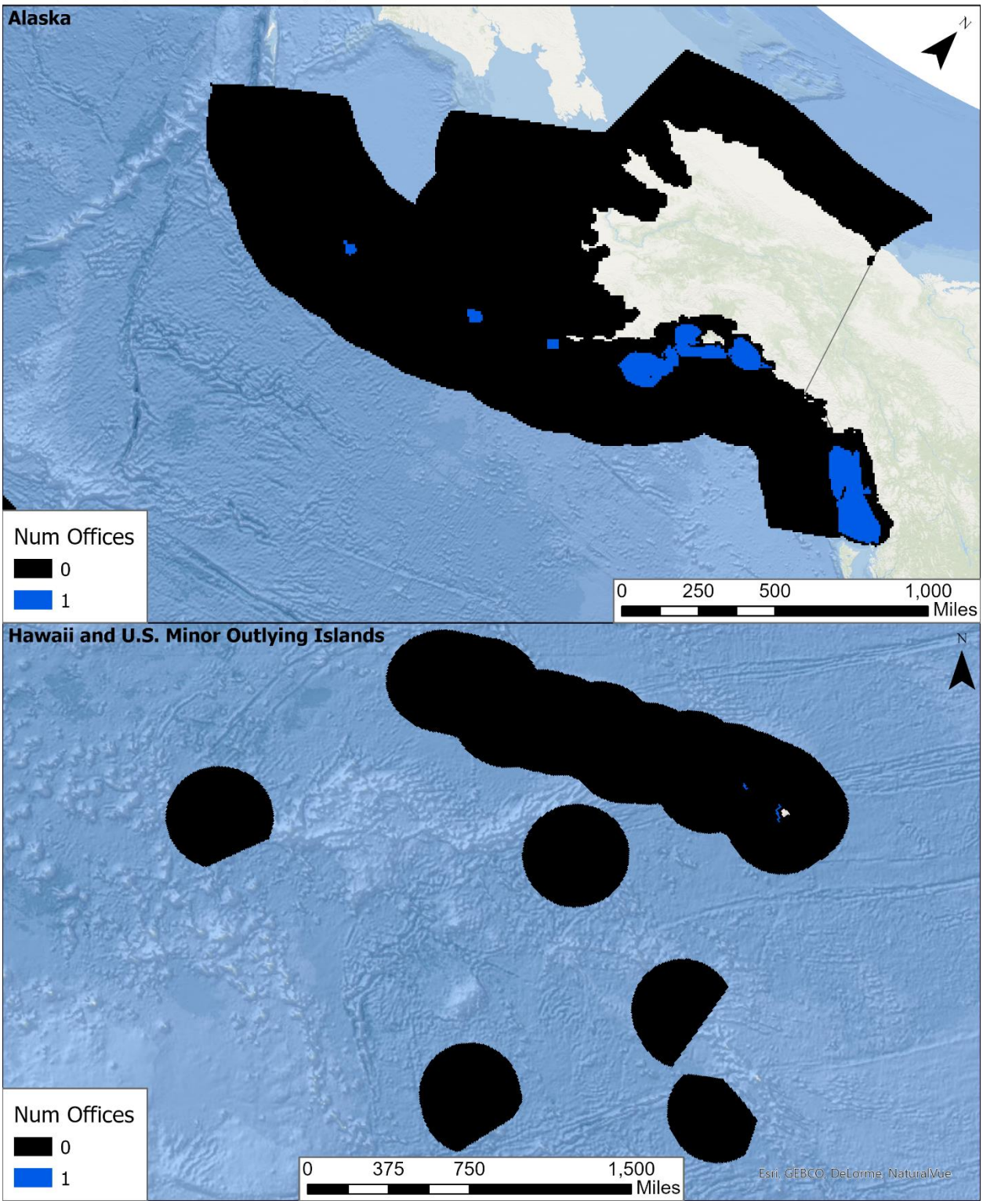
Infrastructure (Non-Energy)

Continental U.S., Guam and Northern Mariana Islands, American Samoa, and U.S. Caribbean



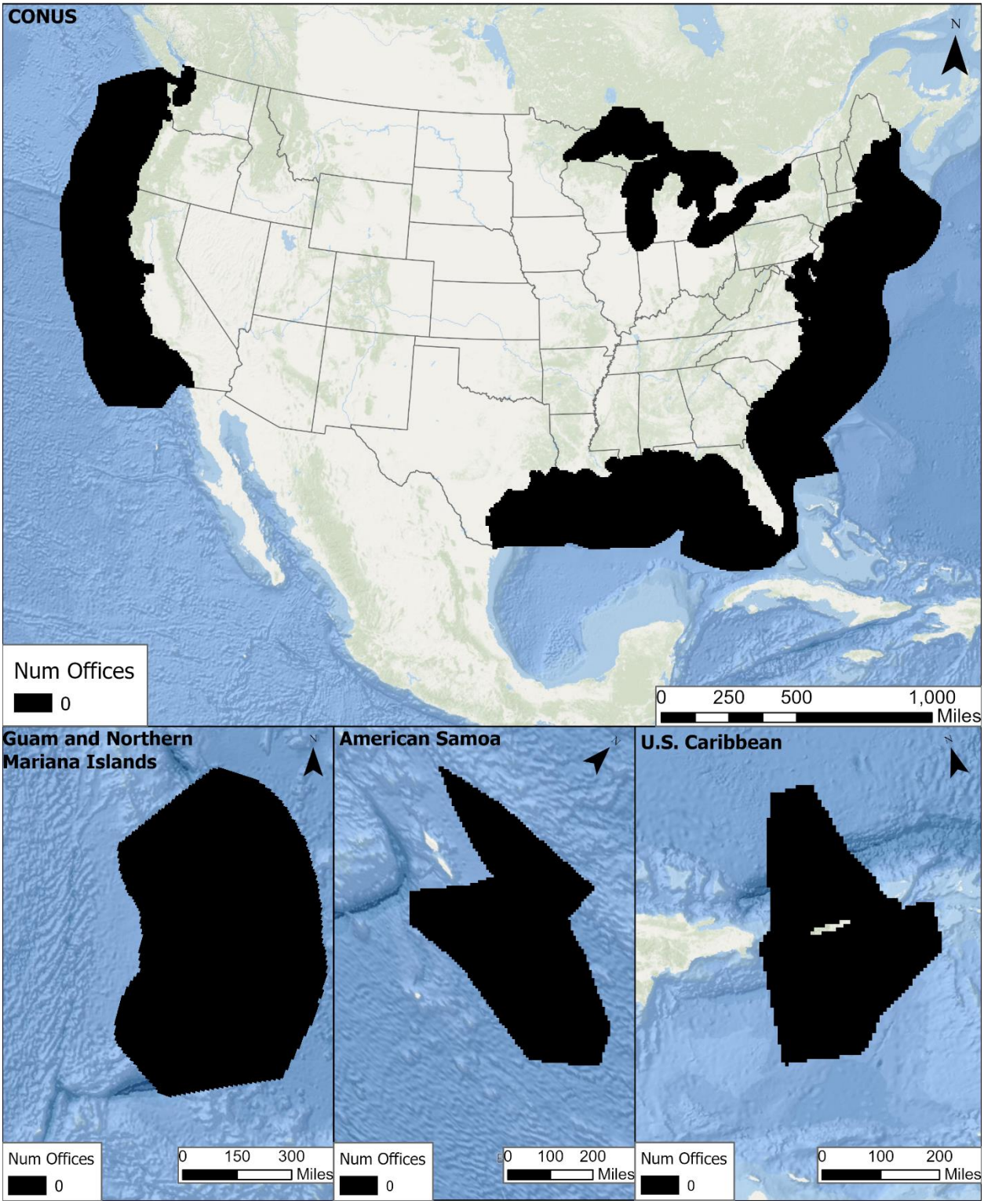
Infrastructure (Non-Energy)

Alaska, Hawaii, and U.S. Minor Outlying Islands



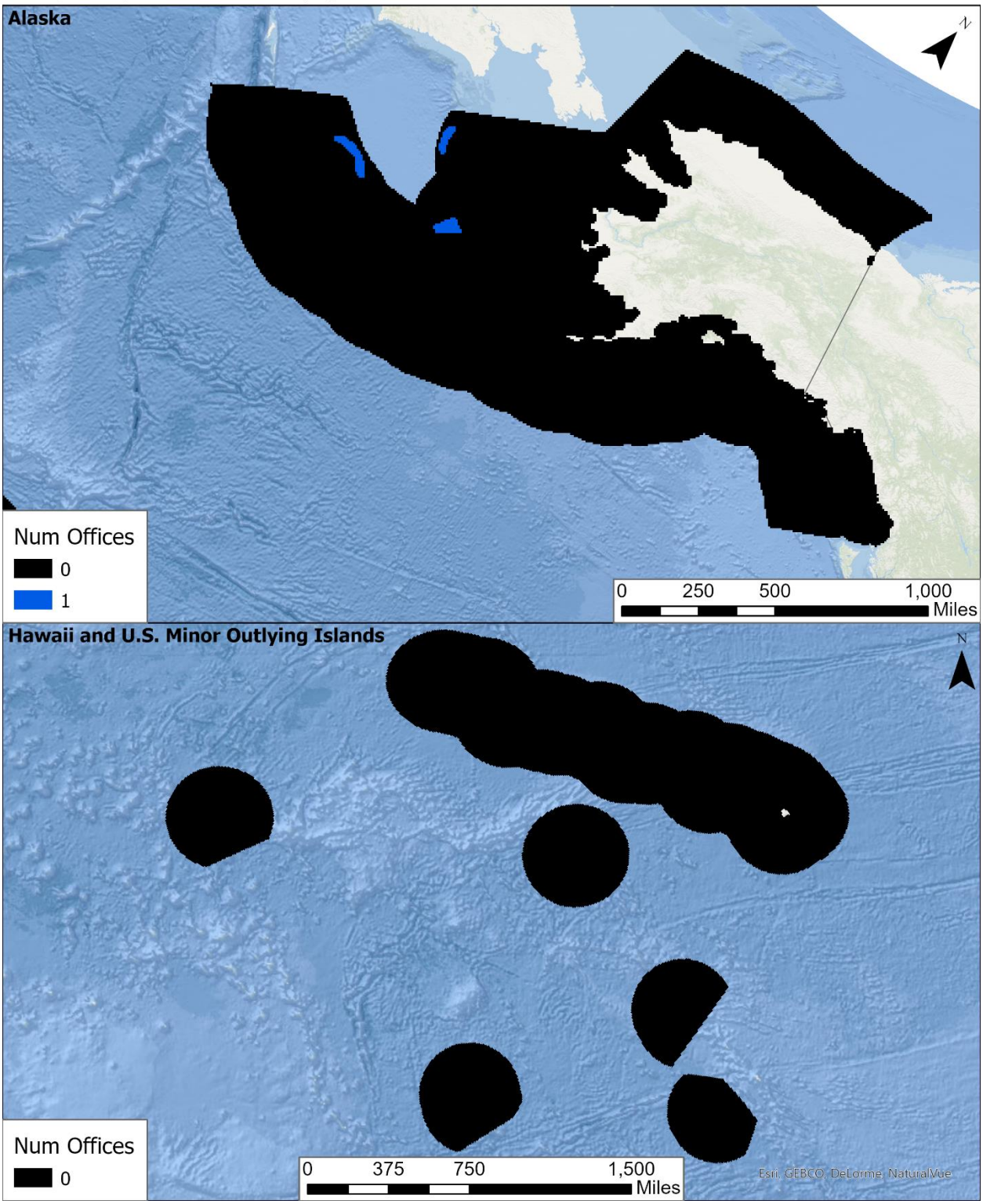
Maritime Boundaries

Continental U.S., Guam and Northern Mariana Islands, American Samoa, and U.S. Caribbean



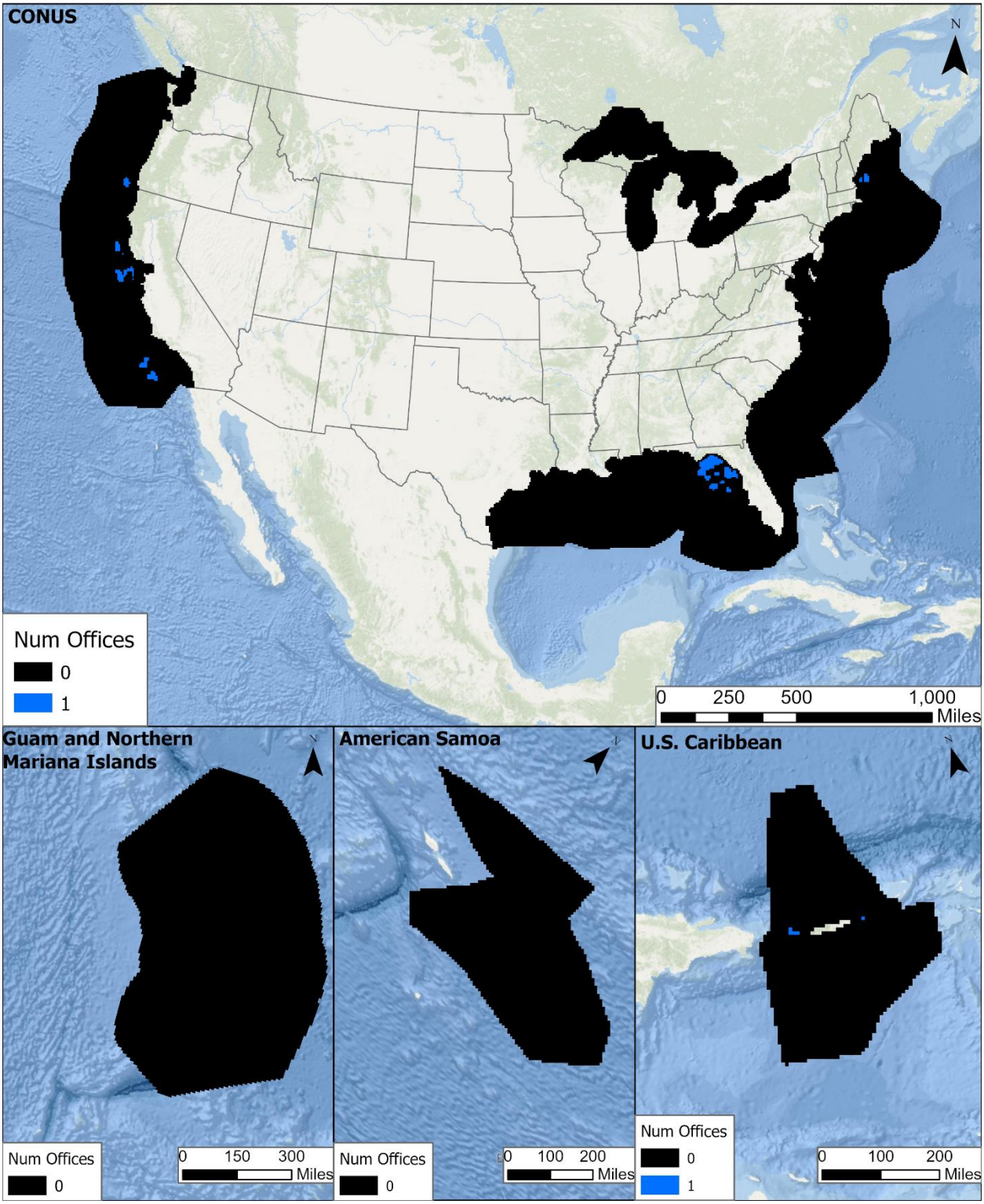
Maritime Boundaries

Alaska, Hawaii, and U.S. Minor Outlying Islands



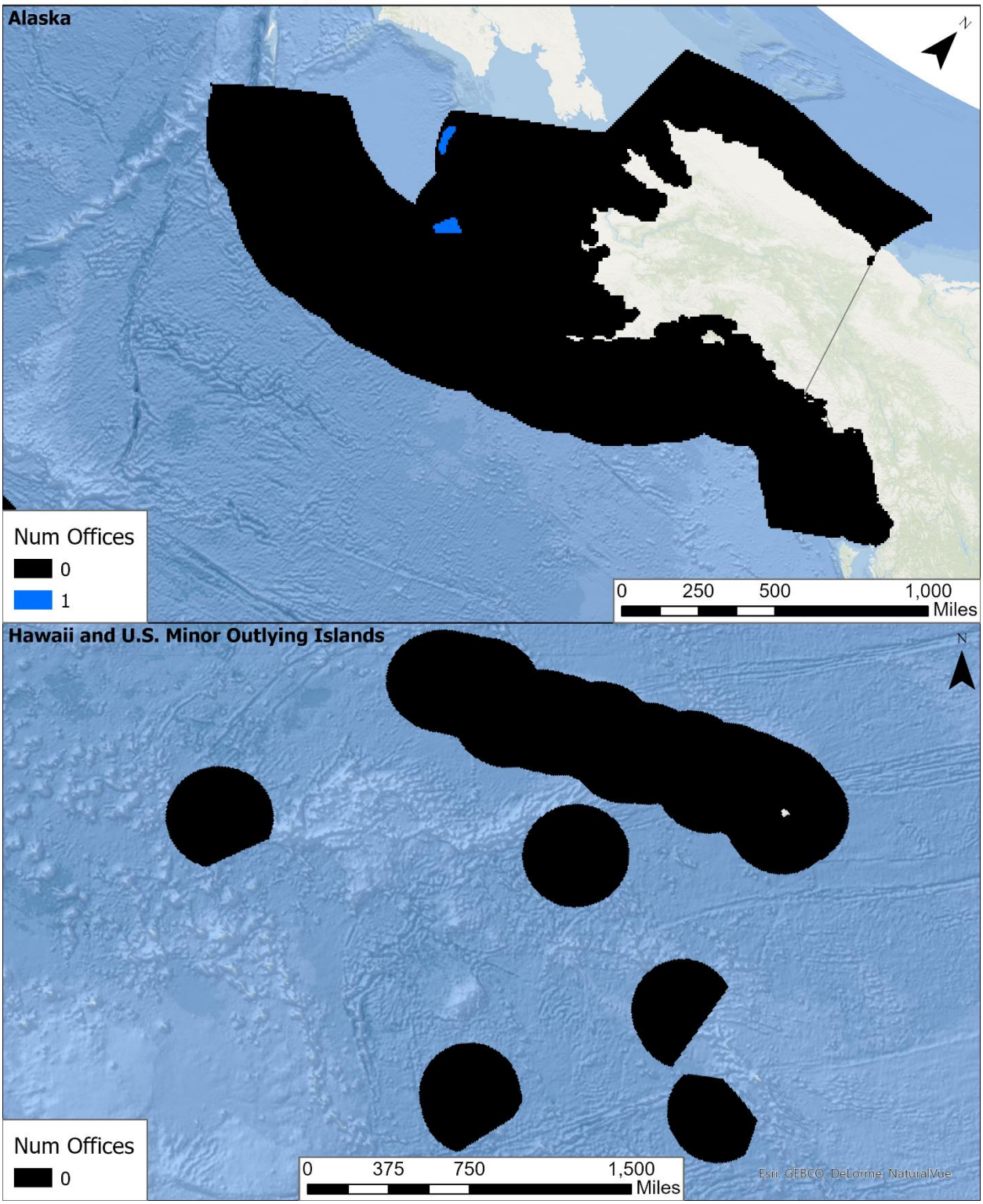
Mineral Resources

Continental U.S., Guam and Northern Mariana Islands, American Samoa, and U.S. Caribbean



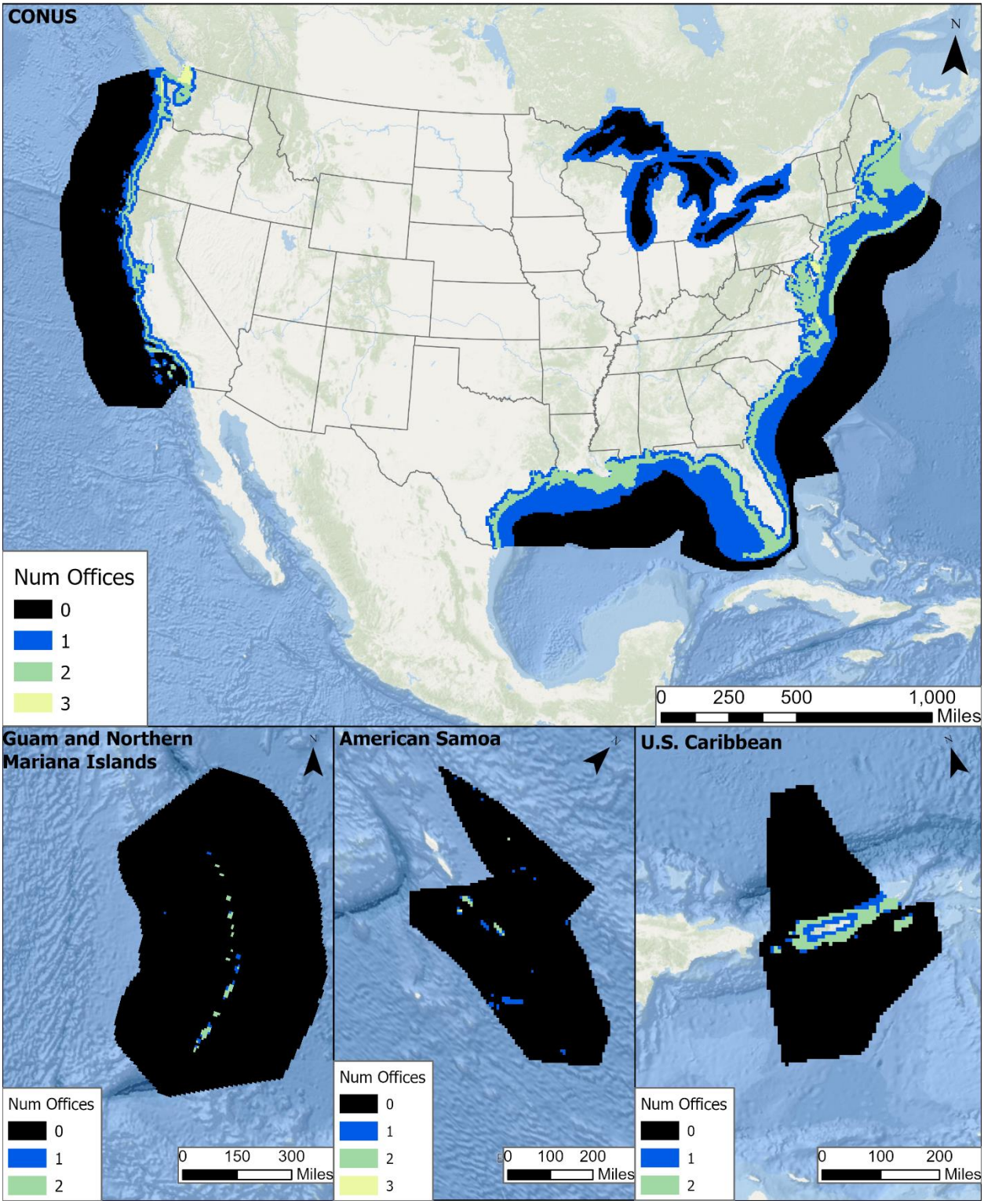
Mineral Resources

Alaska, Hawaii, and U.S. Minor Outlying Islands



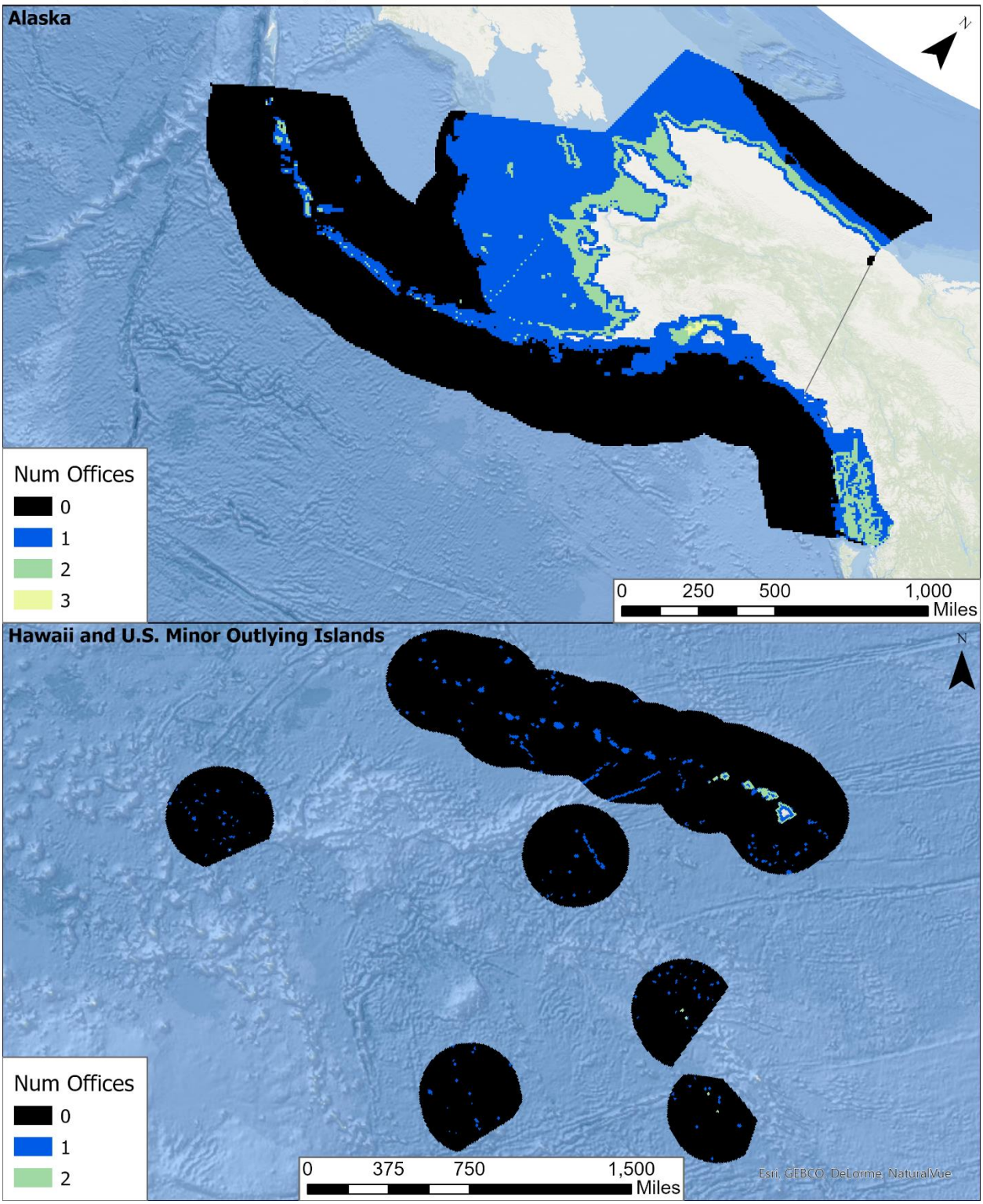
Modeling

Continental U.S., Guam and Northern Mariana Islands, American Samoa, and U.S. Caribbean



