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NOAA Technical Memorandum CRCP 28

National Coral Reef Monitoring Program Socioeconomic Monitoring Component

Summary Findings for Puerto Rico, 2015

NOAA Coral Reef Conservation Program

Silver Spring, MD

May 2017

United States Department of Commerce	National Oceanic and Atmospheric Administration	National Ocean Service
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About this document

The mission of the National Oceanic and Atmospheric Administration (NOAA) is to understand and predict changes in the Earth's environment and to conserve and manage coastal and oceanic marine resources and habitats to help meet our Nation's economic, social, and environmental needs. As a branch of NOAA, the National Ocean Service (NOS) conducts or sponsors research and monitoring programs to improve the scientific basis for conservation and management decisions. The NOS strives to make information about the purpose, methods, and results of its scientific studies widely available.

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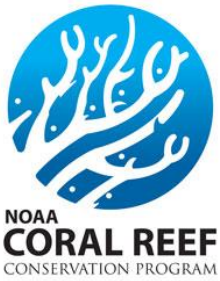
http://www.coris.noaa.gov/monitoring/socioeconomic.html



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Executive Summary

The Socioeconomic Component of the National Coral Reef Monitoring Program (NCRMP) is currently in the process of monitoring socioeconomic indicators across all United States (US) coral reef territories and jurisdictions. These indicators fall under the following broader categories: demographics of these areas, human use of coral reef resources, and knowledge, attitudes, and perceptions of coral reefs and coral reef management. The overall goal of this endeavor is to track relevant information regarding each jurisdiction's population, social and economic structure, society's interactions with coral reef resources, and the responses of local communities to coral management. From there, these baseline data are used to develop indicators that describe the state of each jurisdiction and provide researchers with the ability to compare jurisdictions to one another. The National Oceanic and Atmospheric Administration's (NOAA) Coral Reef Conservation Program (CRCP) will use the information for future research, to assess the socioeconomic outcomes of management activities, and to improve the results of programs designed to protect coral reef resources.

Coral bleaching, diseases, invasive species, and physical damage have contributed to the declining health of the reefs. Overall, approximately 93% of Puerto Rico's coral reefs are rated as threatened, with 84% at high risk, and are therefore among the most threatened in the U.S. Caribbean (NOAA CRCP 2016). This fact, coupled with the overfishing of Puerto Rico's reefs during the last 20 years, pressures from coastal development, and oil spills (Puglise and Kelty 2007), exemplifies the strong impact of human activities in this region. It is also important to note that the communities of this region benefit from coral reef resources through the tourism industry, commercial fishing, and a range of recreational activities enjoyed by residents (NOAA CRCP 2015).

This report outlines human dimensions information relevant to coral reef resources in Puerto Rico. In 2014, the Puerto Rican government designated nine socioeconomic regions: Aguadilla, Arecibo, Bayamon, Caguas, Carolina, Humacao, Mayaguez, Ponce, and San Juan (Nieves 2014). The survey results contained within this document are representative of each of the regions. The findings were derived from a combination of data gathered through household surveys conducted from December 2014 to February 2015, and additional secondary sources of socioeconomic information for the region.

With respect to human participation in recreational coral reef-related activities, the surveys demonstrated that Puerto Rican residents participate in swimming (51% participate) and beach recreation (83% participate) most frequently. In terms of activities that place residents in close proximity with coral reefs, survey results indicated that 8% of residents dive and 22% of residents snorkel. Additionally, just over 15% of residents indicated that they participate in fishing, spearfishing, or gathering of marine resources. Residents who fish/gather marine resources were asked about the reasons why they extract resources, and the most frequent choice was "for fun" (80% of fisher/gatherers), followed by "to feed myself and my family/household"

(69% of fisher/gatherers). When examining residents' perception of the condition of marine resources, it was found that the amount of coral had a more negative perceived condition than the other marine resource conditions assessed in the survey. Forty-one percent of respondents indicated that the current condition of the amount of coral was "bad;" and 66% of respondents indicated that the amount of coral had gotten worse over the last decade. However, it also must be noted that there was uncertainty amongst the population concerning coral condition; this was the resource that respondents were the most unsure of as it relates to their perception of condition. Differences in perceptions concerning marine resource condition were identified between respondents based on region of residence. All thing held equal, residents of Bayamon were more likely to have a more negative perception concerning the current condition of marine resources, while residents of San Juan were more likely to have a more positive perception concerning the change in condition of marine resources.