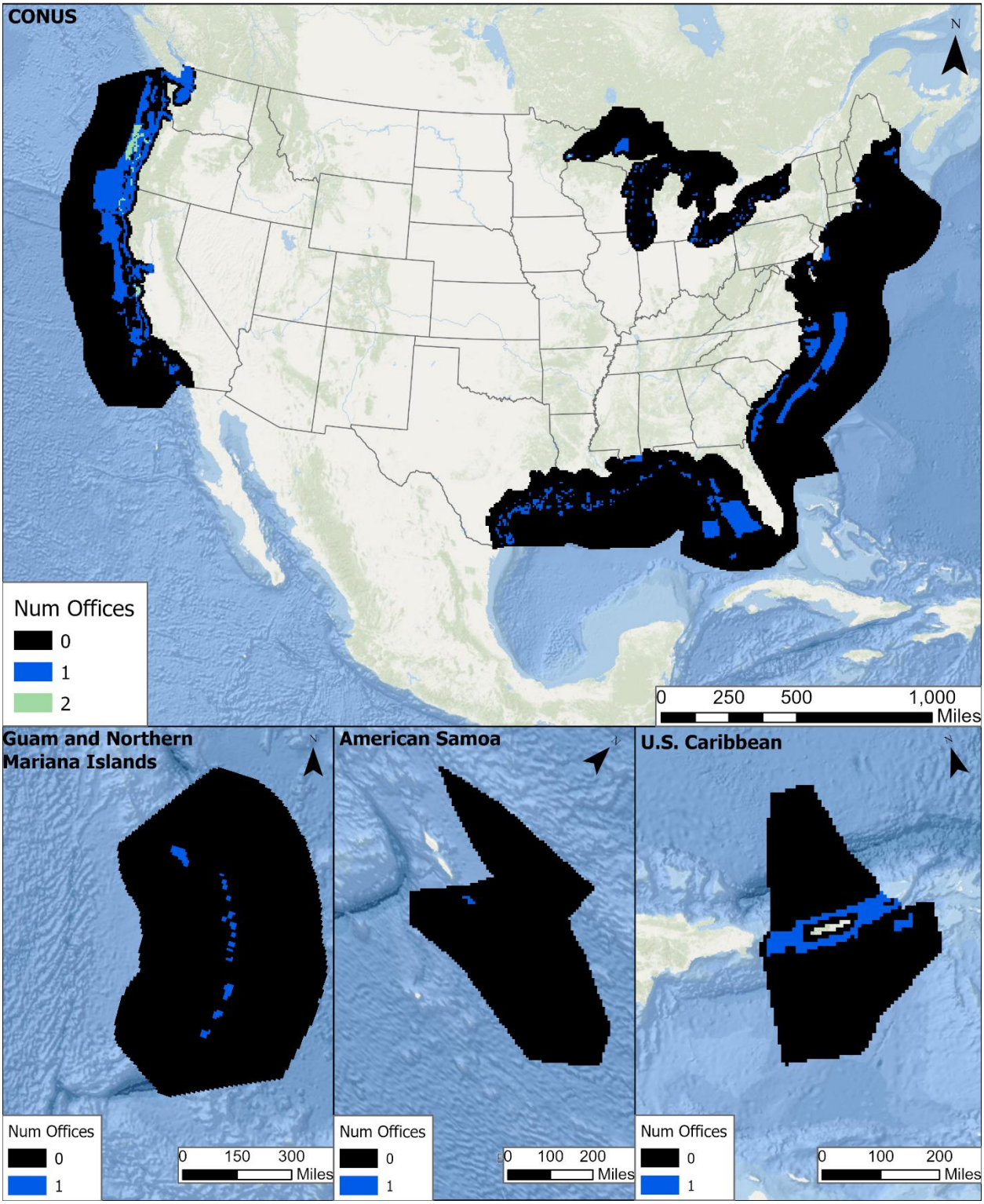
Modeling

Alaska, Hawaii, and U.S. Minor Outlying Islands



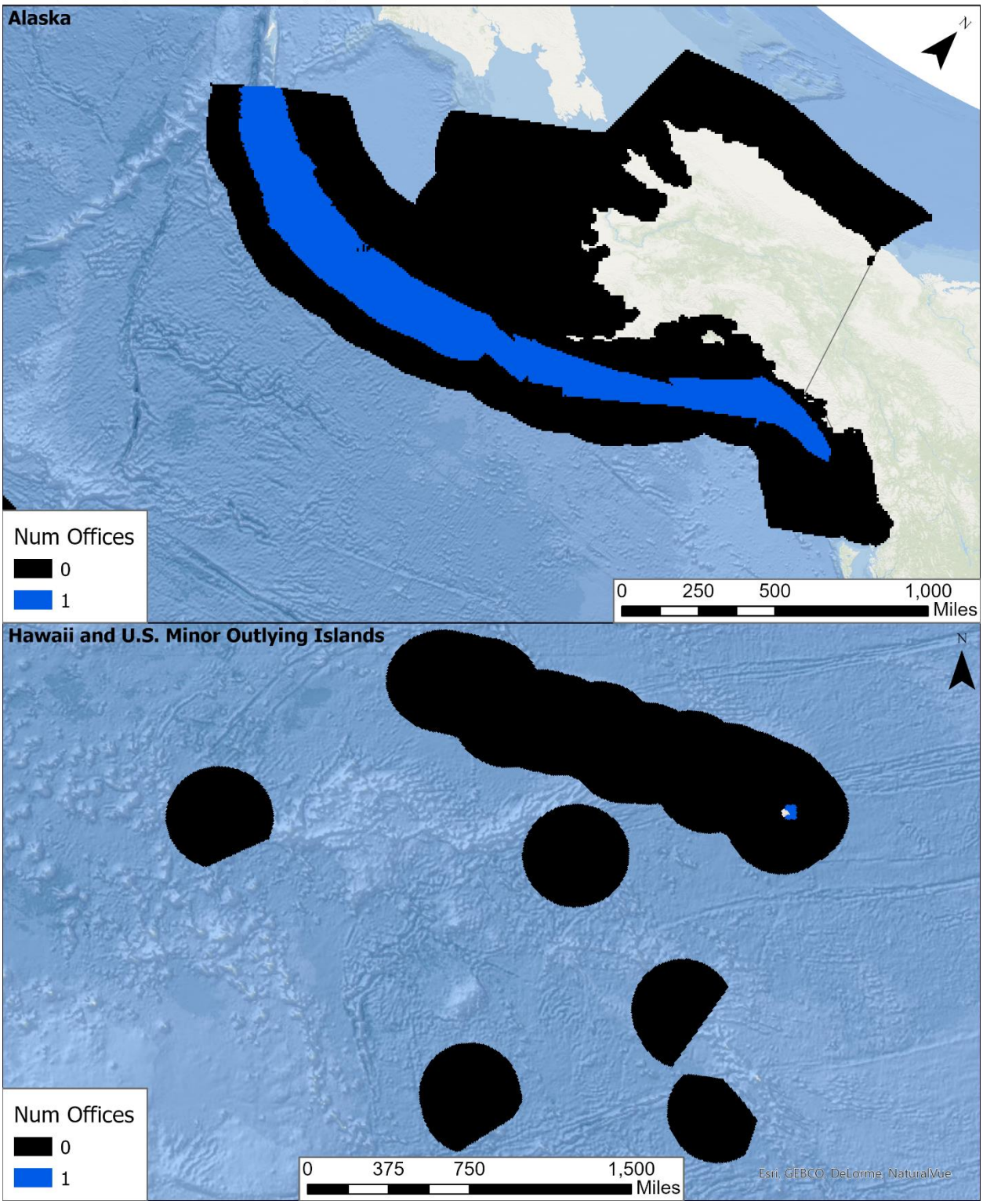
Monitoring

Continental U.S., Guam and Northern Mariana Islands, American Samoa, and U.S. Caribbean



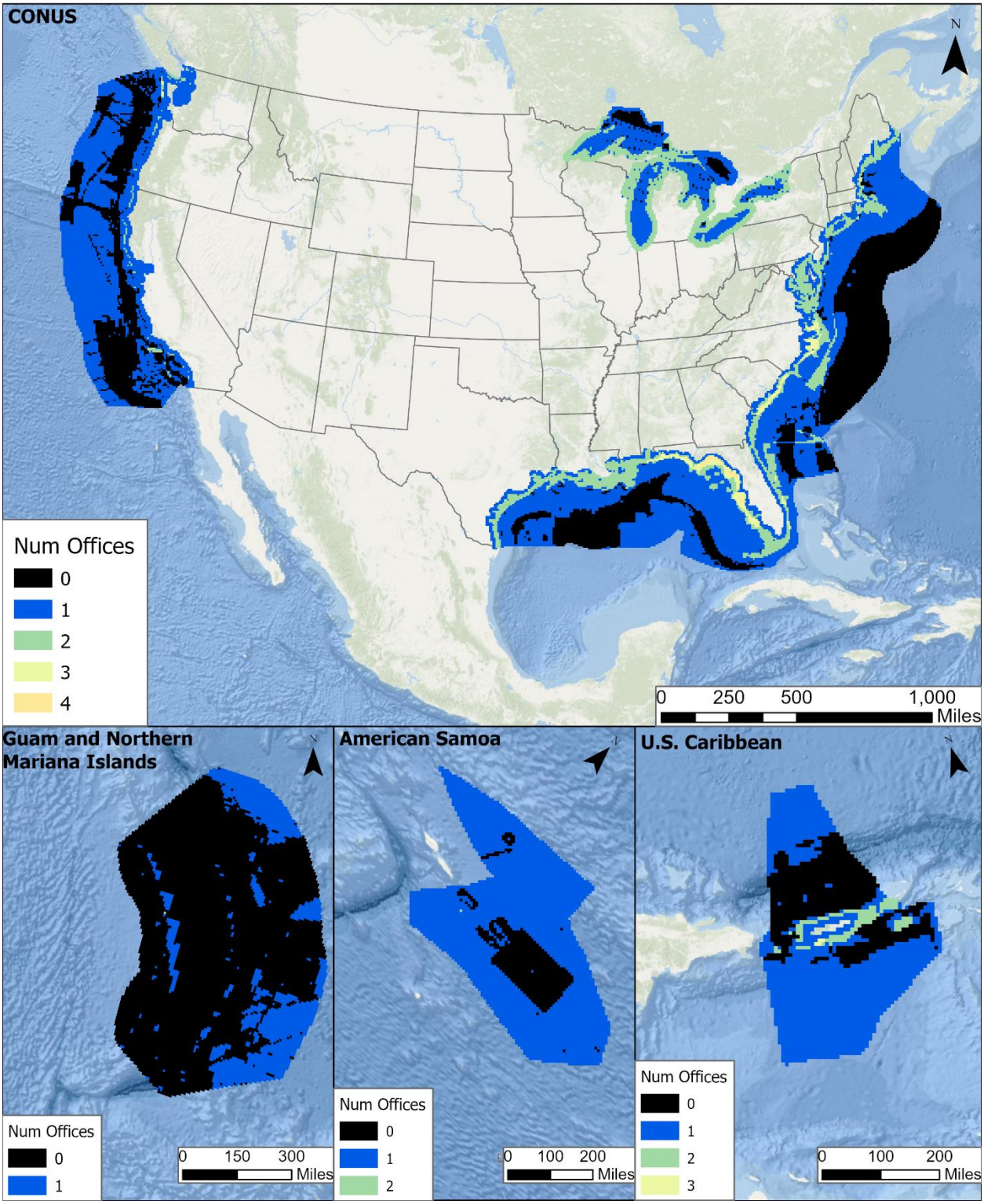
Monitoring

Alaska, Hawaii, and U.S. Minor Outlying Islands



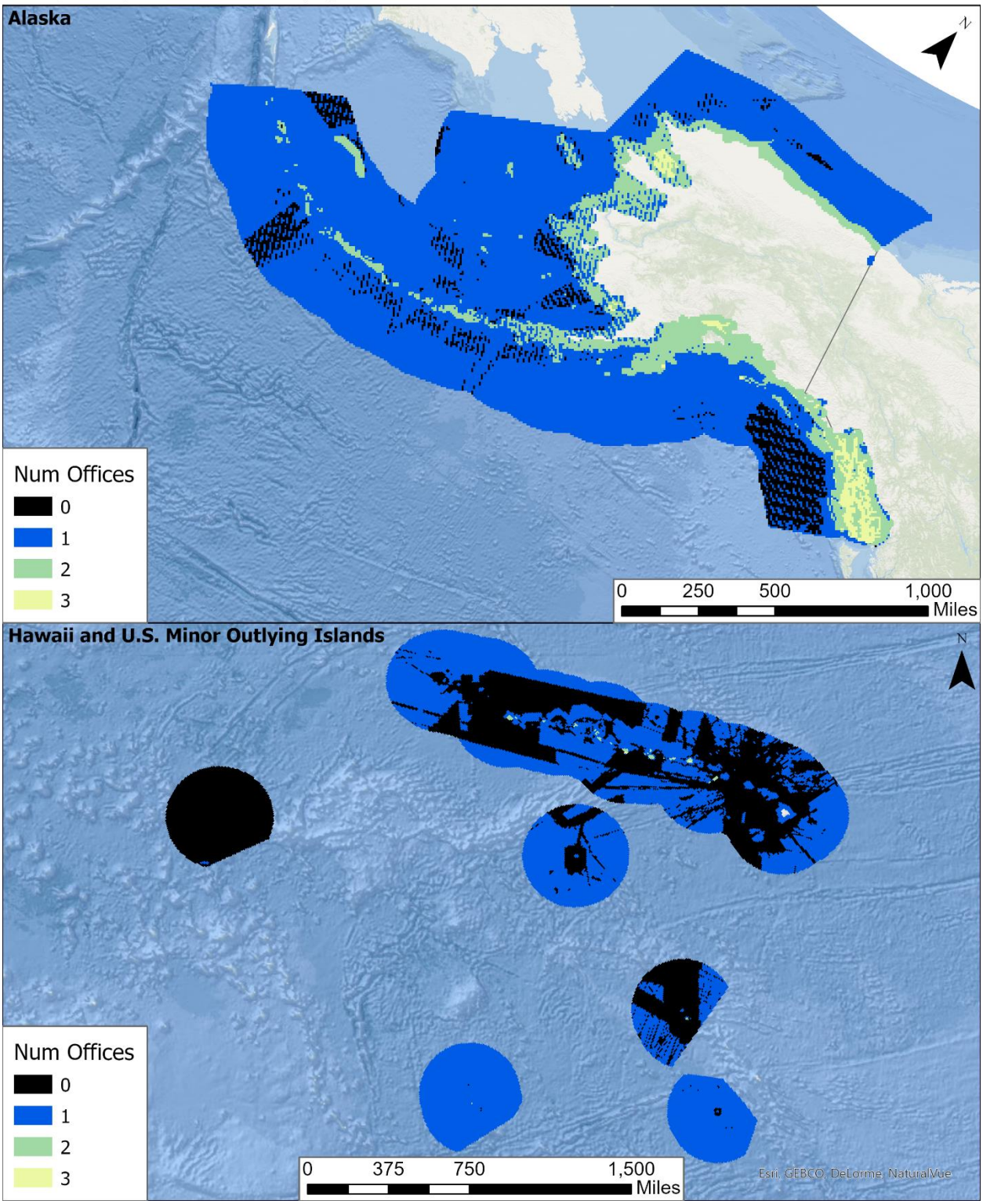
Navigation Safety

Continental U.S., Guam and Northern Mariana Islands, American Samoa, and U.S. Caribbean



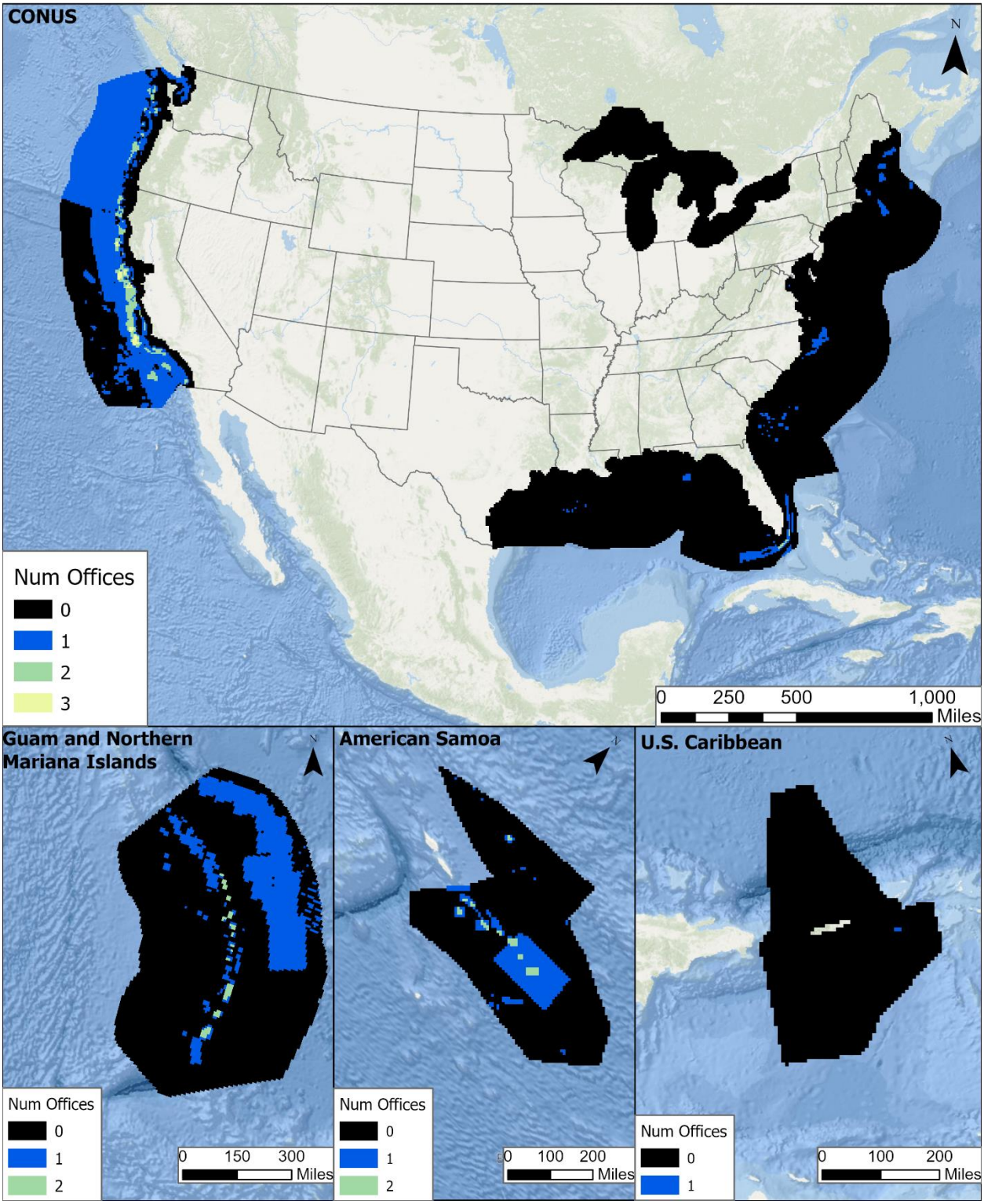
Navigation Safety

Alaska, Hawaii, and U.S. Minor Outlying Islands



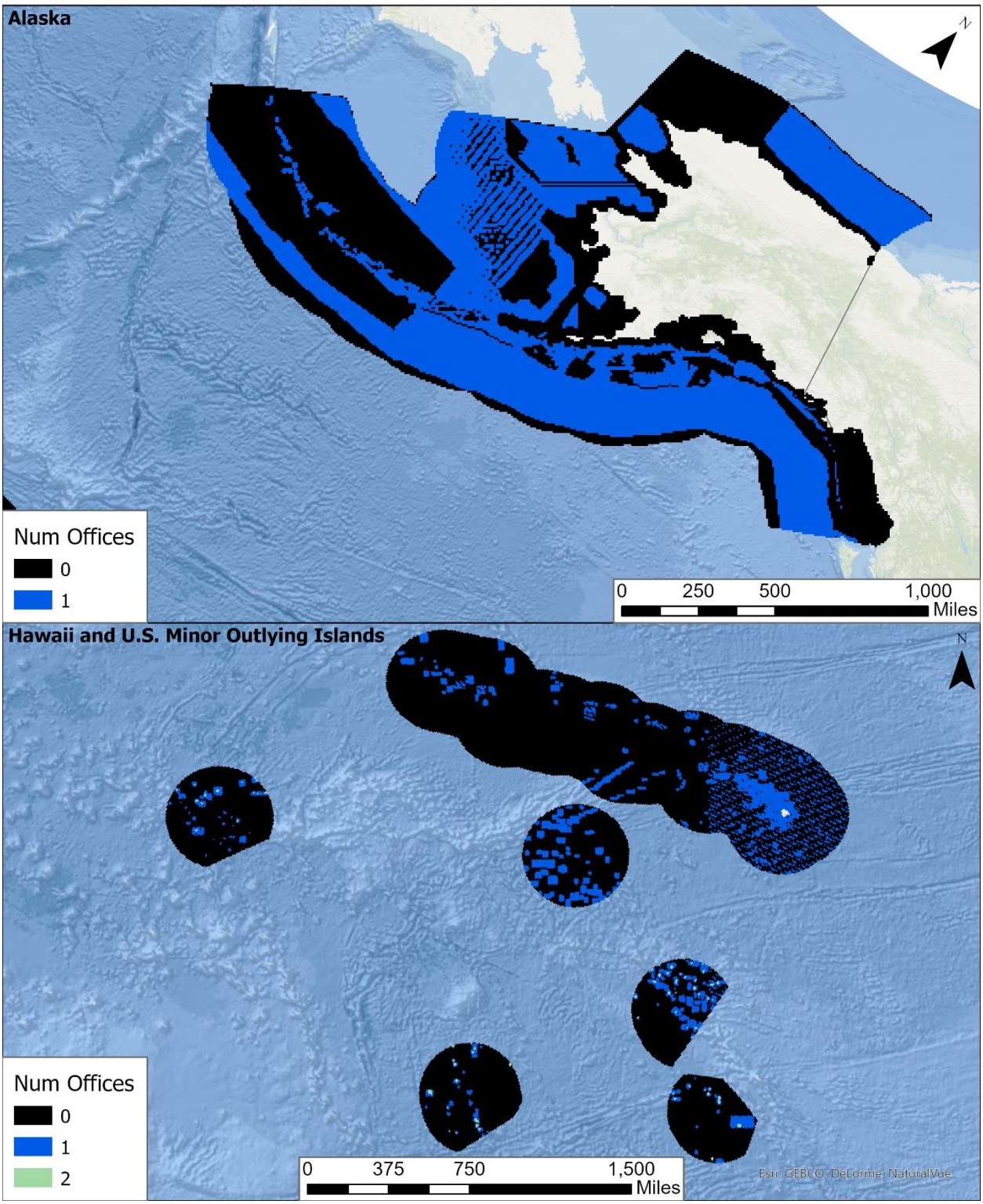
Protection and Management Areas

Continental U.S., Guam and Northern Mariana Islands, American Samoa, and U.S. Caribbean



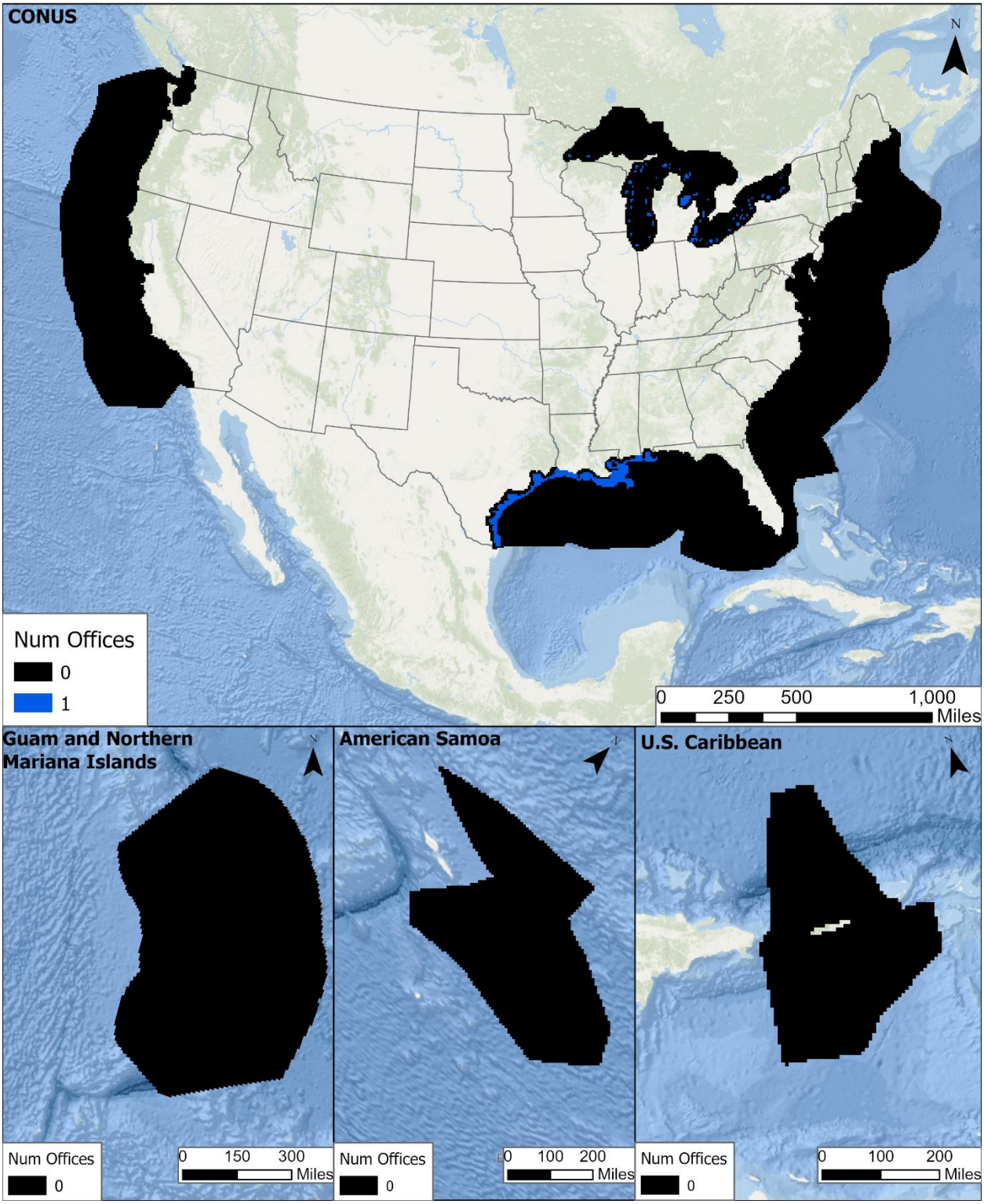
Protection and Management Areas

Alaska, Hawaii, and U.S. Minor Outlying Islands



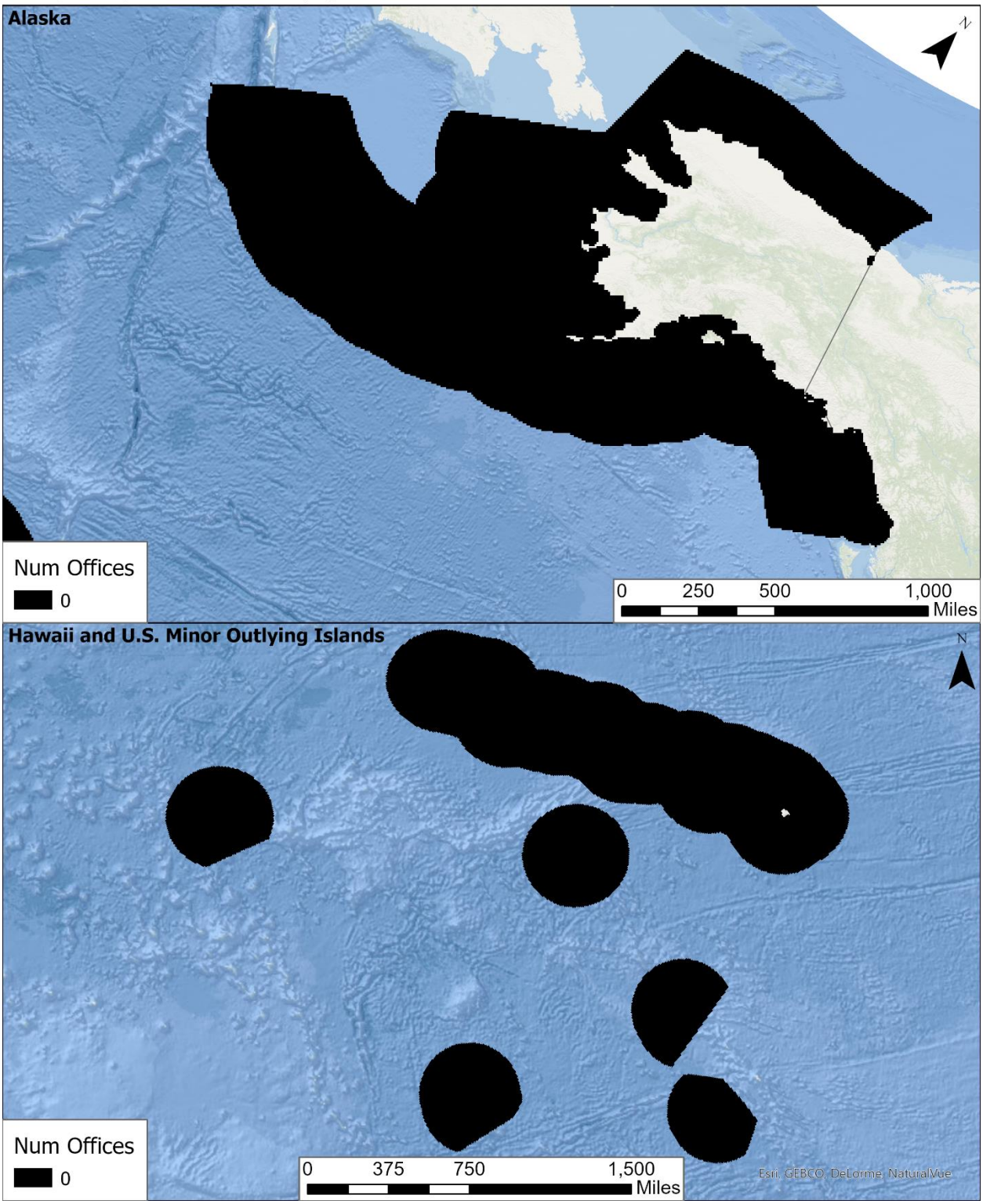
Public Health

Continental U.S., Guam and Northern Mariana Islands, American Samoa, and U.S. Caribbean



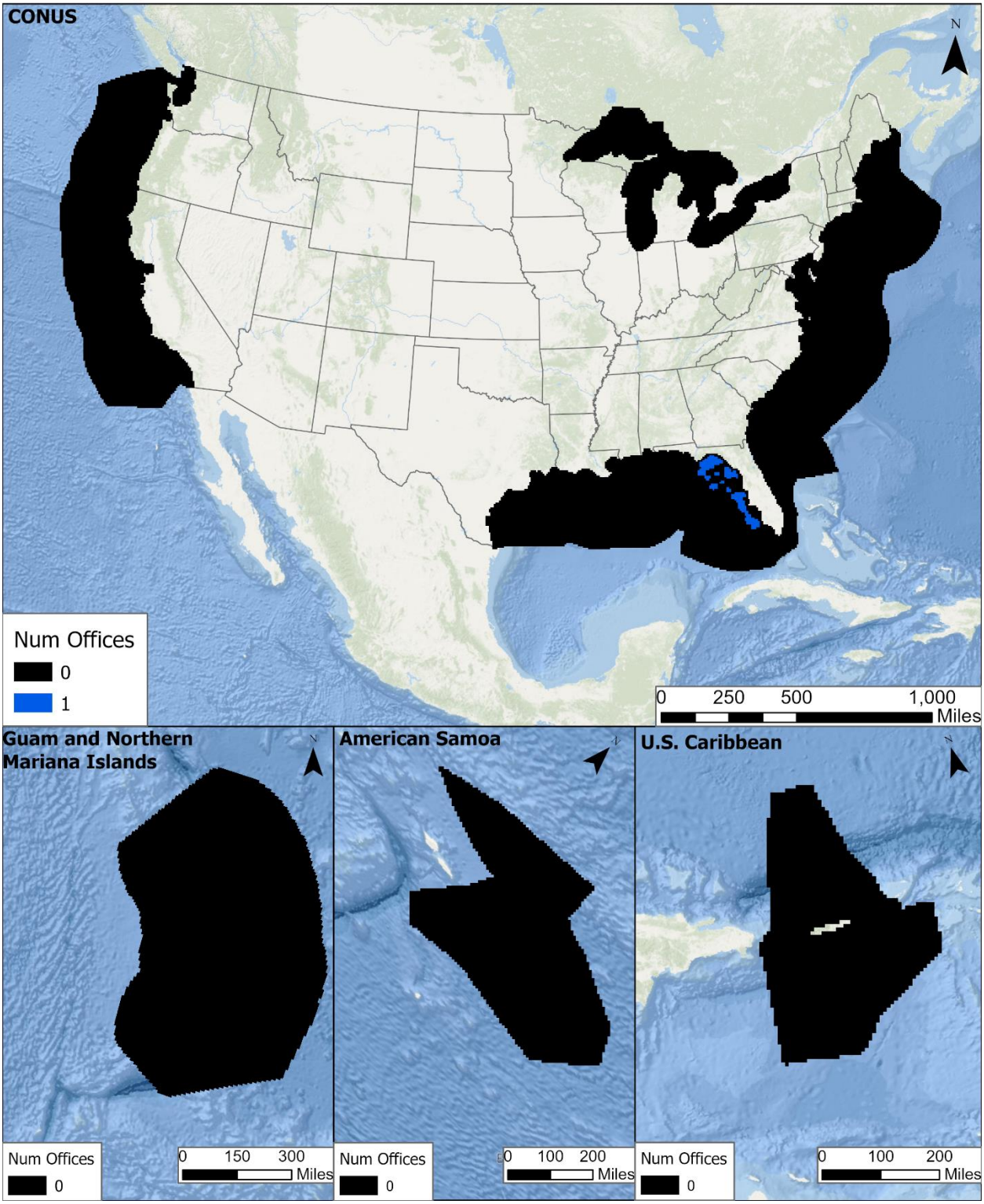
Public Health

Alaska, Hawaii, and U.S. Minor Outlying Islands



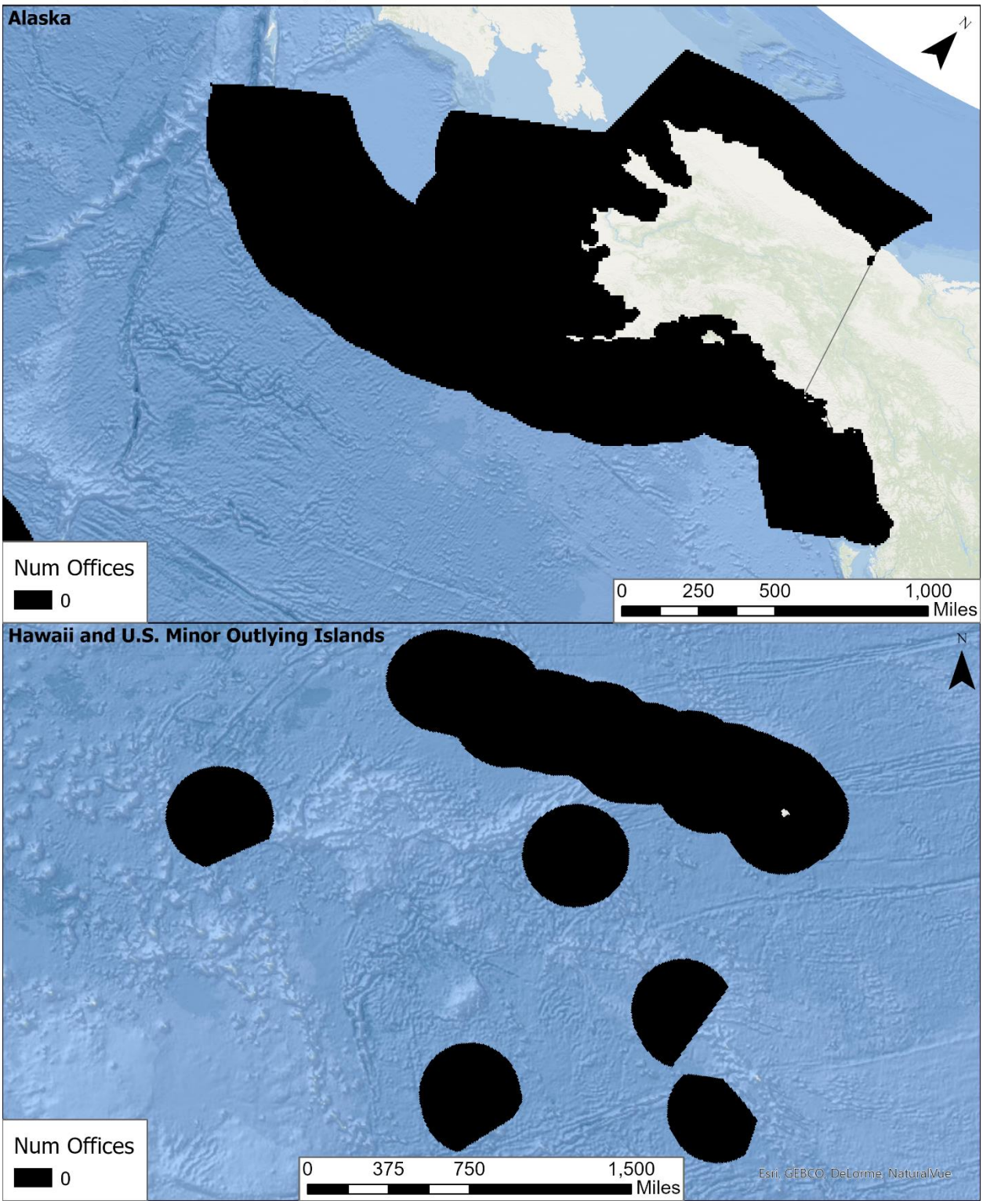
Recreational Activities

Continental U.S., Guam and Northern Mariana Islands, American Samoa, and U.S. Caribbean



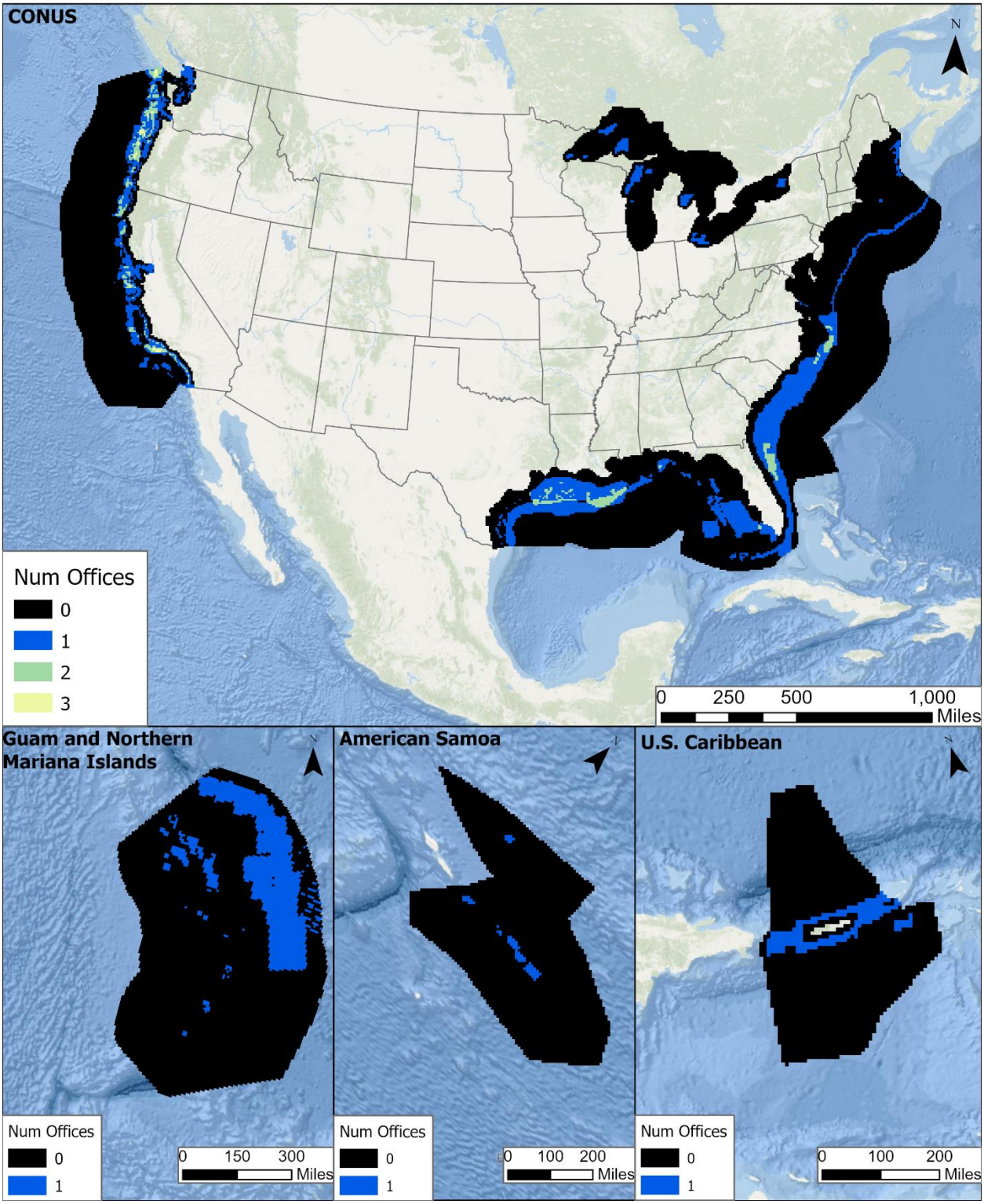
Recreational Activities

Alaska, Hawaii, and U.S. Minor Outlying Islands



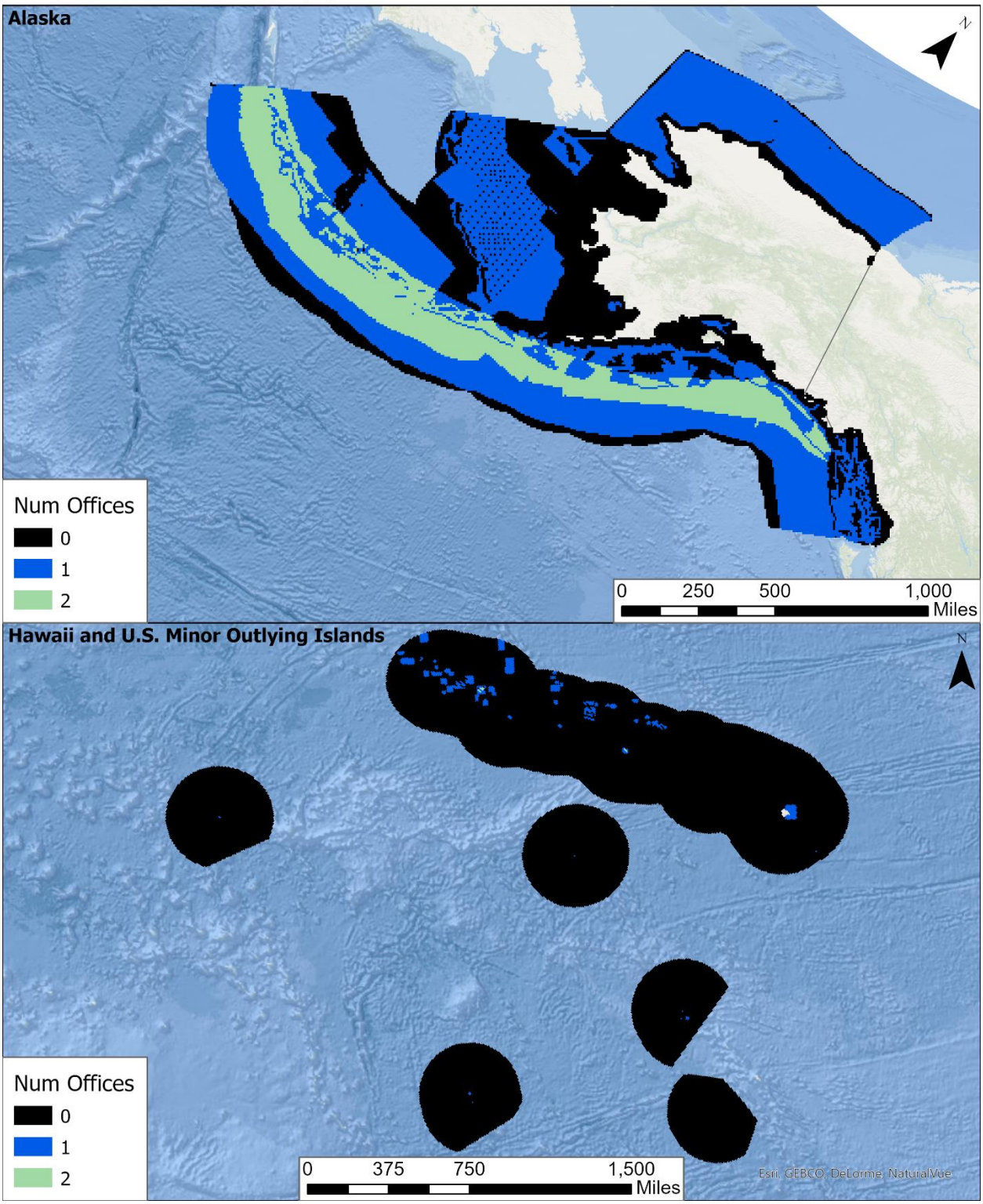
Scientific Research

Continental U.S., Guam and Northern Mariana Islands, American Samoa, and U.S. Caribbean



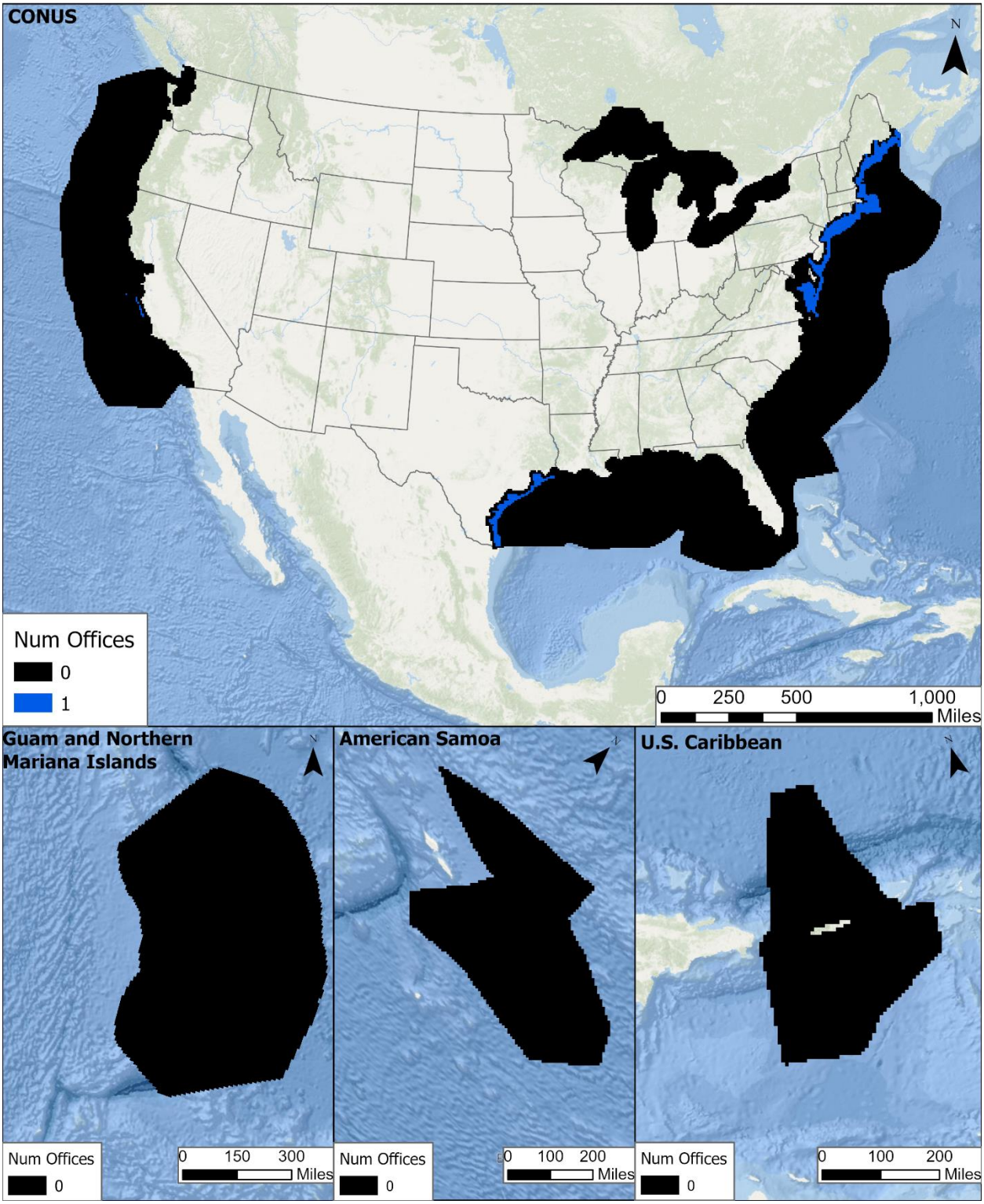
Scientific Research

Alaska, Hawaii, and U.S. Minor Outlying Islands



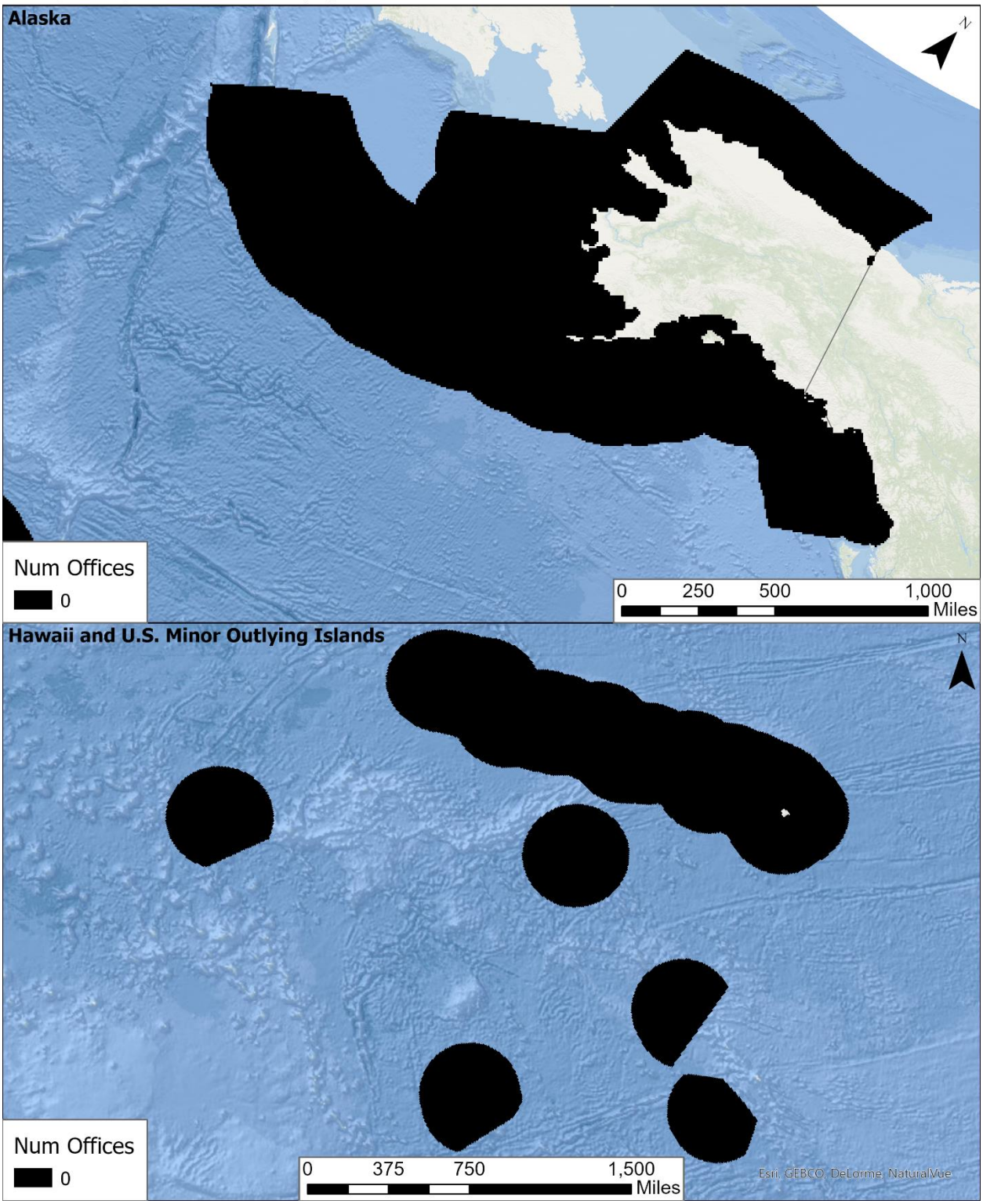
Sediment Transport

Continental U.S., Guam and Northern Mariana Islands, American Samoa, and U.S. Caribbean



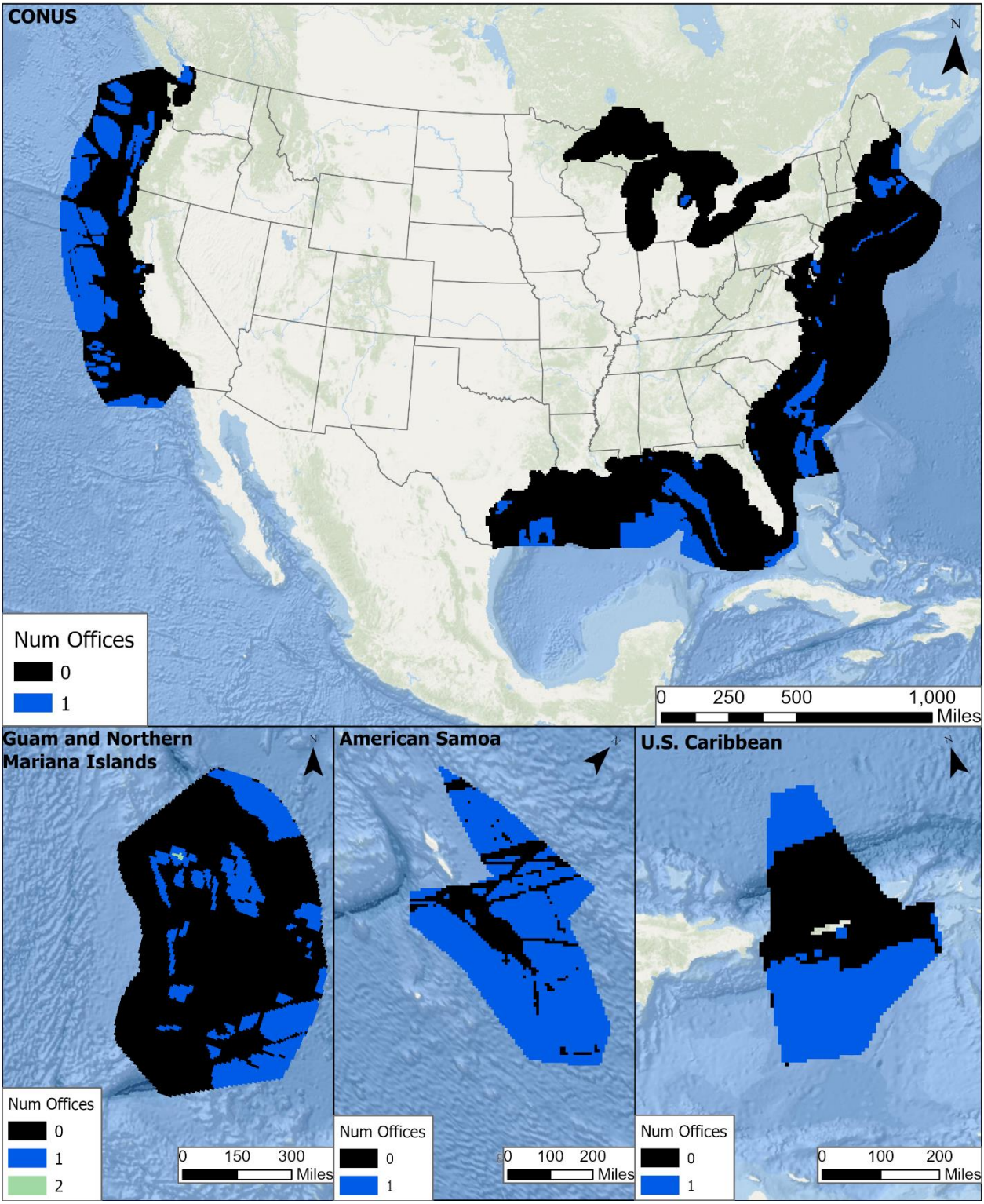
Sediment Transport

Alaska, Hawaii, and U.S. Minor Outlying Islands



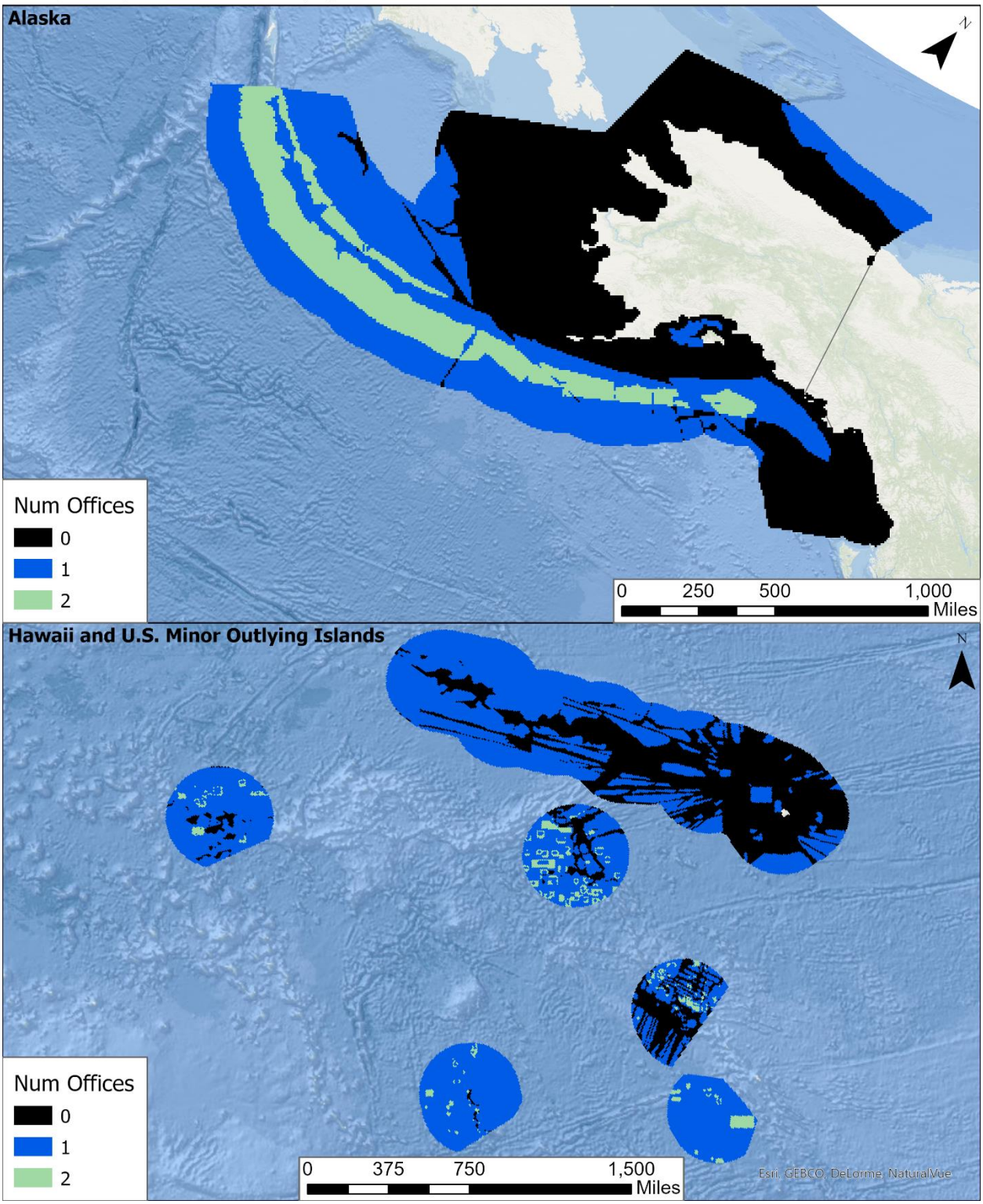
Water Column Exploration

Continental U.S., Guam and Northern Mariana Islands, American Samoa, and U.S. Caribbean



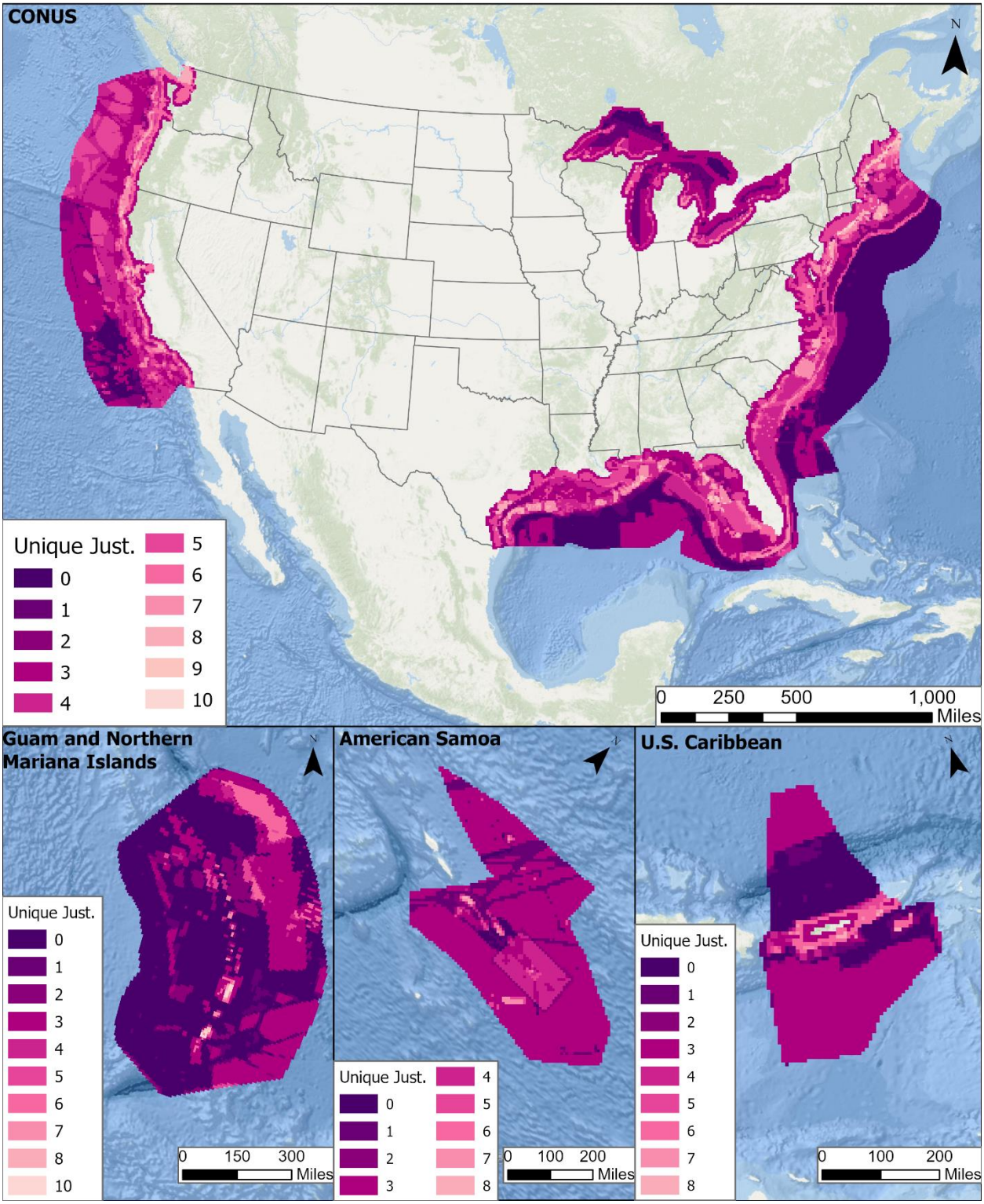
Water Column Exploration

Alaska, Hawaii, and U.S. Minor Outlying Islands



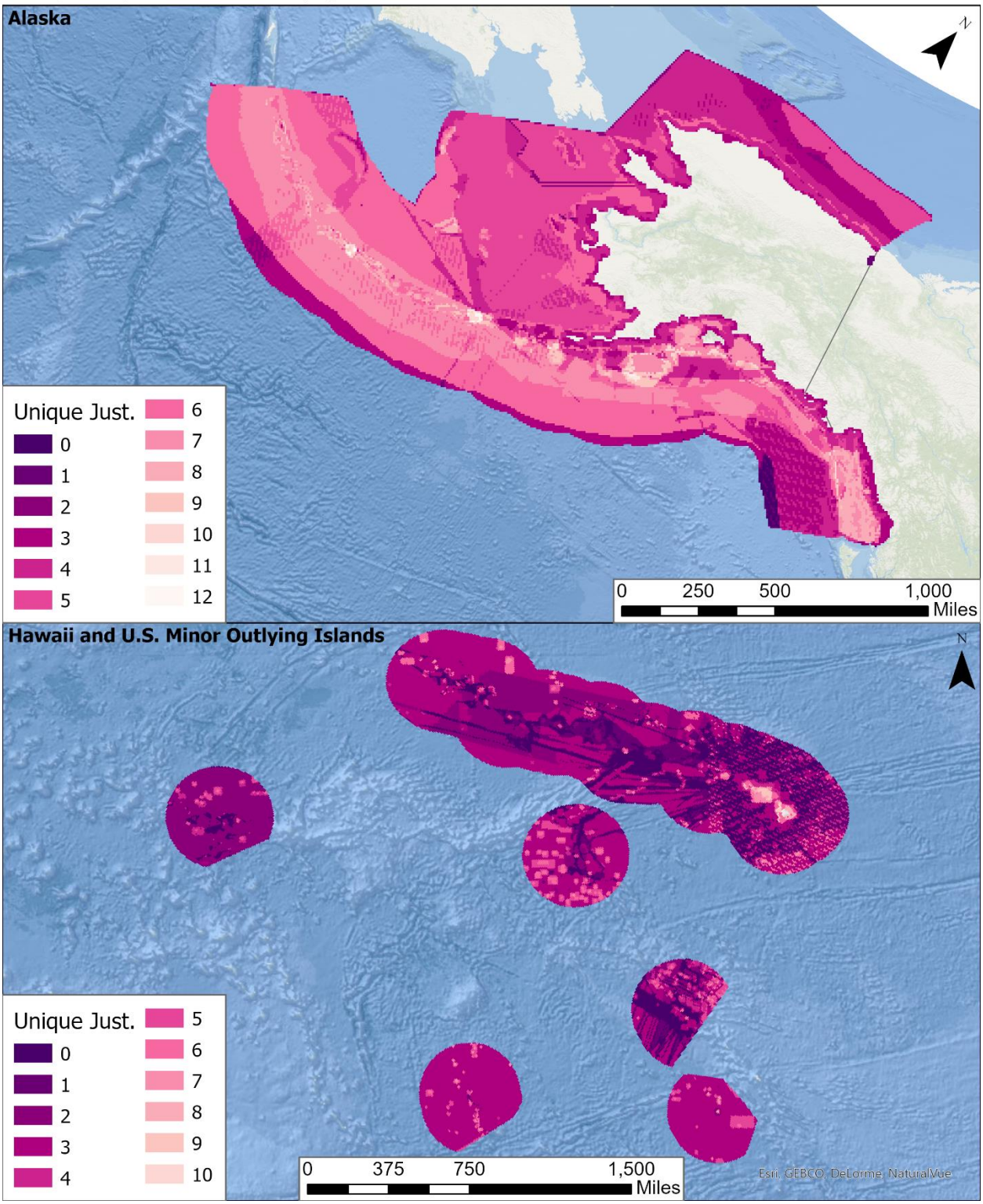
Justification (All)

Continental U.S., Guam and Northern Mariana Islands, American Samoa, and U.S. Caribbean



Justification (All)

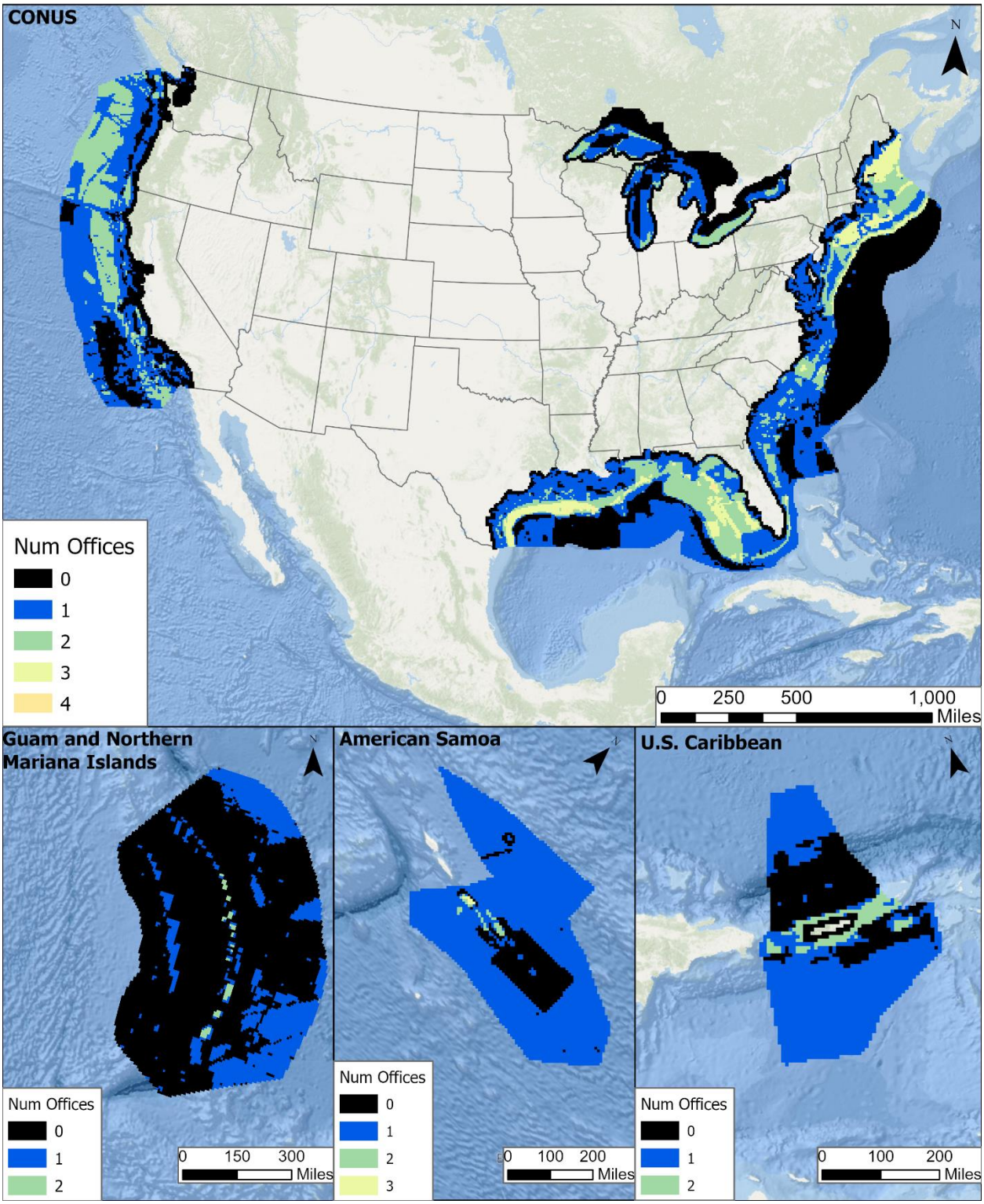
Alaska, Hawaii, and U.S. Minor Outlying Islands



APPENDIX D: MAP PRODUCT MAPS

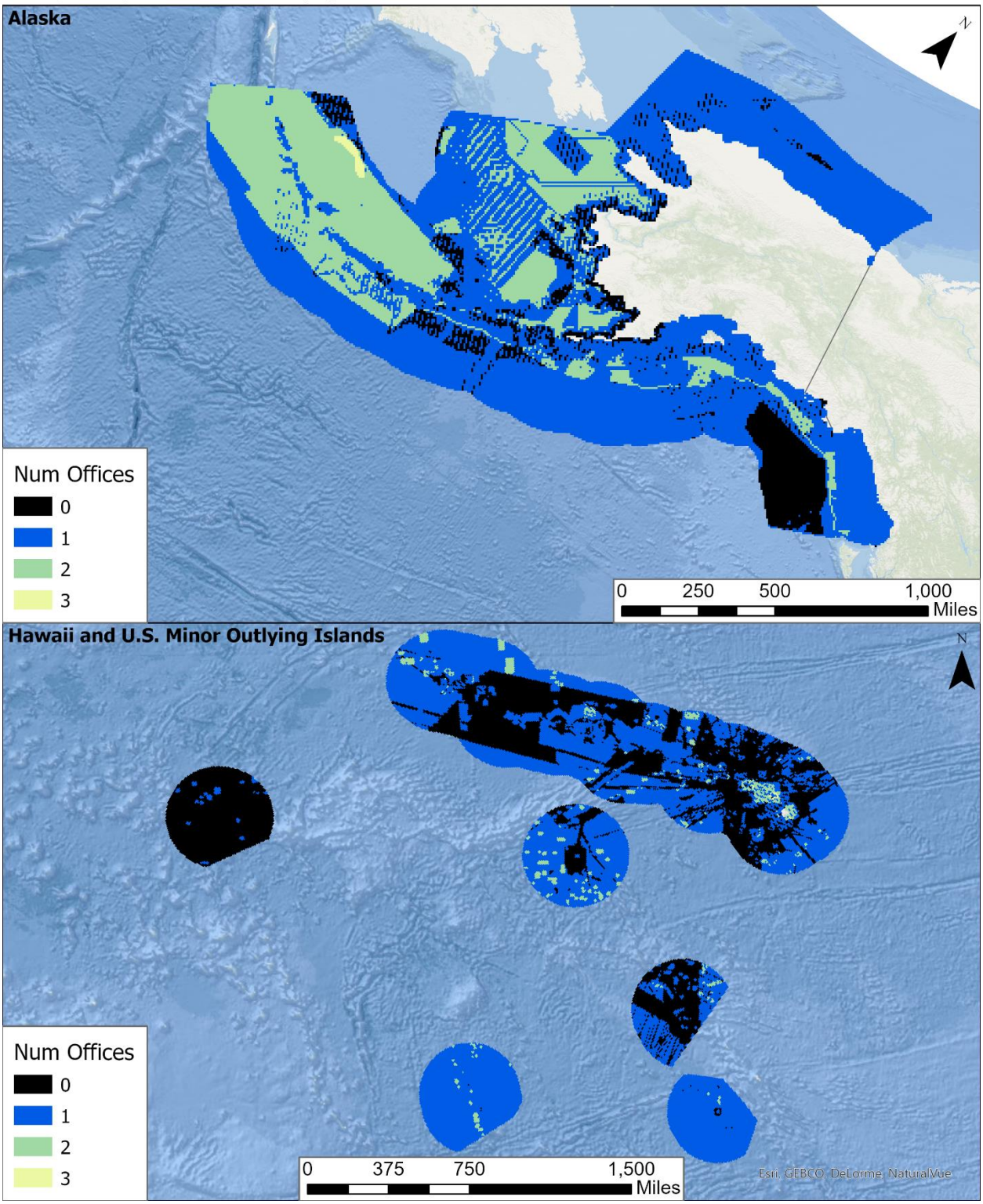
Backscatter Intensity

Continental U.S., Guam and Northern Mariana Islands, American Samoa, and U.S. Caribbean



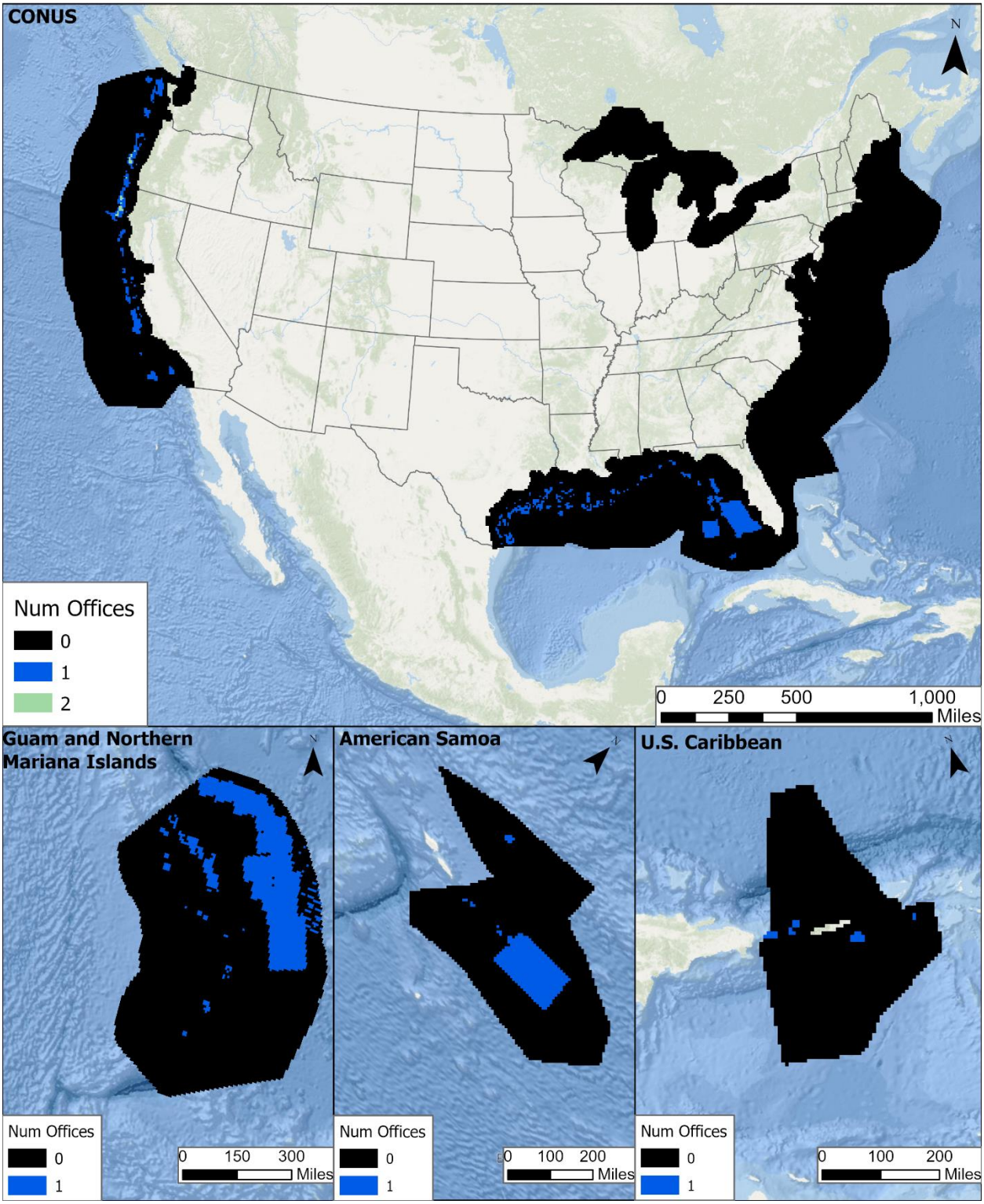
Backscatter Intensity

Alaska, Hawaii, and U.S. Minor Outlying Islands



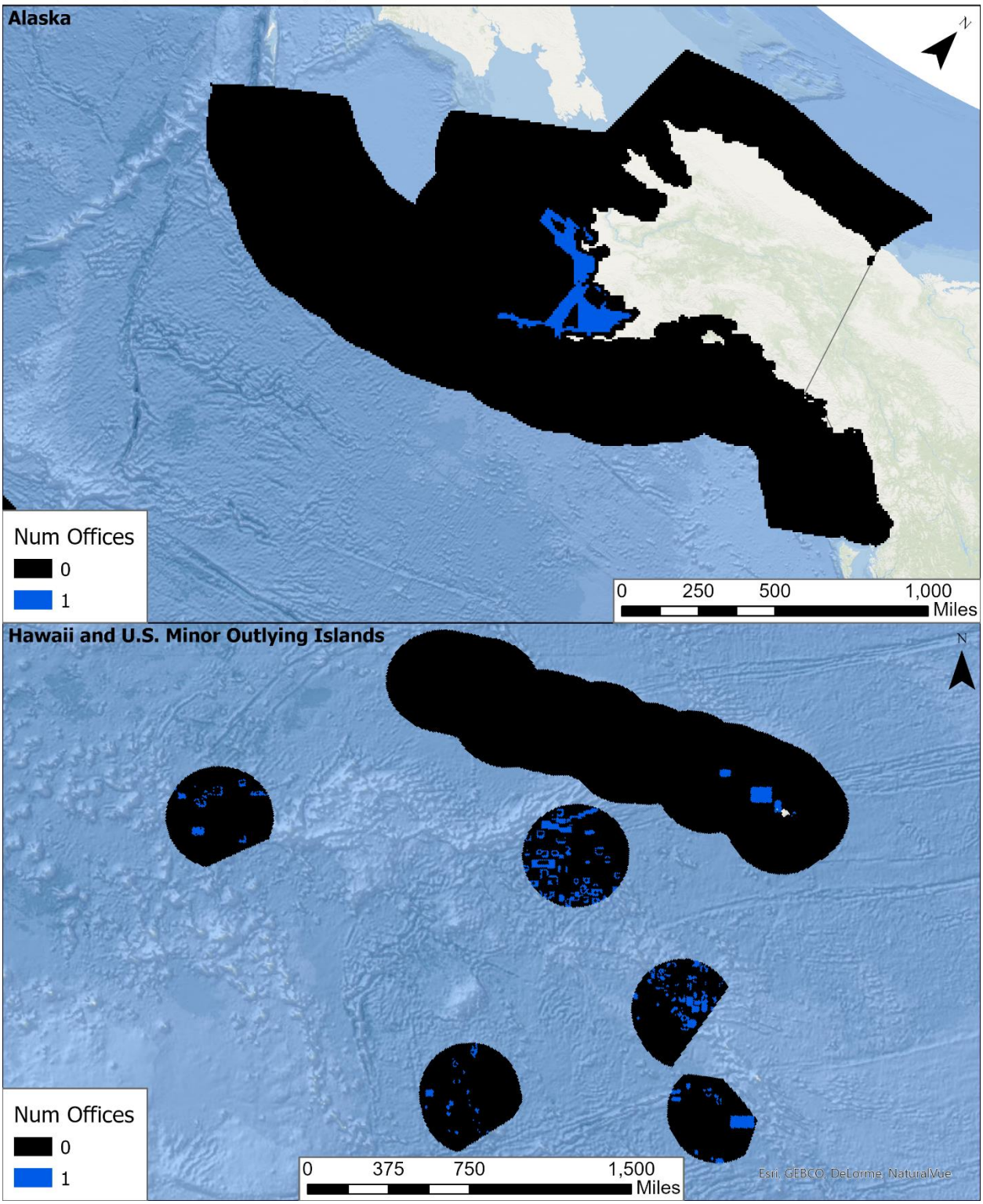
Biological, Chemical, Physical Samples

Continental U.S., Guam and Northern Mariana Islands, American Samoa, and U.S. Caribbean



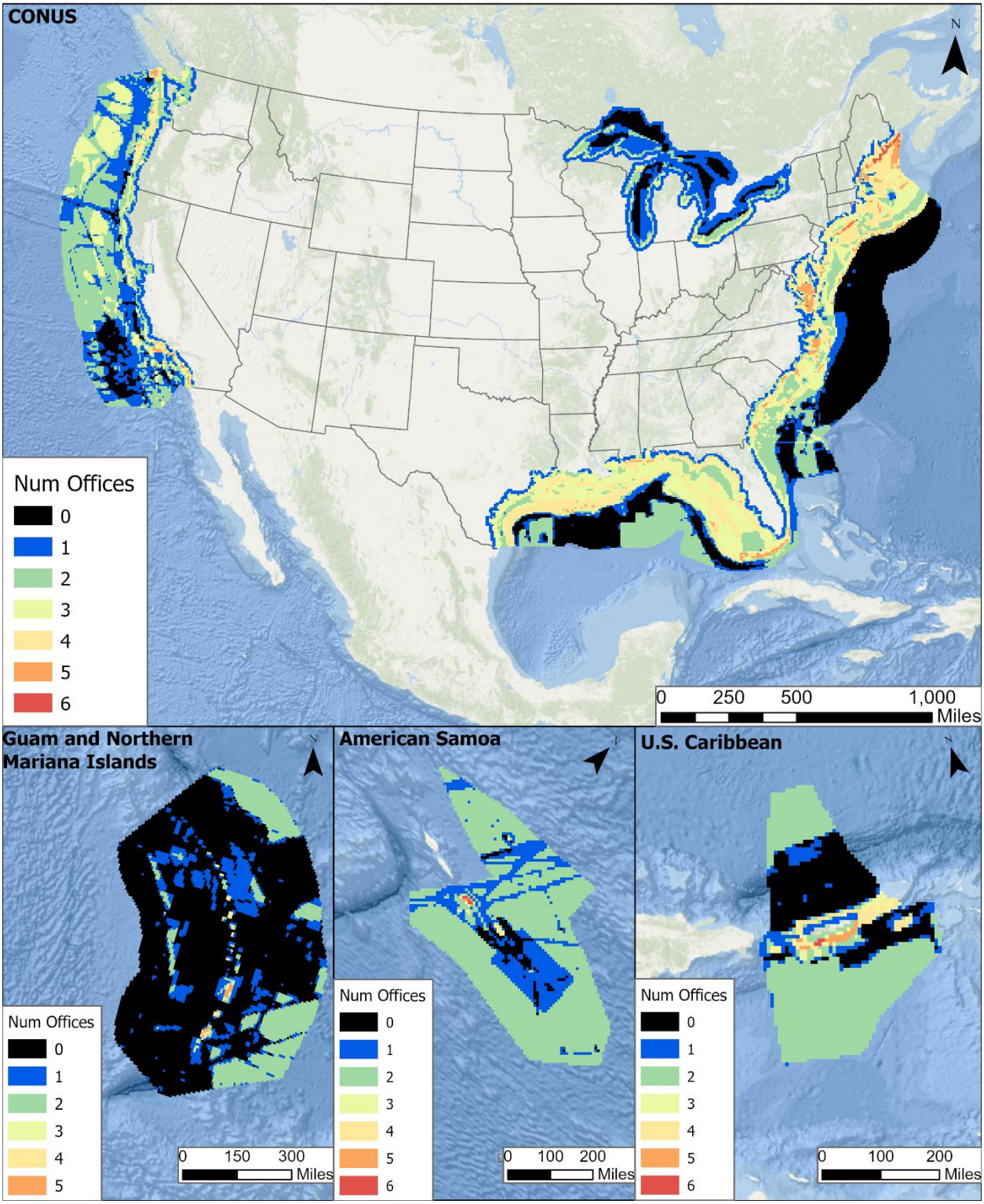
Biological, Chemical, Physical Samples

Alaska, Hawaii, and U.S. Minor Outlying Islands



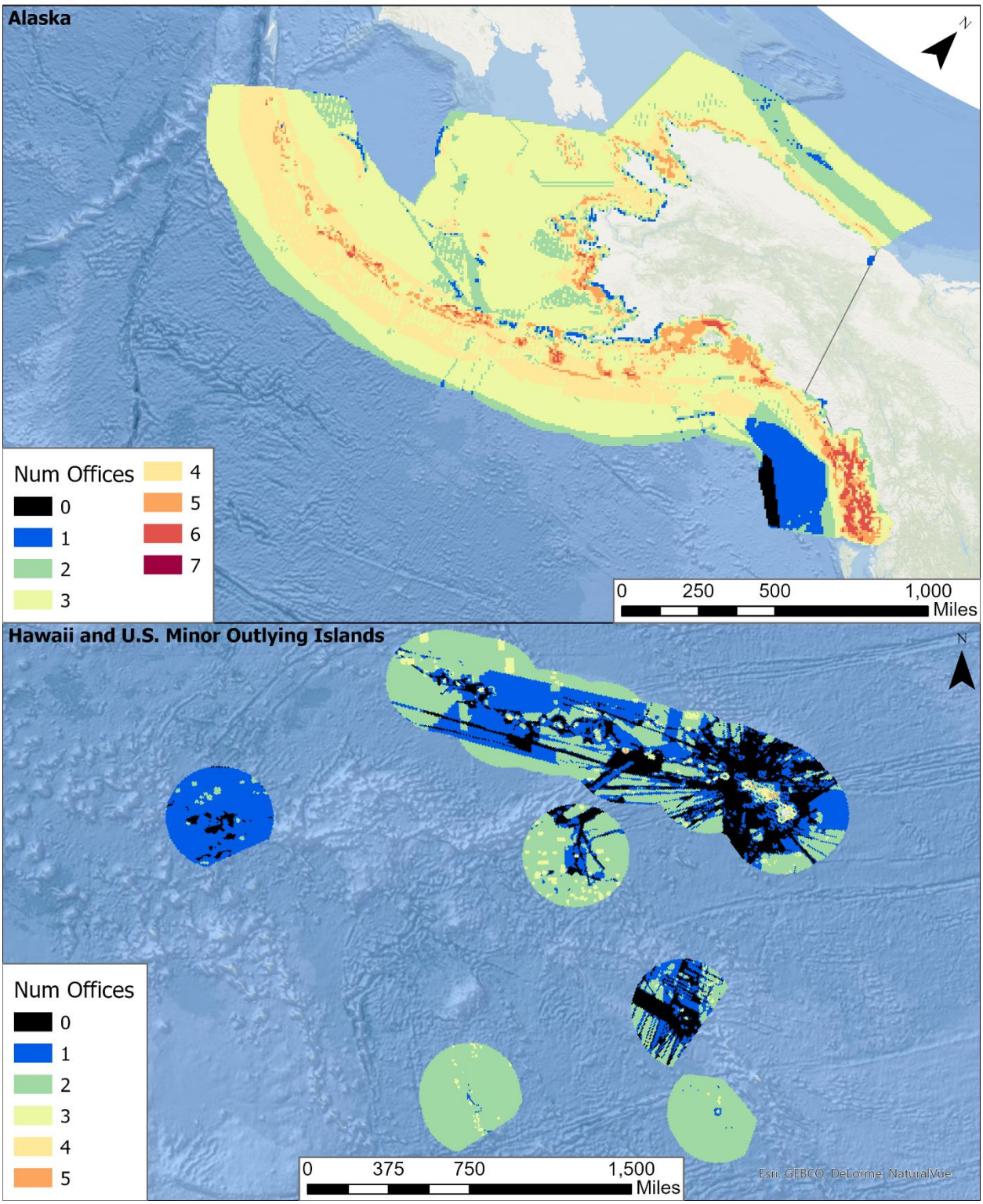
Elevation

Continental U.S., Guam and Northern Mariana Islands, American Samoa, and U.S. Caribbean



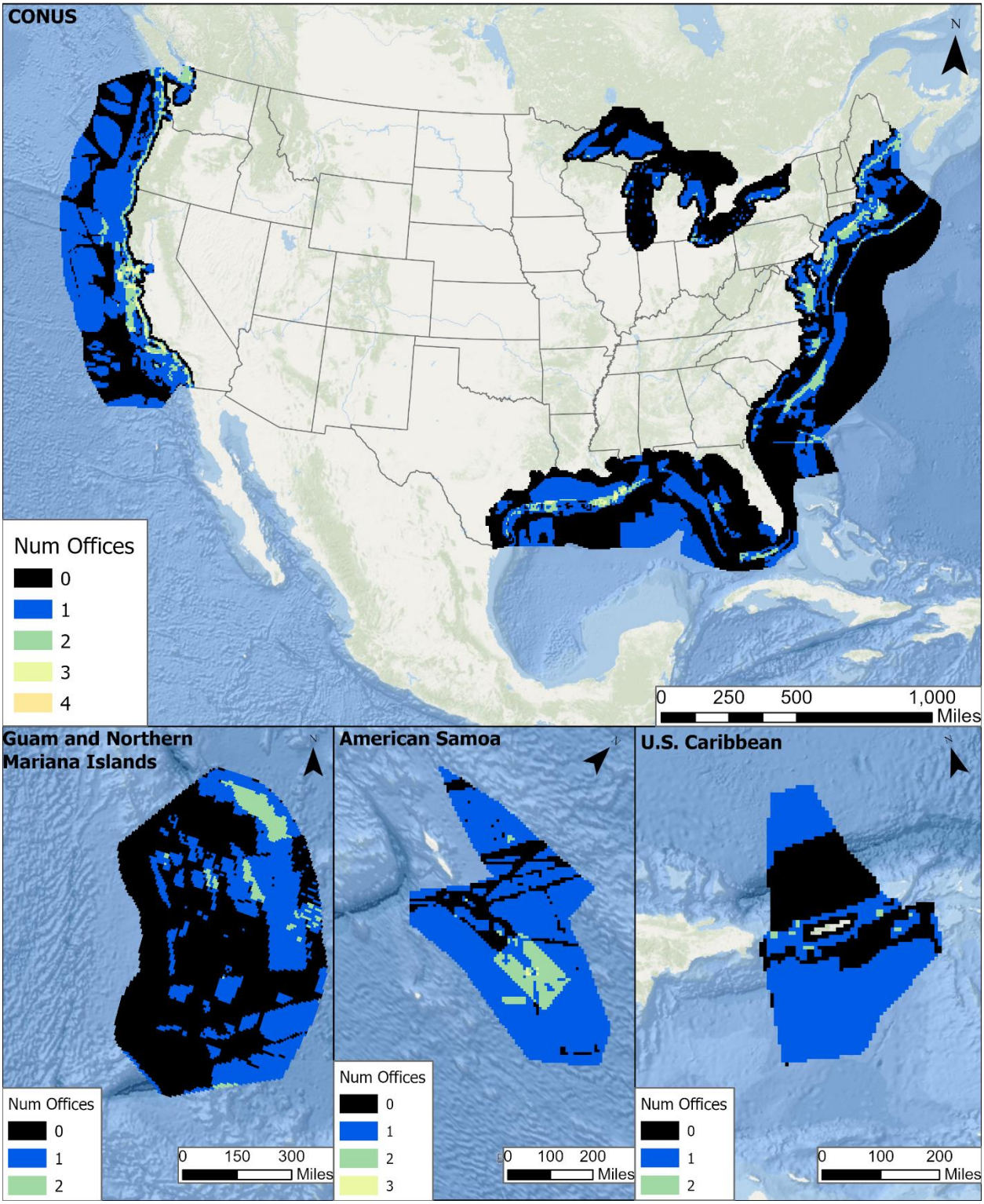
Elevation

Alaska, Hawaii, and U.S. Minor Outlying Islands



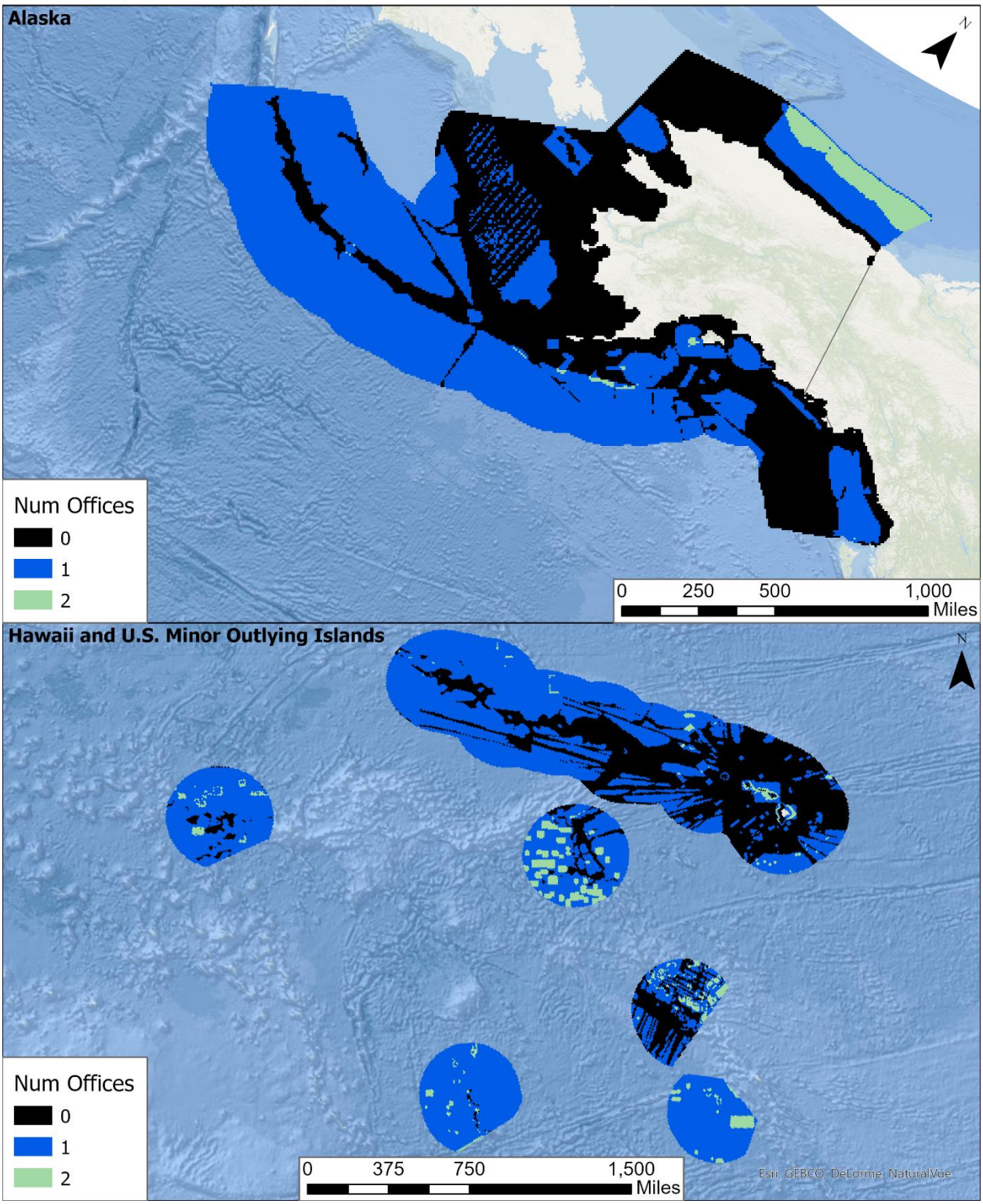
Habitat Map Characterization

Continental U.S., Guam and Northern Mariana Islands, American Samoa, and U.S. Caribbean



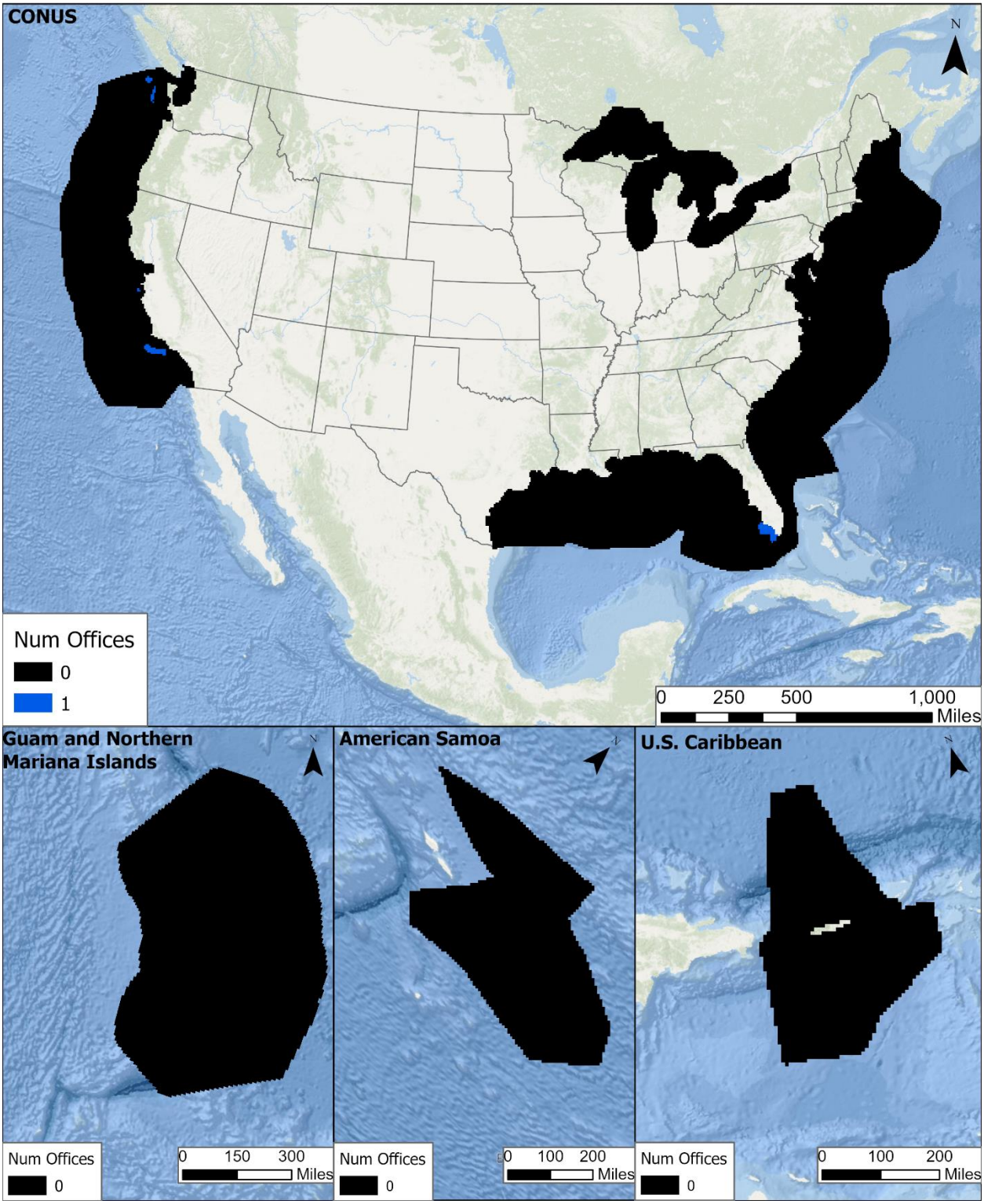
Habitat Map Characterization

Alaska, Hawaii, and U.S. Minor Outlying Islands



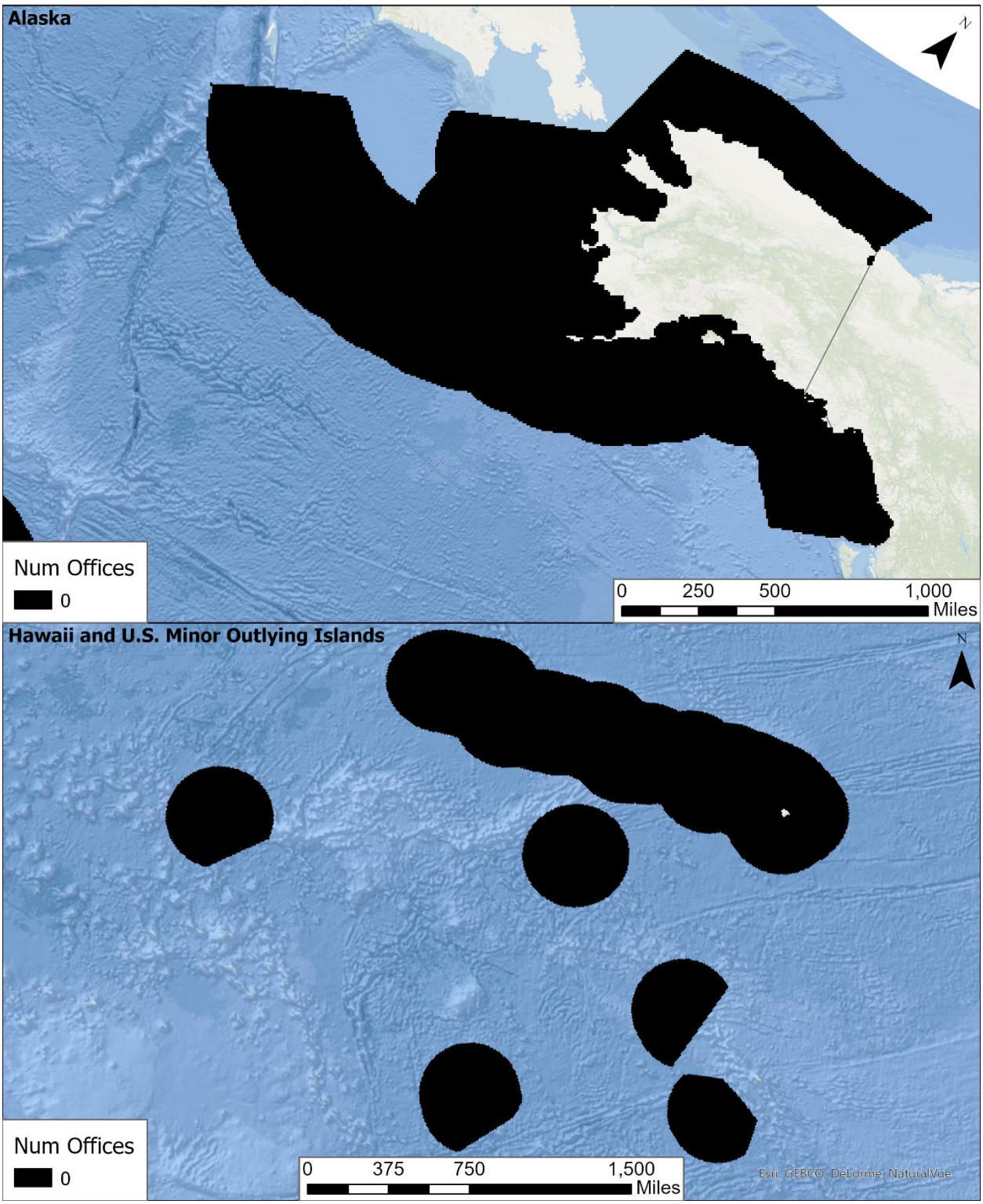
Human Use Statistics

Continental U.S., Guam and Northern Mariana Islands, American Samoa, and U.S. Caribbean



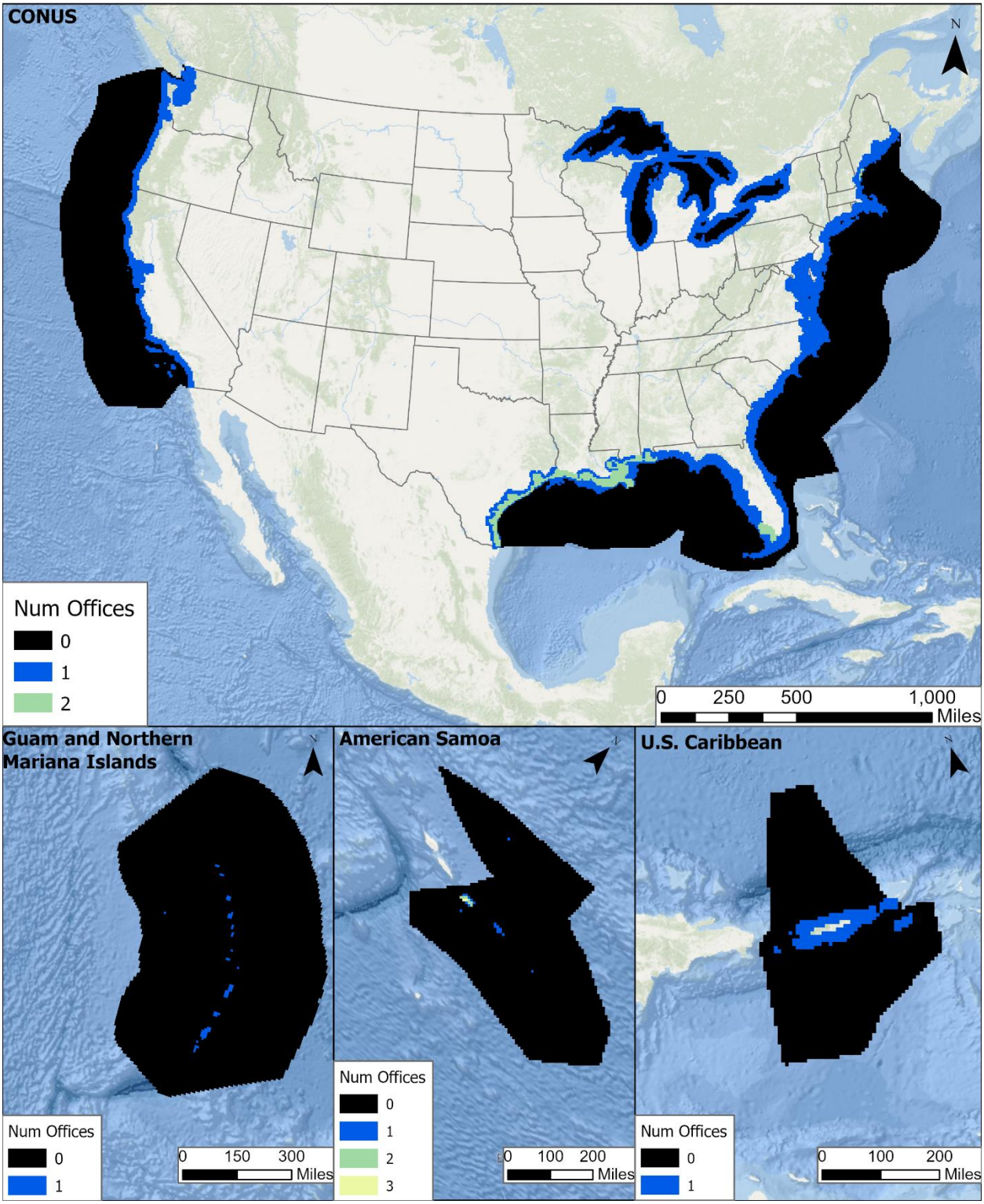
Human Use Statistics

Alaska, Hawaii, and U.S. Minor Outlying Islands



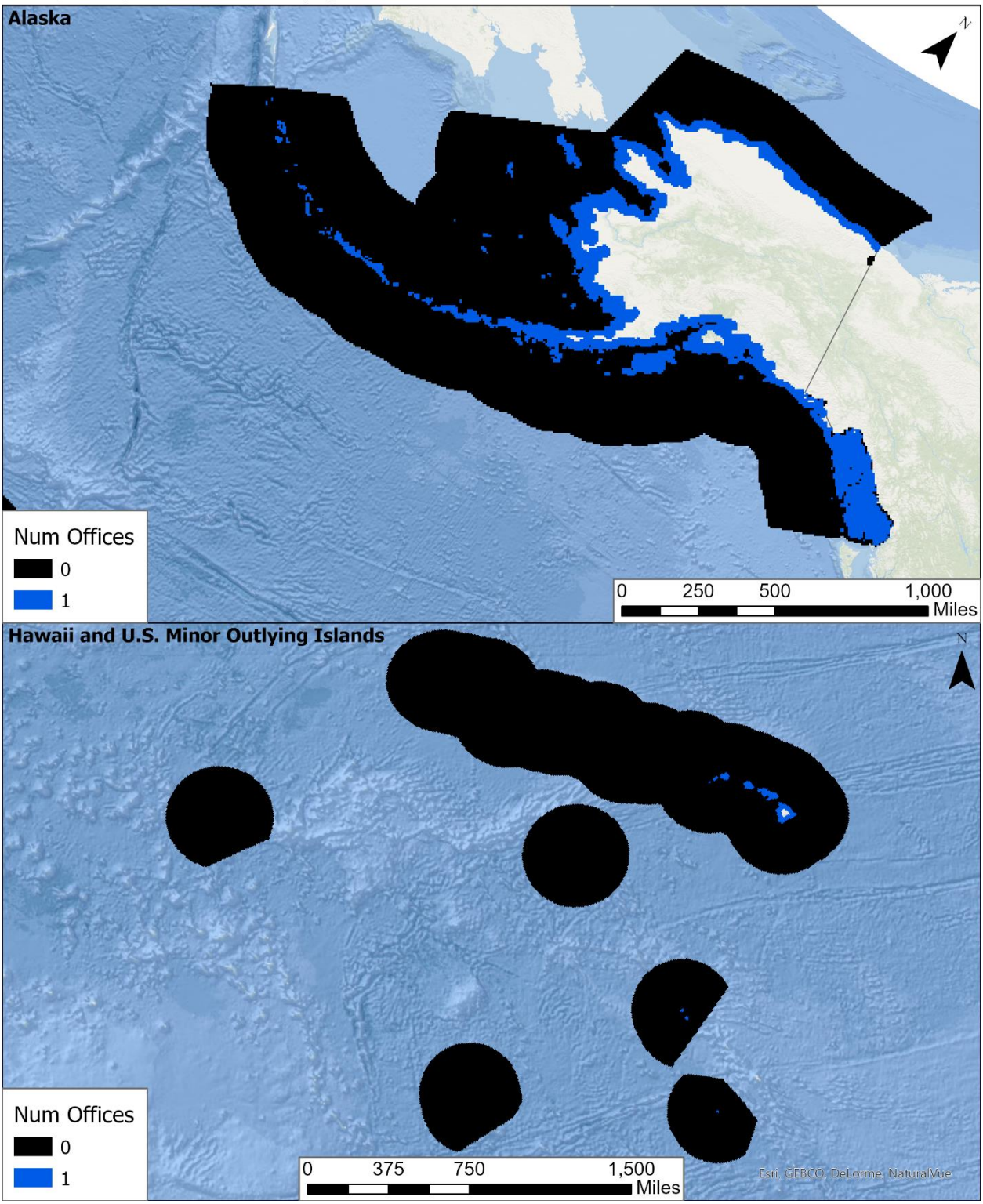
Land Use Impacts

Continental U.S., Guam and Northern Mariana Islands, American Samoa, and U.S. Caribbean



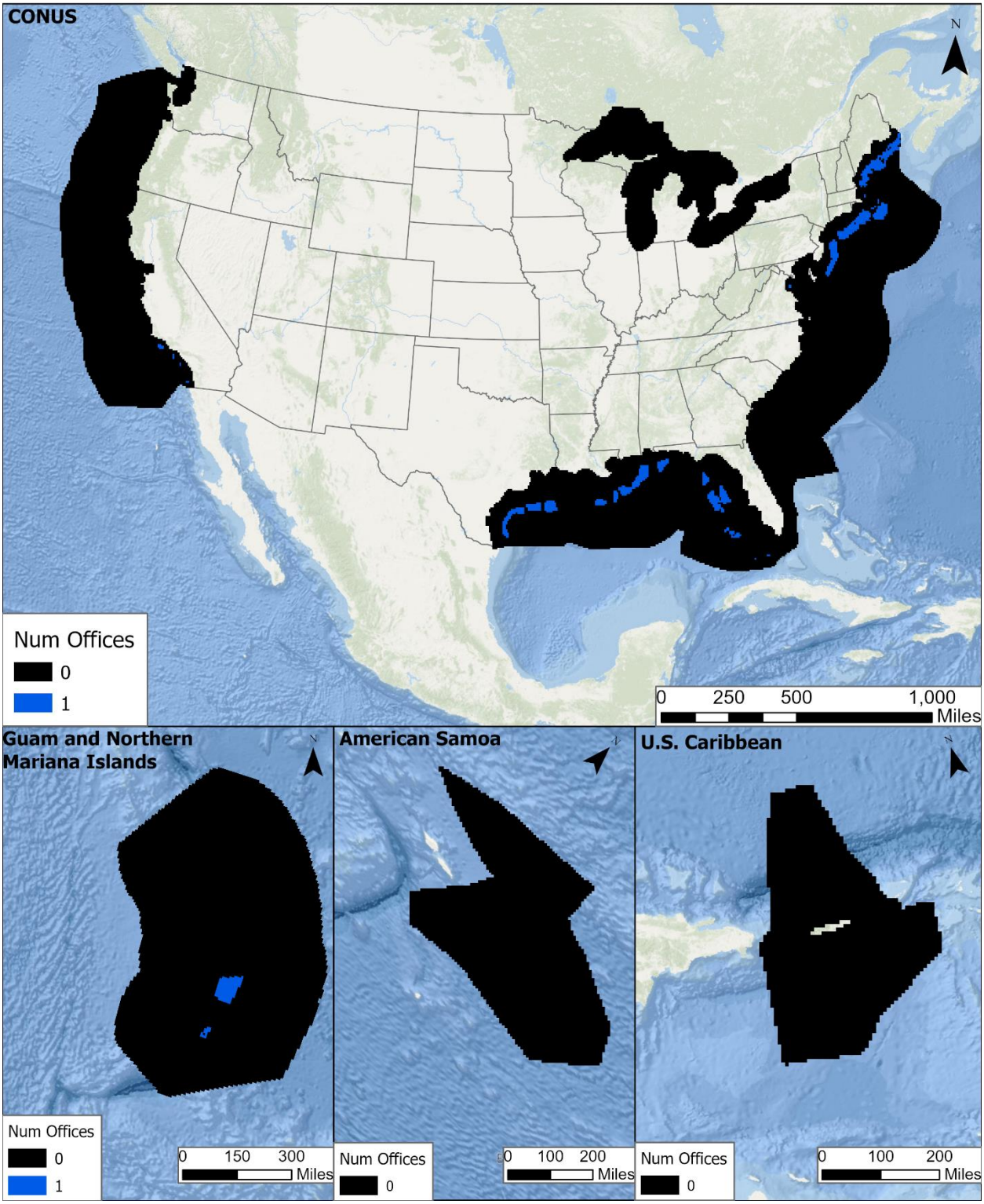
Land Use Impacts

Alaska, Hawaii, and U.S. Minor Outlying Islands



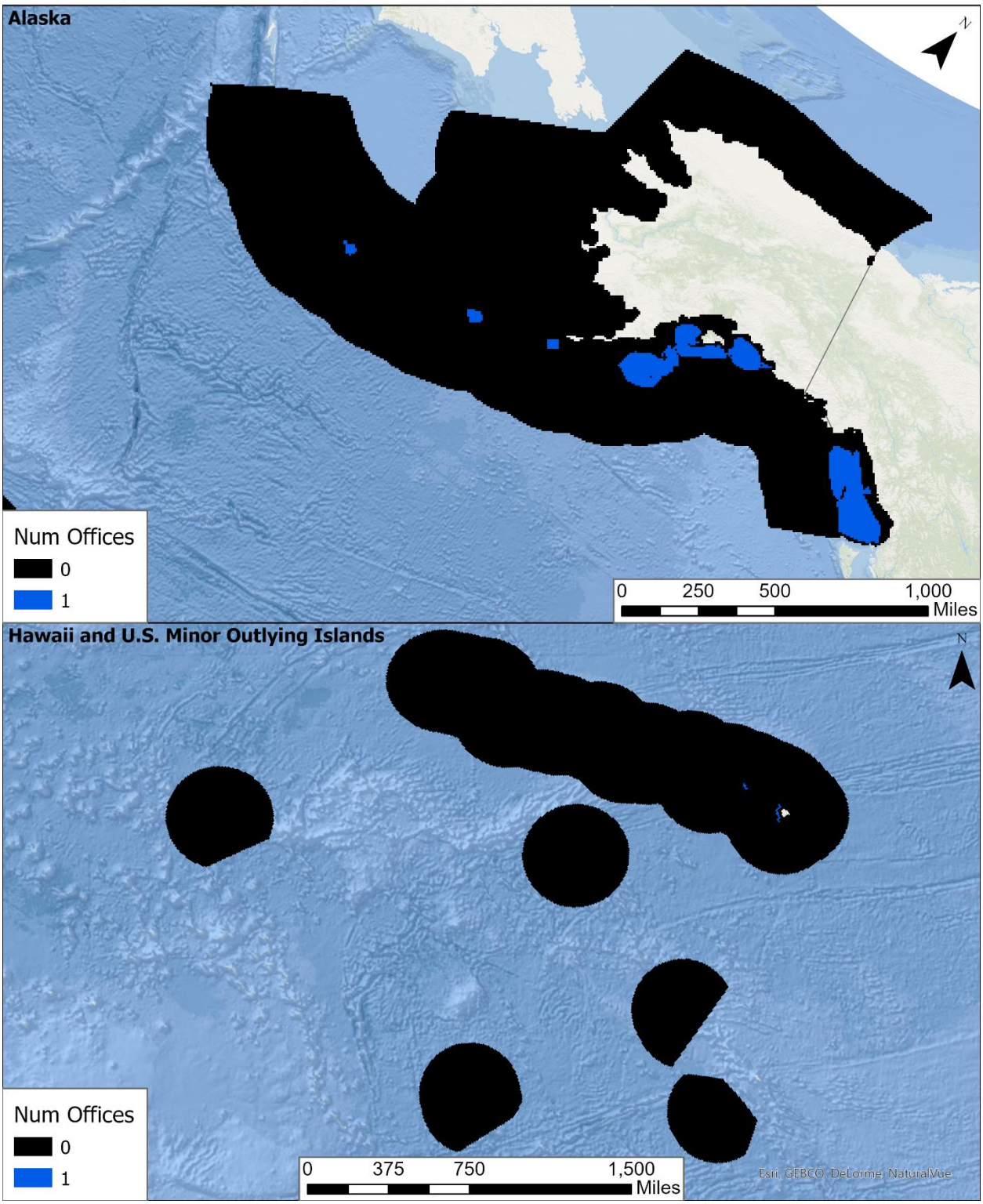
Magnetometer Surveys

Continental U.S., Guam and Northern Mariana Islands, American Samoa, and U.S. Caribbean



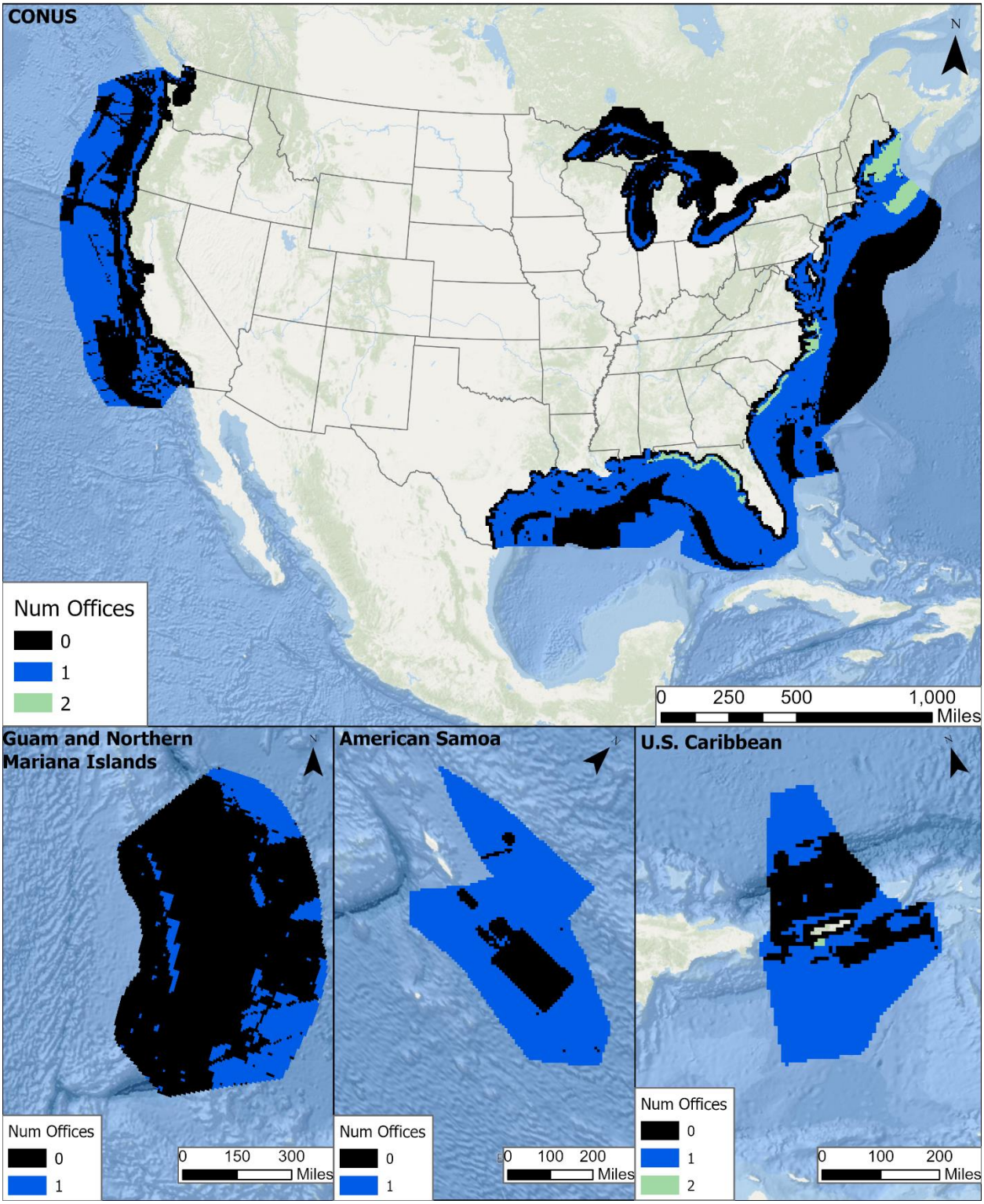
Magnetometer Surveys

Alaska, Hawaii, and U.S. Minor Outlying Islands



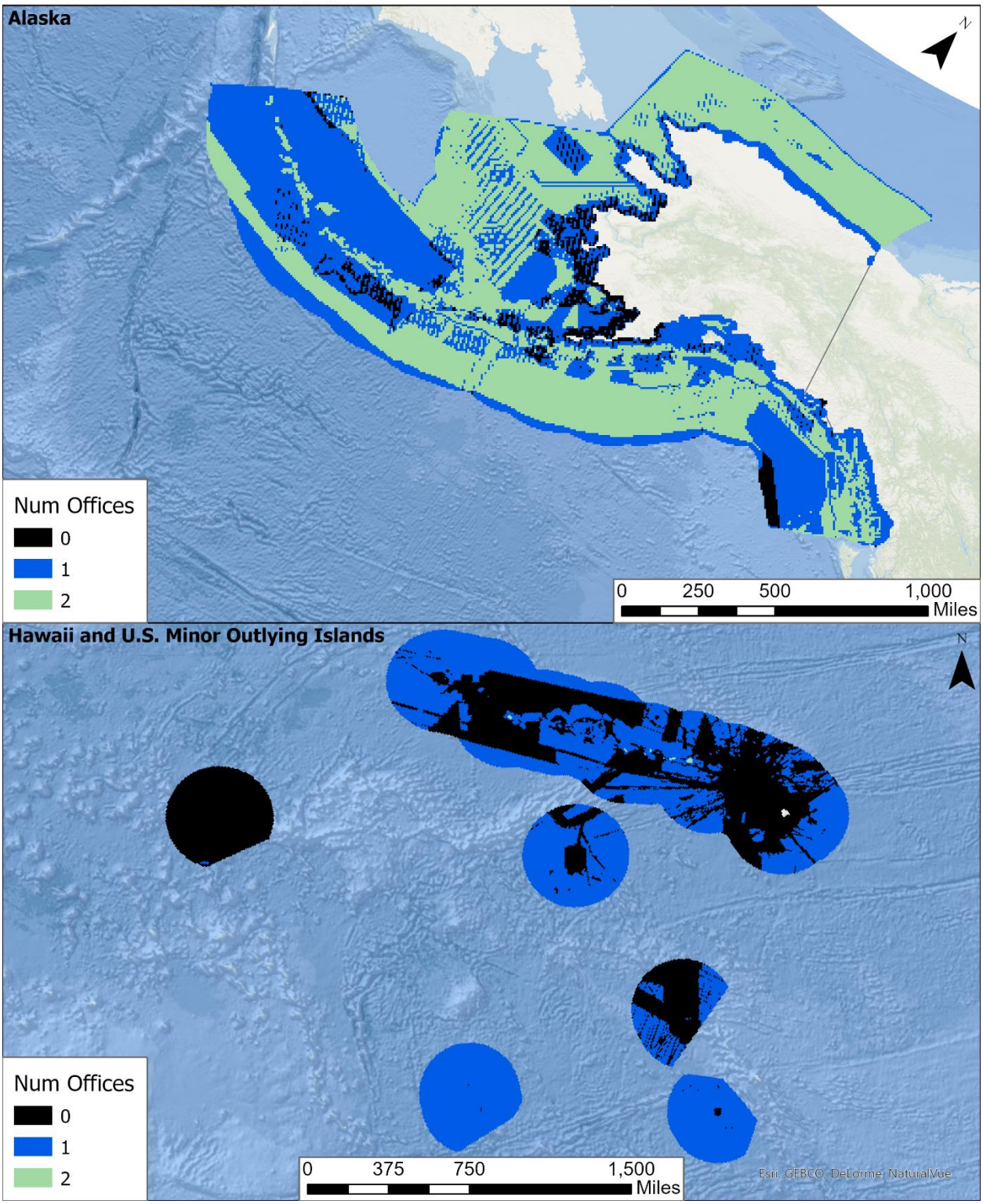
Nautical Map and Chart Products

Continental U.S., Guam and Northern Mariana Islands, American Samoa, and U.S. Caribbean



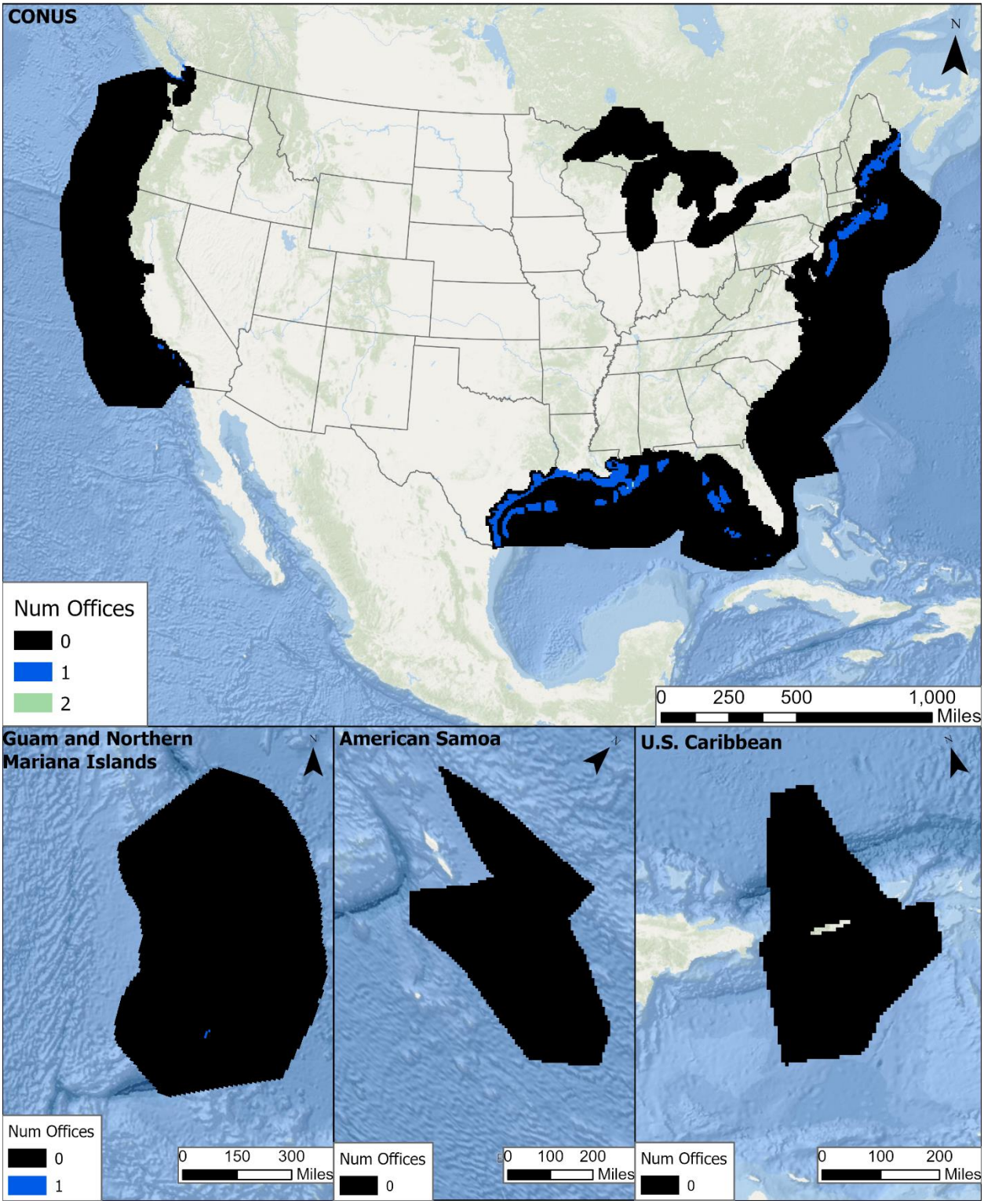
Nautical Map and Chart Products

Alaska, Hawaii, and U.S. Minor Outlying Islands



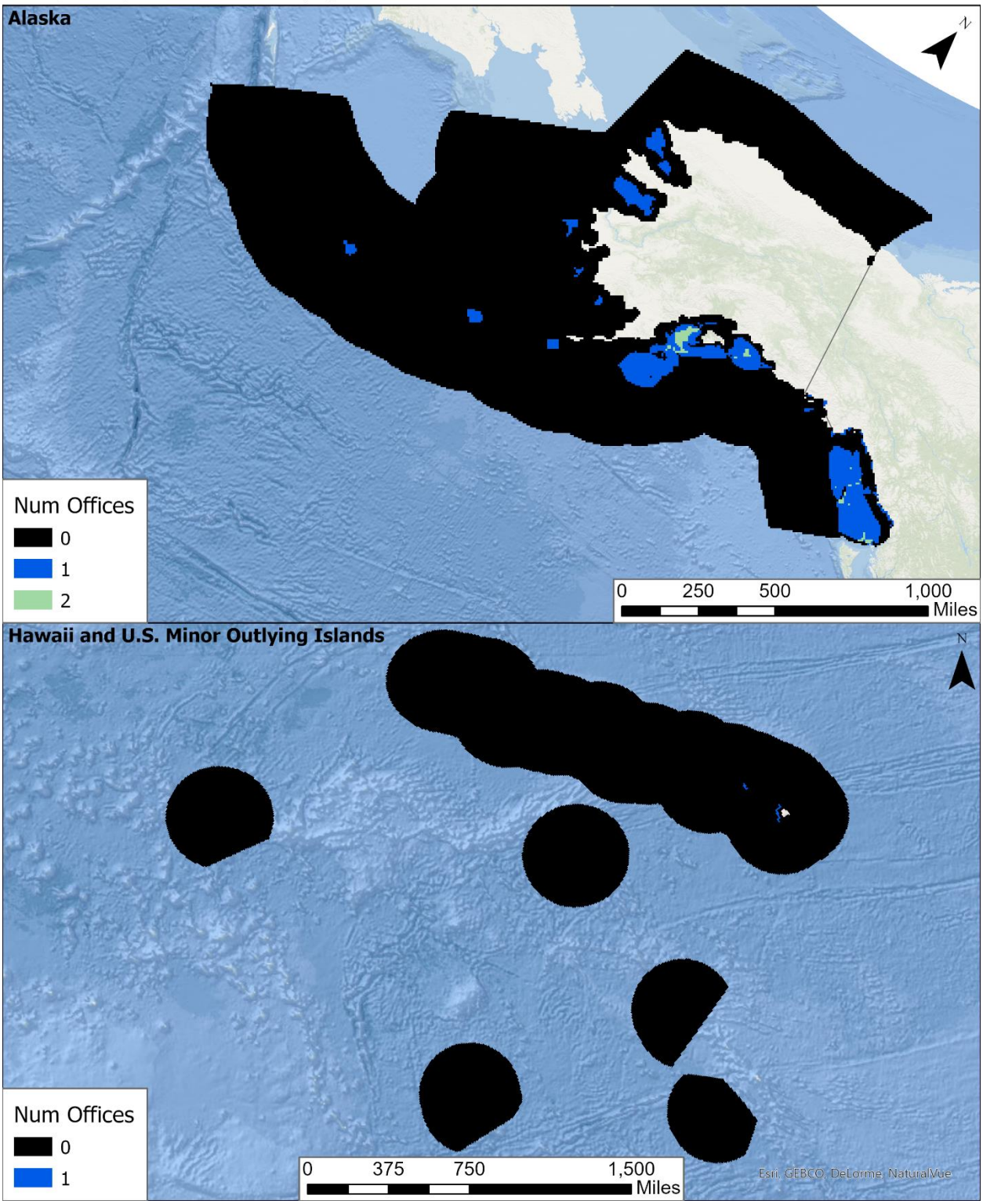
Ocean Use Infrastructure Site Maps

Continental U.S., Guam and Northern Mariana Islands, American Samoa, and U.S. Caribbean



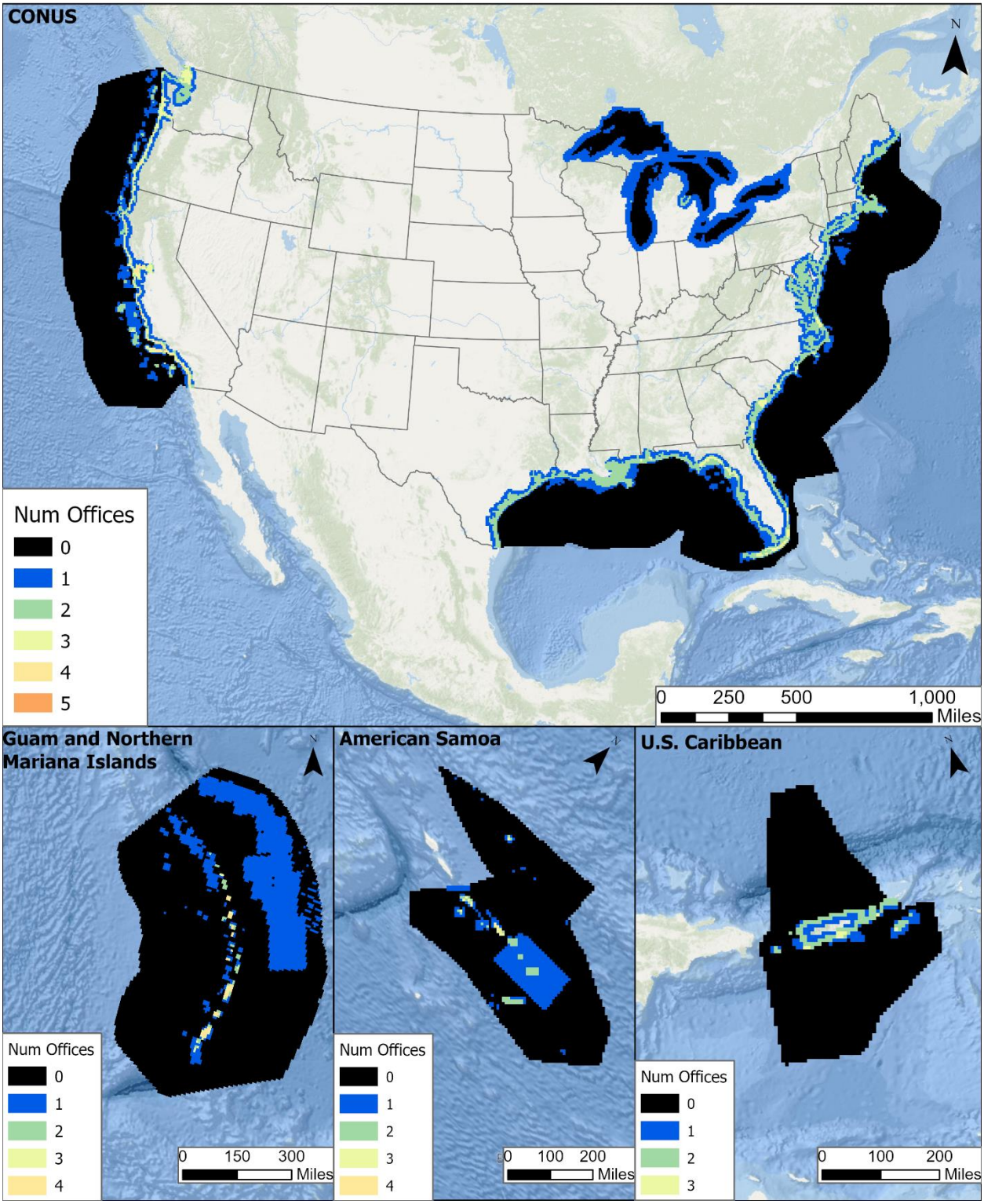
Ocean Use Infrastructure Site Maps

Alaska, Hawaii, and U.S. Minor Outlying Islands



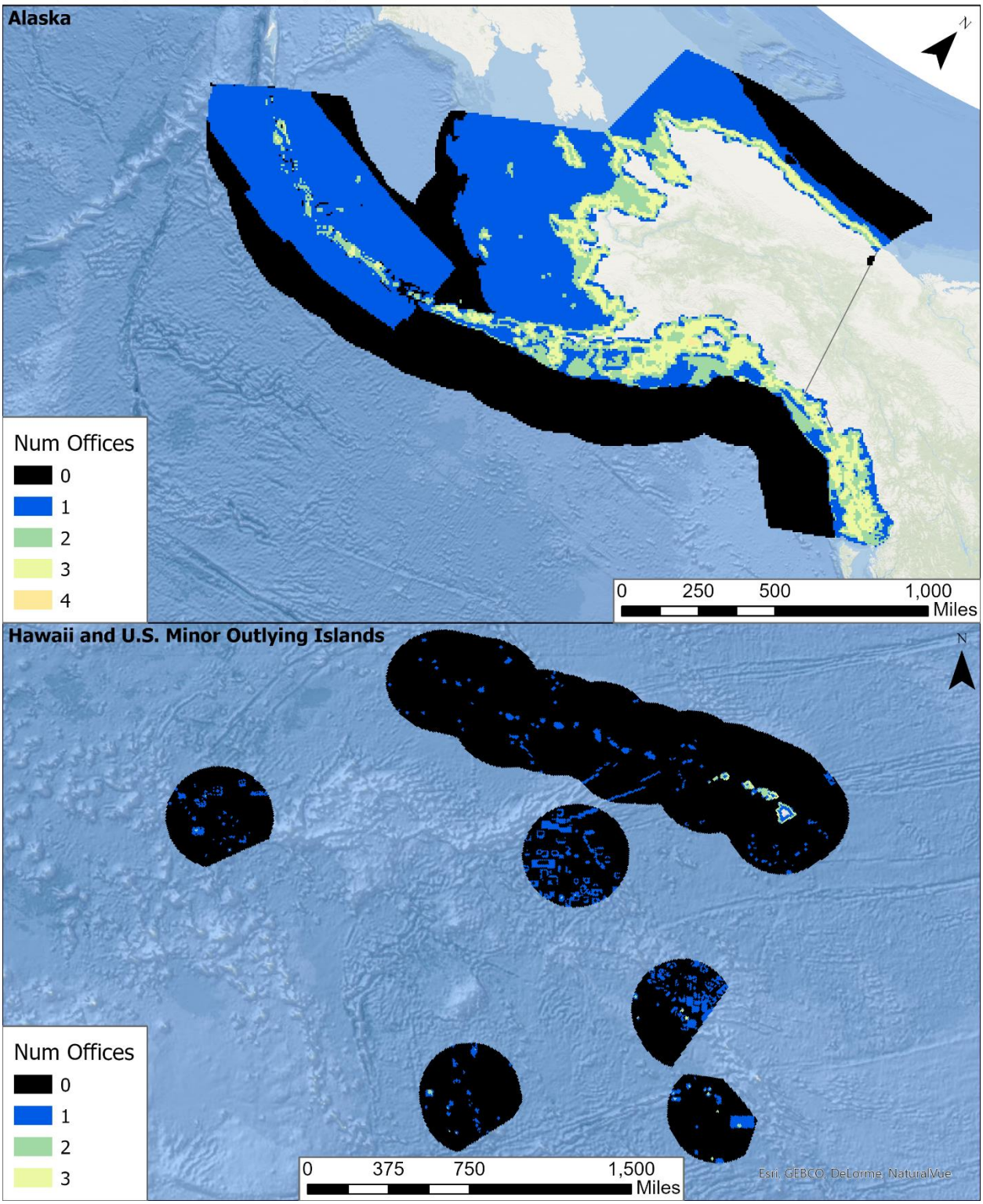
Photographs, Videos, Imagery

Continental U.S., Guam and Northern Mariana Islands, American Samoa, and U.S. Caribbean



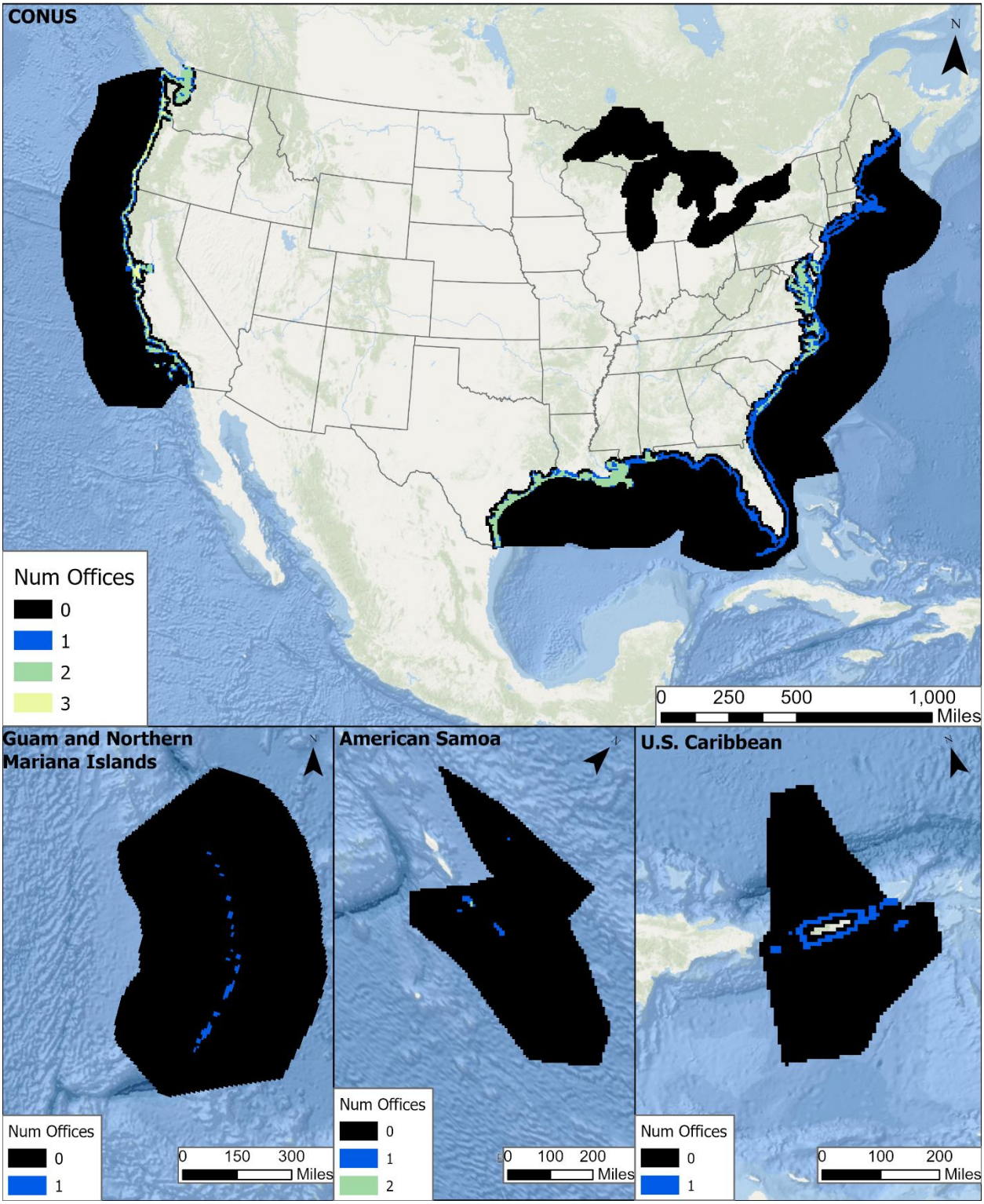
Photographs, Videos, Imagery

Alaska, Hawaii, and U.S. Minor Outlying Islands



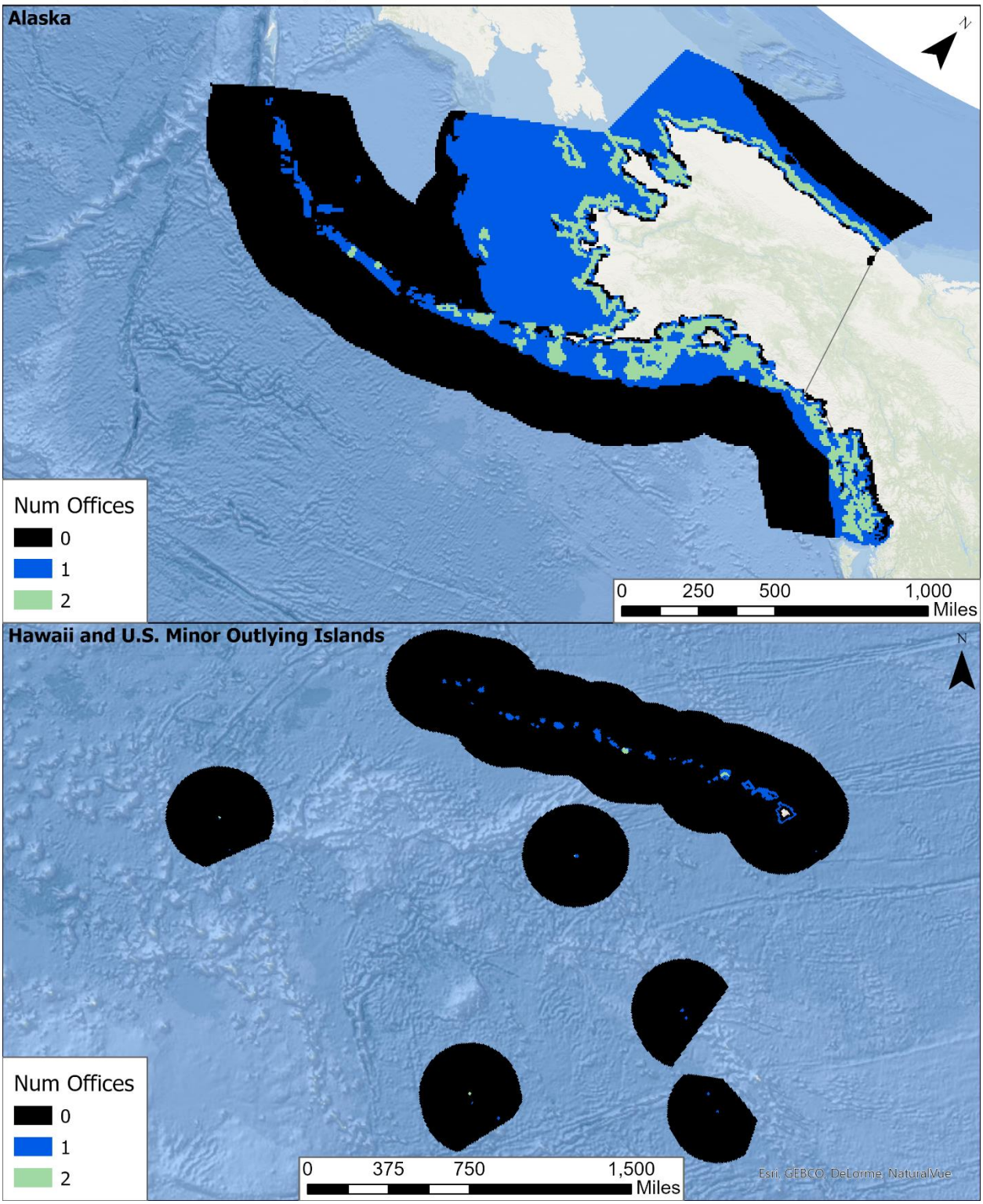
Shoreline Characterization

Continental U.S., Guam and Northern Mariana Islands, American Samoa, and U.S. Caribbean



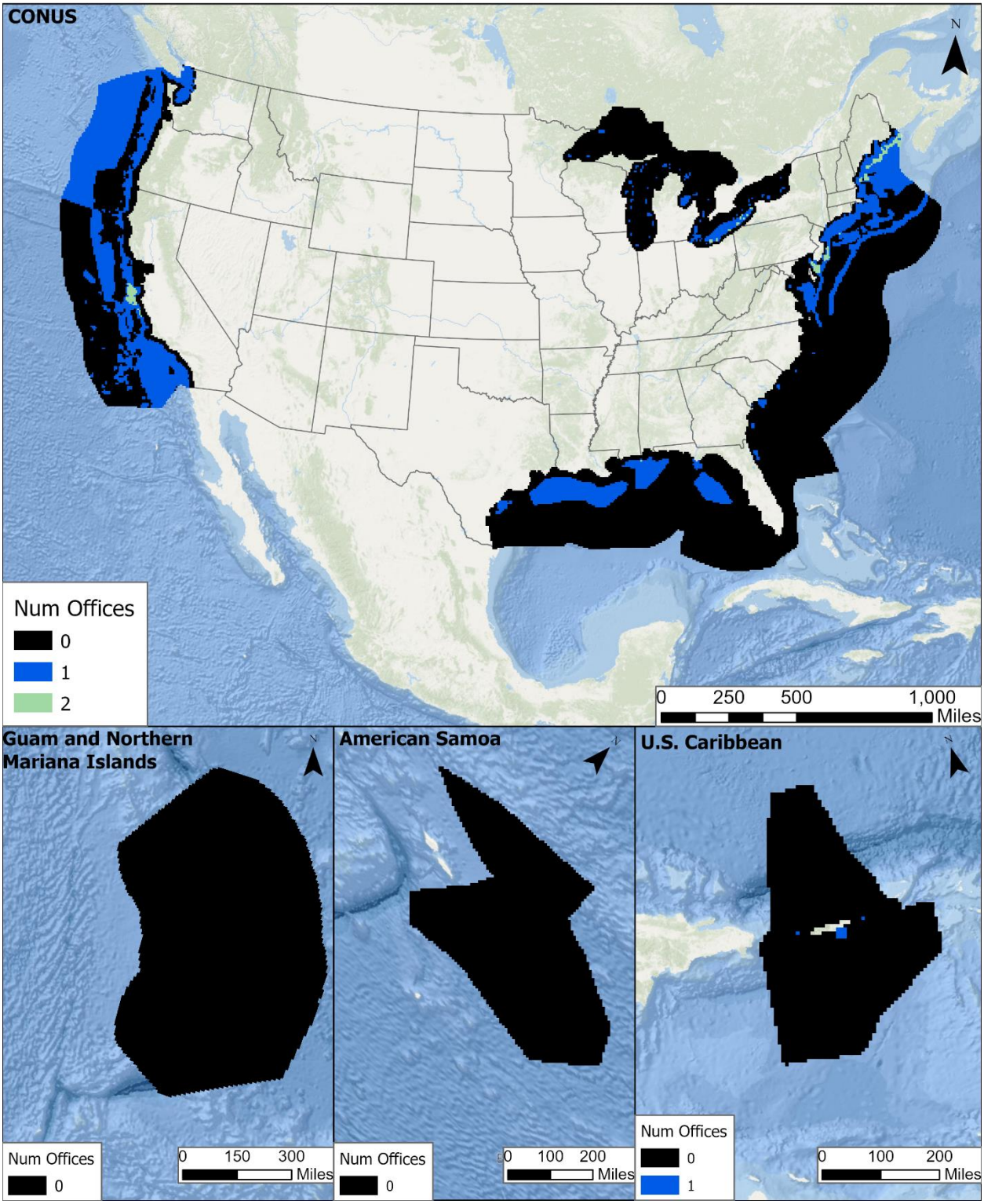
Shoreline Characterization

Alaska, Hawaii, and U.S. Minor Outlying Islands



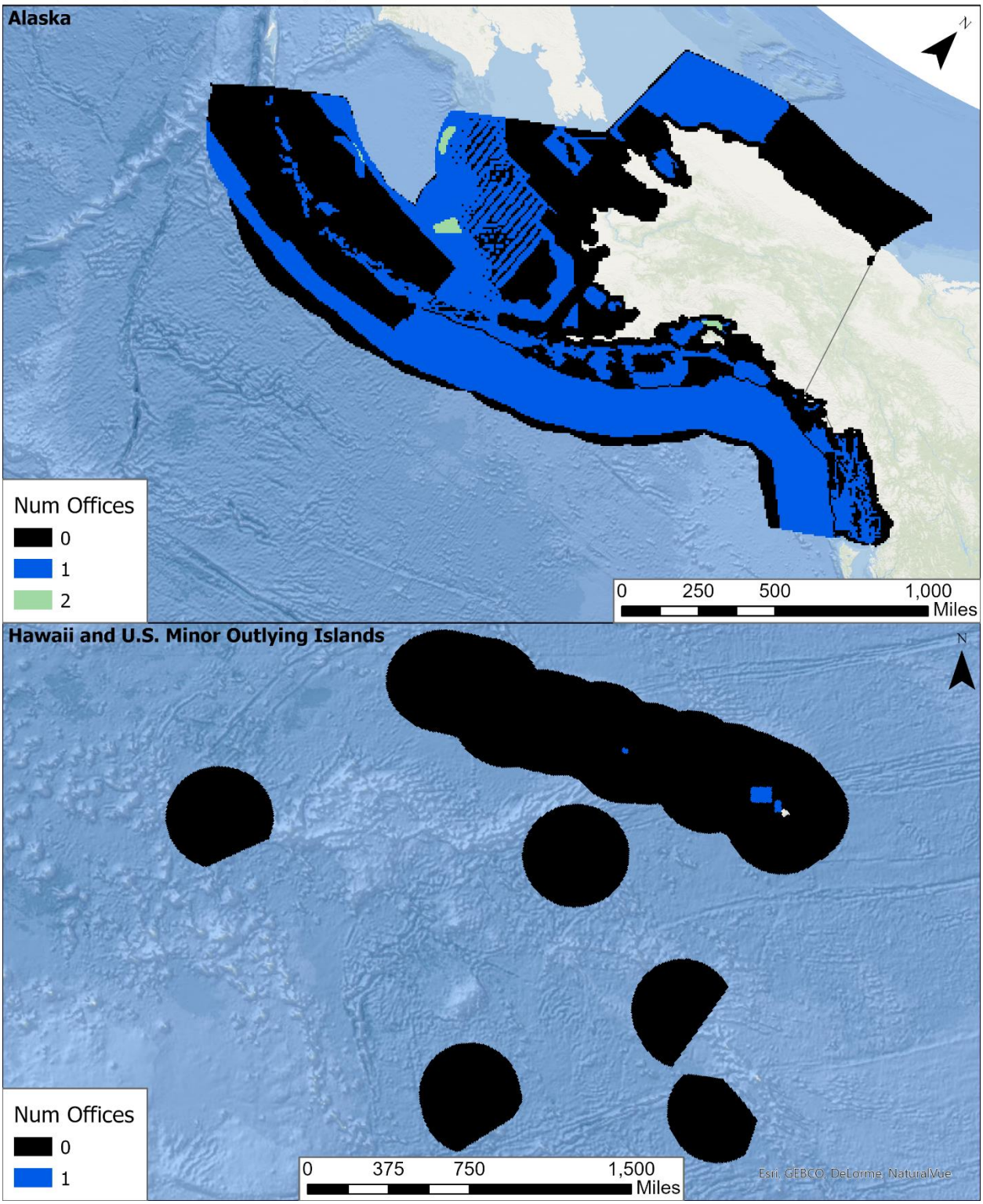
Substrate and Subbottom Characterization

Continental U.S., Guam and Northern Mariana Islands, American Samoa, and U.S. Caribbean



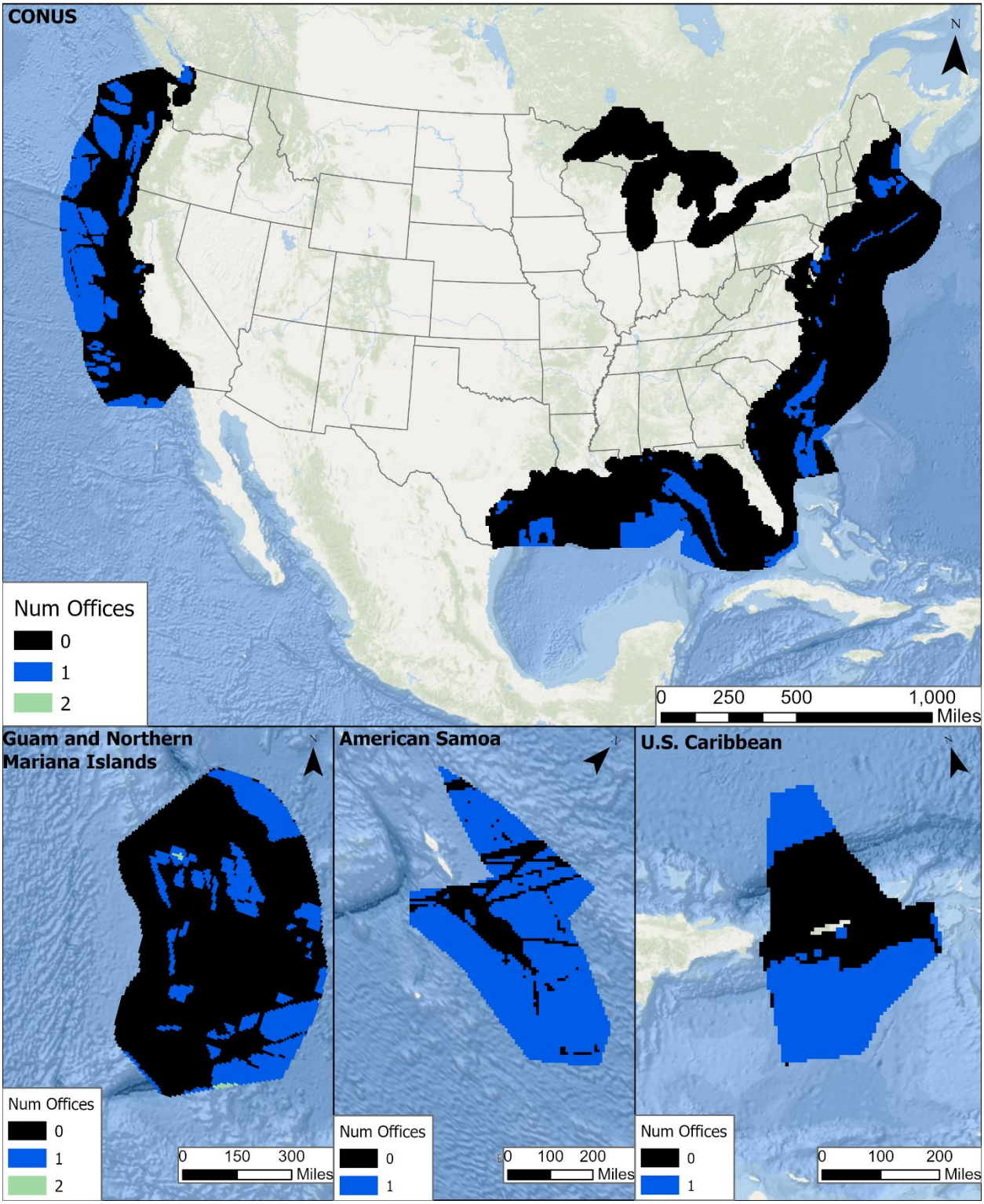
Substrate and Subbottom Characterization

Alaska, Hawaii, and U.S. Minor Outlying Islands



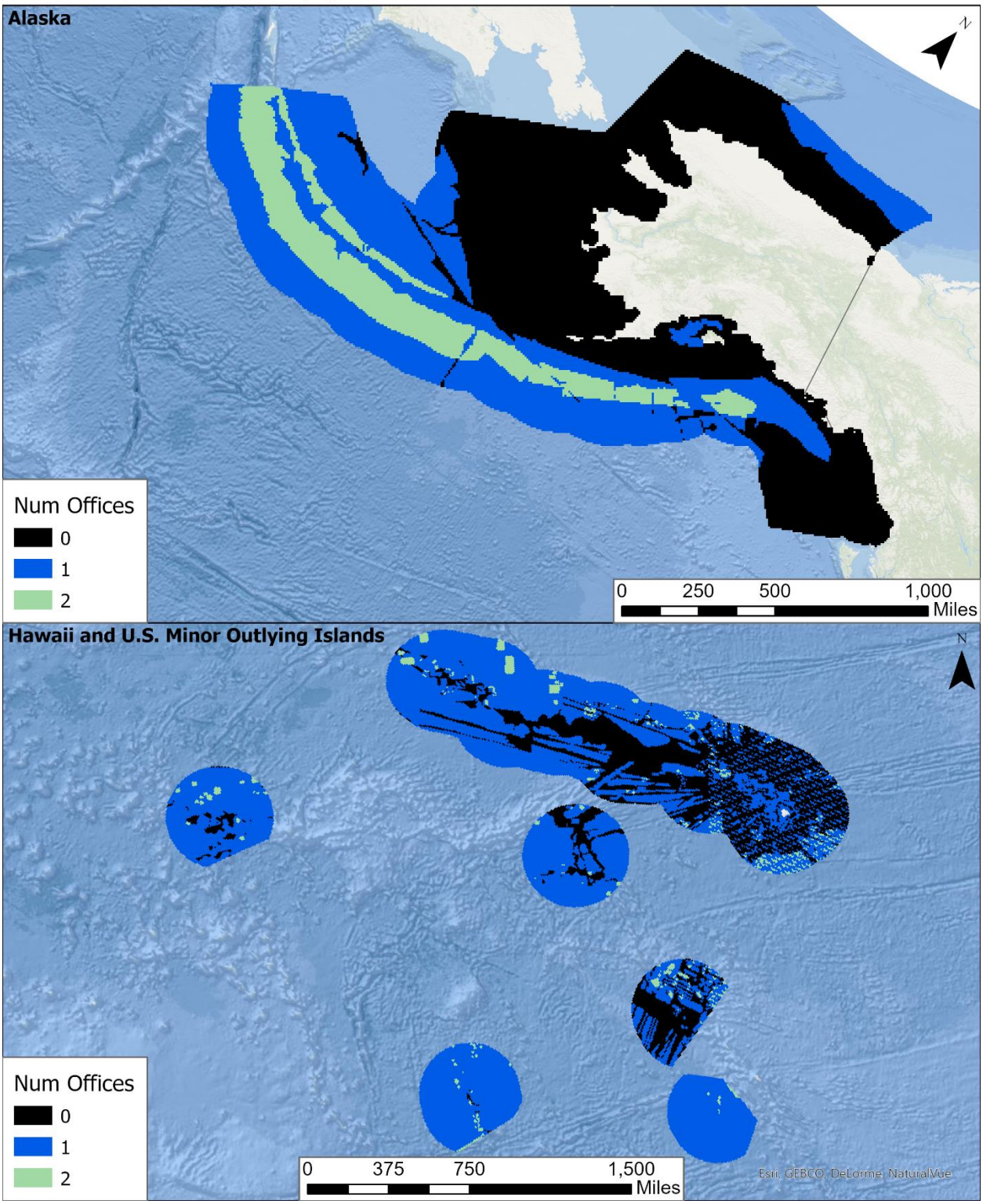
Water Column Mapping

Continental U.S., Guam and Northern Mariana Islands, American Samoa, and U.S. Caribbean



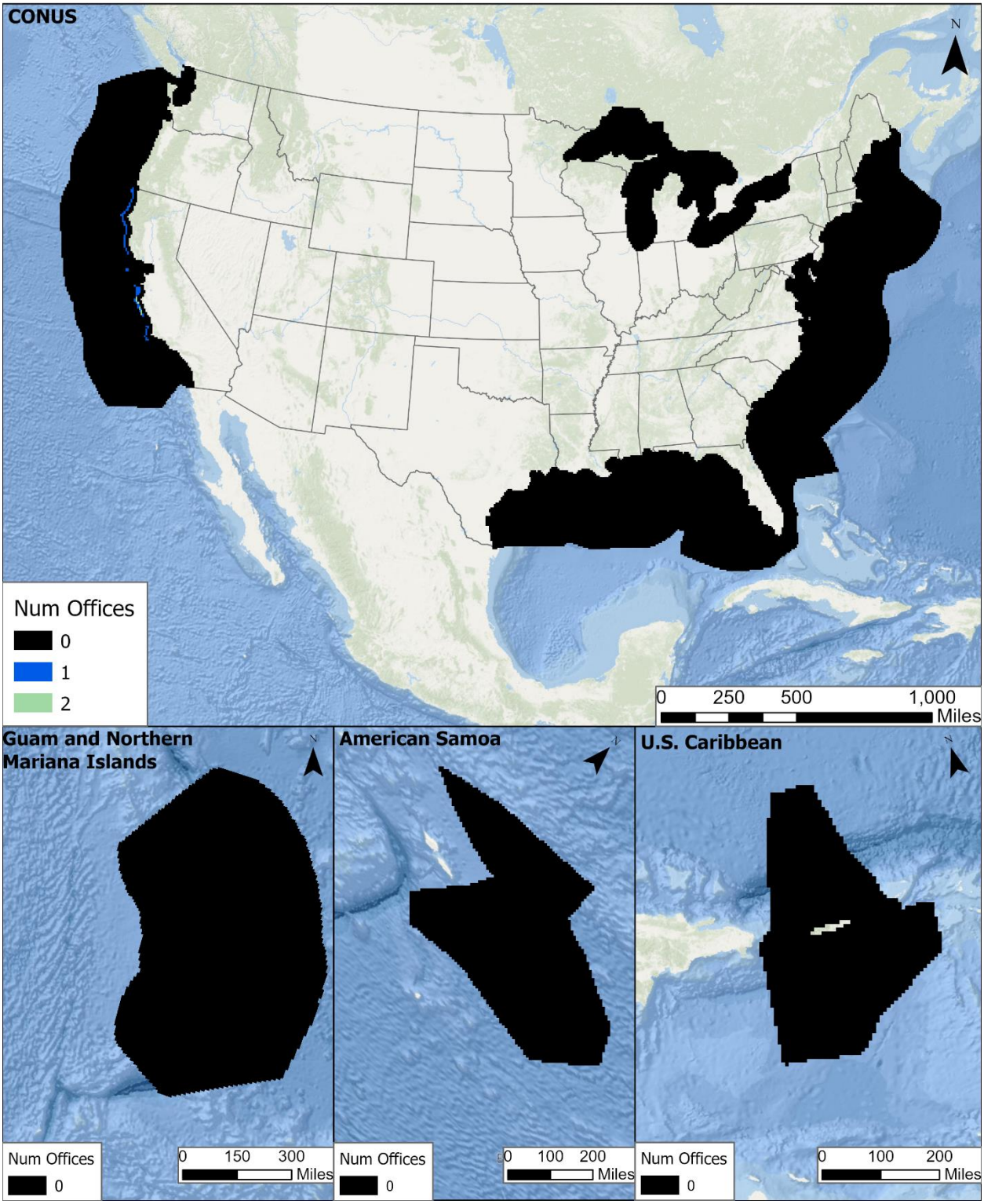
Water Column Mapping

Alaska, Hawaii, and U.S. Minor Outlying Islands



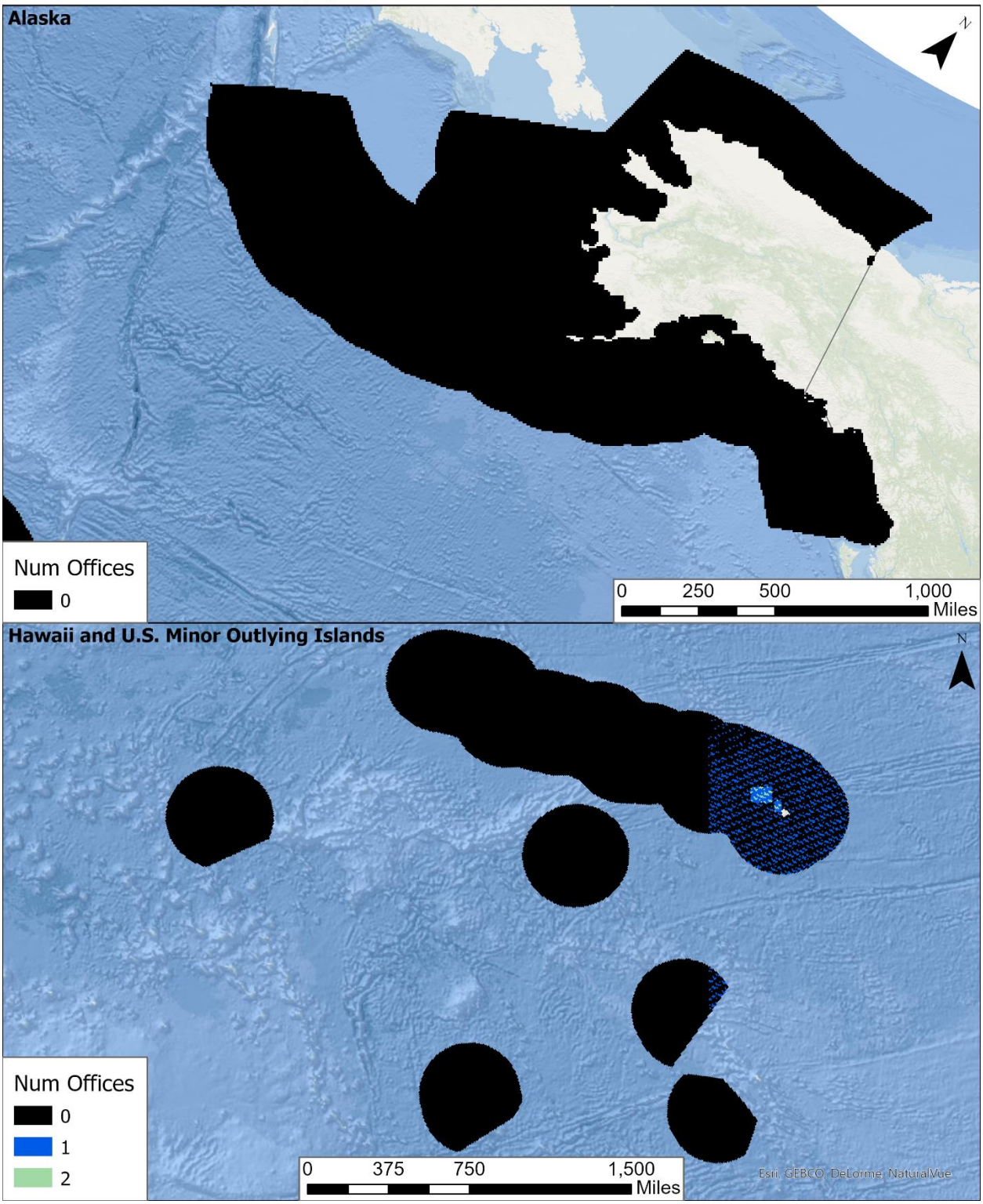
Wildlife Population Characterization

Continental U.S., Guam and Northern Mariana Islands, American Samoa, and U.S. Caribbean



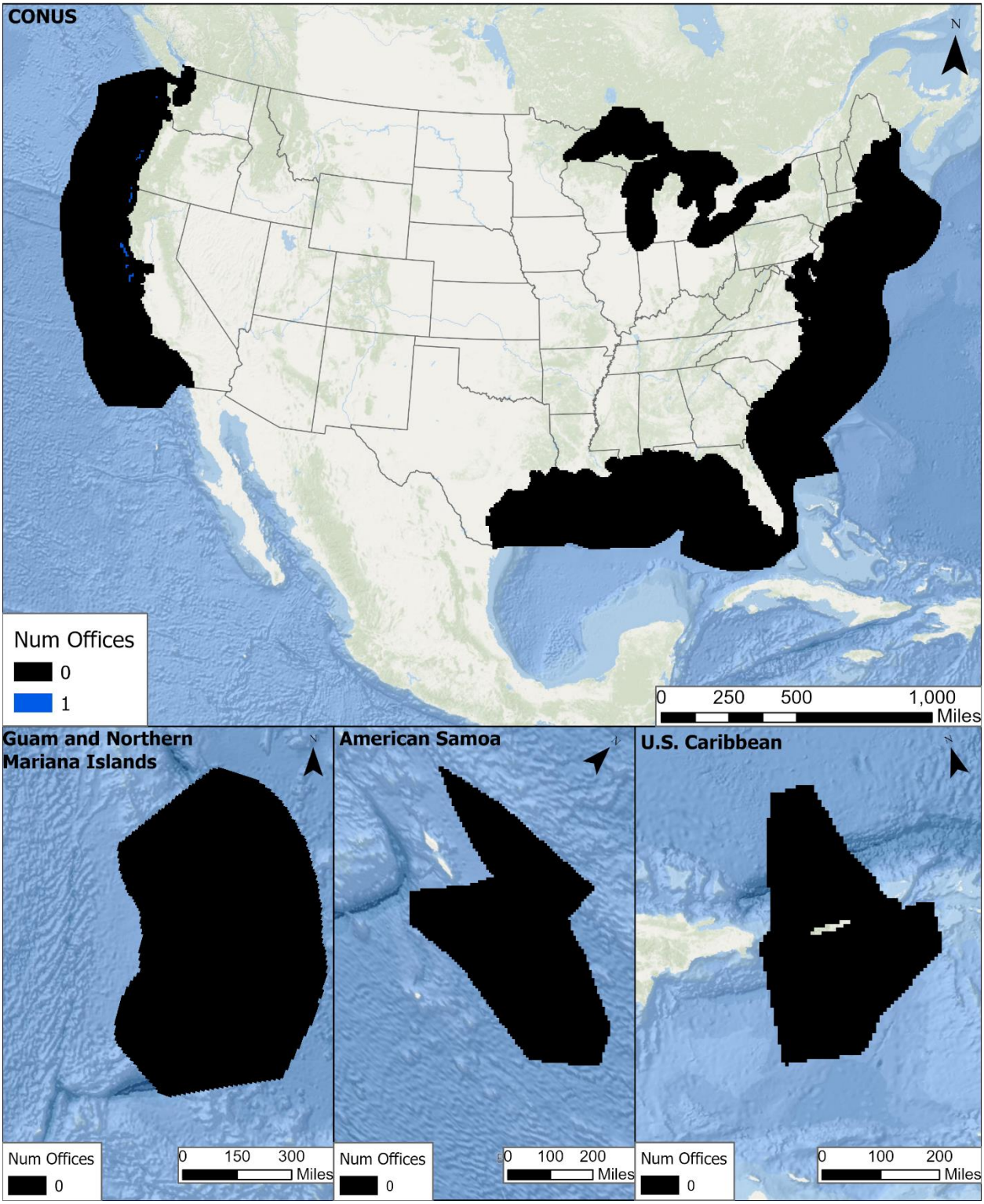
Wildlife Population Characterization

Alaska, Hawaii, and U.S. Minor Outlying Islands



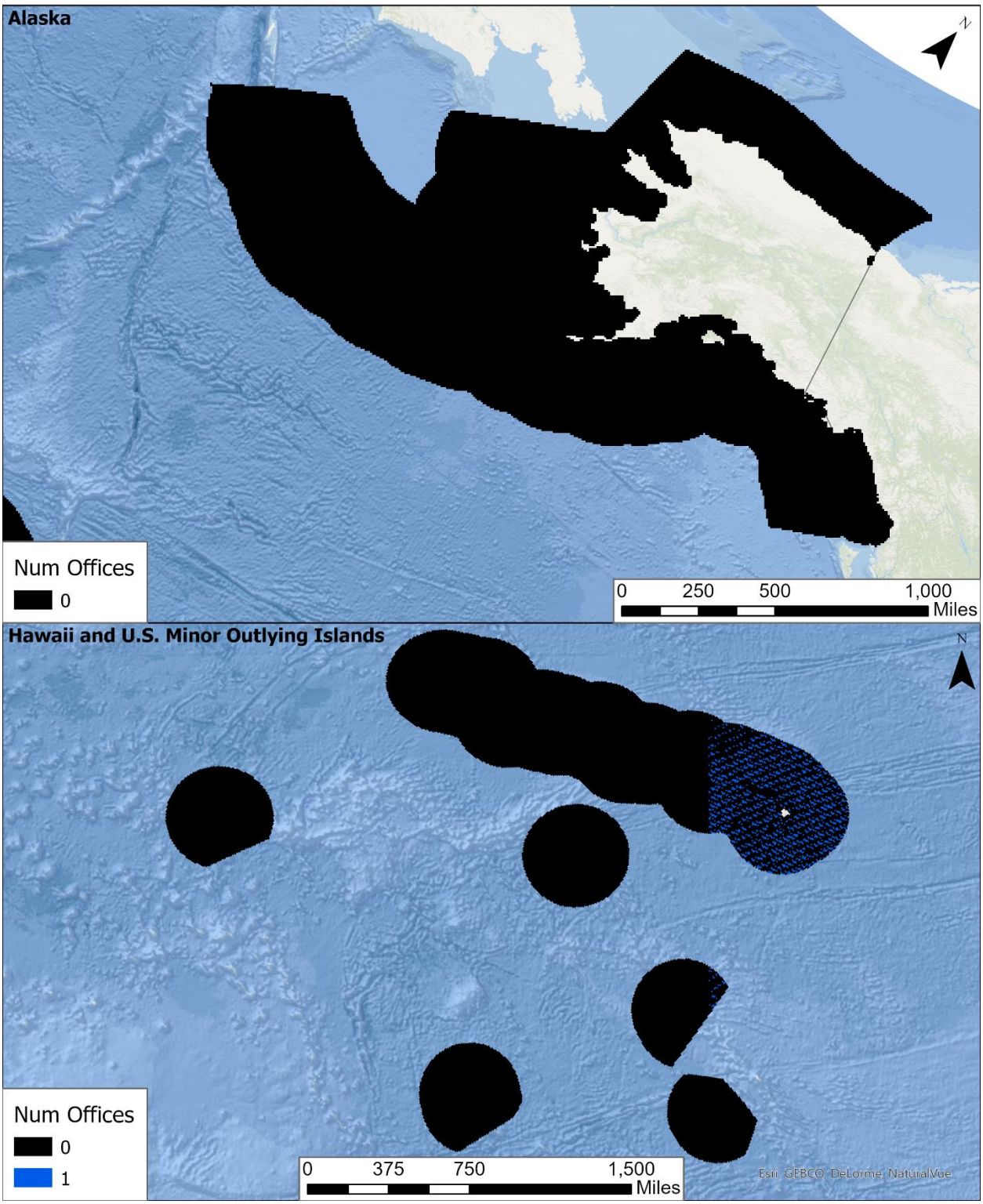
Other

Continental U.S., Guam and Northern Mariana Islands, American Samoa, and U.S. Caribbean



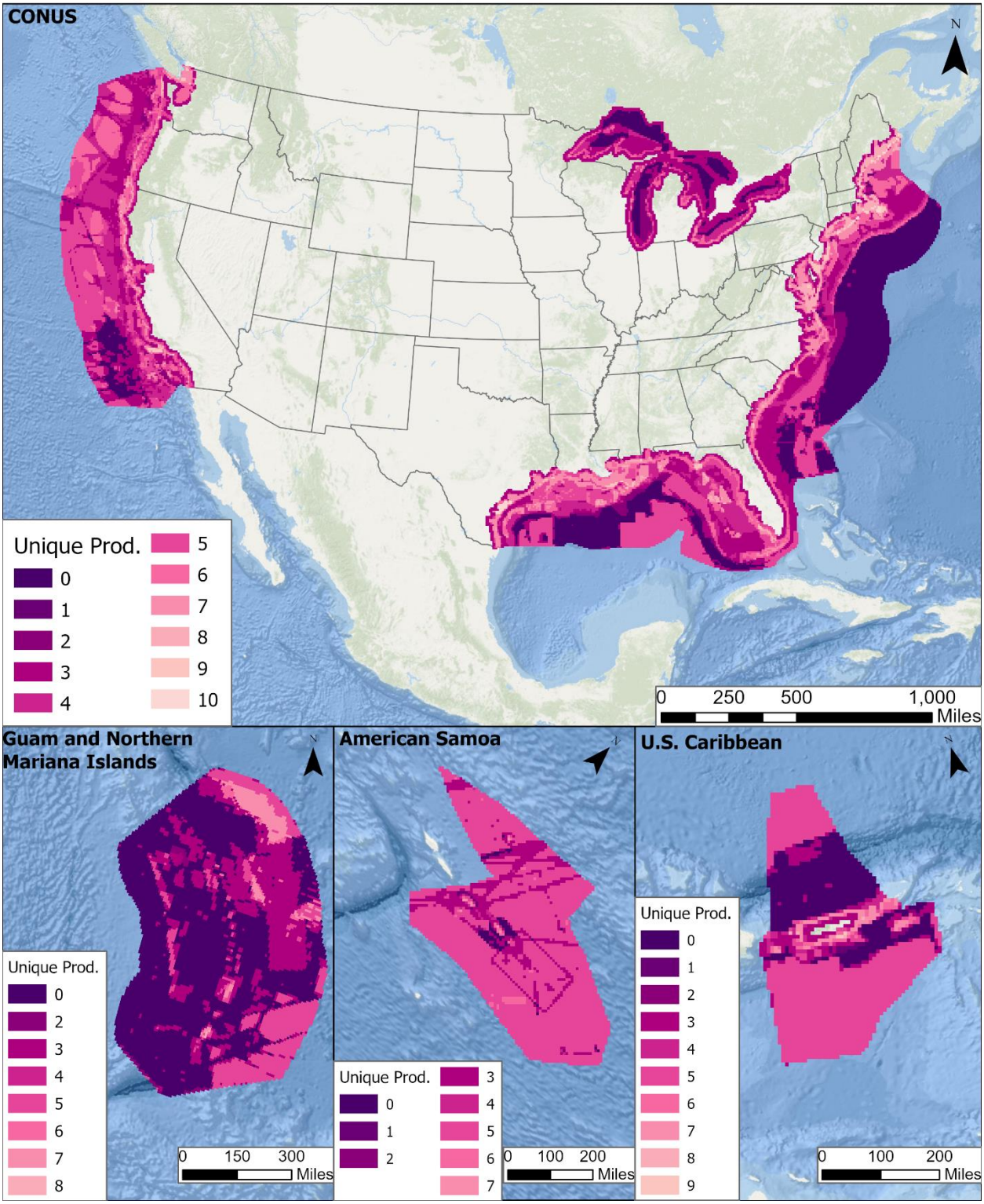
Other

Alaska, Hawaii, and U.S. Minor Outlying Islands



Product (All)

Continental U.S., Guam and Northern Mariana Islands, American Samoa, and U.S. Caribbean



Product (All)

Alaska, Hawaii, and U.S. Minor Outlying Islands