Surveys also revealed that Puerto Rican residents generally support a range of potential marine management policies and regulations (such as limited recreational use, stricter pollution control, and community participation in management), and are moderately familiar with the various threats faced by coral reefs (such as hurricanes, pollution, and coastal development). While Puerto Rican residents were overall moderately familiar with coral reef threats, over two thirds of survey respondents indicated that they felt the threats to coral reefs were at least "large," and over half felt that the condition of coral reefs will get worse over the next 10 years. In terms of the value that Puerto Rican residents place upon coral reefs, three fourths of survey respondents agreed that coral reefs are important to Puerto Rican culture and 86% agreed that coral reefs protect Puerto Rico from erosion and natural disasters. Survey results also indicate that Puerto Rican residents are largely unfamiliar with marine protected areas and there is a mixed perception concerning residents' confidence in the enforcement of coral reef rules and regulations.

Puerto Rico experienced a number of social challenges between 2000 and 2010, including a decreasing population (due in part to heavy outward migration to the mainland United States), a declining gross domestic product, an increase in the unemployment rate, and high poverty rates. Additionally, over one-third of Puerto Rico's households relied on the Supplemental Nutrition Assistance Program (SNAP) (i.e. food stamps) in 2012 (US Census American Community Survey). The ongoing economic issues faced by the territory pose significant risk to the well-being of the population.

There were key lessons learned from this first NCRMP socioeconomic data collection in Puerto Rico. First, there is a need to fine-tune the survey question pertaining to fish consumption and fishing activity in order to make it more specific to coral reef related fish and invertebrate species, as well as a need to distinguish between locally caught and imported fish. Second, within the "confidence in marine regulation enforcement" section, jurisdictional partners in Puerto Rico expressed a need to delineate between federal and local forms of marine regulation enforcement to gain a greater understanding of Puerto Rican residents' confidence in the various

facets of marine regulation enforcement. Third, the NCRMP team plans to refine the community involvement question in order to make the definition of "community" less ambiguous. As similar surveys are implemented across other US coral reef jurisdictions, the NCRMP team will be making adjustments to the data collection effort to improve on the type of information being generated; thus, the findings contained within this report should be considered a starting point in the development of more detailed research questions for future work. These findings also represent the baseline assessment for future socioeconomic monitoring of Puerto Rico's coral reefs, and they will feed into composite indicators that will detail the status of Puerto Rico's coral reef adjacent communities in relation to the other US coral reef jurisdictions. Surveys will be repeated in each US coral reef jurisdiction after the completion of a full monitoring cycle, approximately once every five to seven years.

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List of Acronyms

ACS	American Community Survey
AFDC	Aid to Families with Dependent Children
AQI	Air Quality Index
ATTAINS	Assessment Total Maximum Daily Load Tracking and Implementation System
BEA	Bureau of Economic Analysis
BLS	Bureau of Labor Statistics
CATI	Computer Assisted Telephone Interviewing
C-CAP	Coastal Change Analysis Program
CRCP	Coral Reef Conservation Program
DEMA	Diving and Equipment Marketing Association
DNER	Puerto Rico Department of Natural and Environmental Resources
ENOW	Economics National Ocean Watch
EPA	Environmental Protection Agency
ESA	Endangered Species Act
GDP	Gross Domestic Product
HHS	Department of Health and Human Services
MPA	Marine Protected Area
MRFSS	Marine Recreational Fisheries Statistics Survey
MRIP	Marine Recreational Information Program
NCCOS	National Centers for Coastal Ocean Science
NCRMP	National Coral Reef Monitoring Program
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NOS	National Ocean Service
NWS	National Weather Service
OCM	Office for Coastal Management
OMB	Office of Management and Budget
OR&R	Office of Response and Restoration
RDD	Random Digit Dialing
SCUBA	Self Contained Underwater Breathing Apparatus
SNAP	Supplemental Nutrition Assistance Program
SSI	Supplemental Security Income
UNEP	United Nations Environment Programme
TANF	Temporary Assistance to Needy Families
US	United States
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
WTTC	World Travel and Tourism Council

Introduction

In 2007, the National Oceanic and Atmospheric Administration's (NOAA) Coral Reef Conservation Program (CRCP) underwent an external review by an expert panel to provide an independent assessment of the CRCP's effectiveness in meeting its mandates and to suggest recommendations for future improvement. Some major recommendations from the external review included increasing the CRCP's social science portfolio, strategically using social science to improve coral reef management by engaging local communities, and better assessing the social and economic consequences of management policies, interventions, and activities on local communities. In response, the *CRCP Social Science Strategy* (Loper *et al*. 2010) recommended three priority activities:

1. Developing of a set of national-level social science indicators
2. Collecting these indicators via regular and repeated jurisdictional surveys
3. Increasing social science capacity within the coral reef conservation program.

In 2010, the CRCP created the National Coral Reef Monitoring Program (NCRMP), which for the first time, included a socioeconomic monitoring component that would improve the Program's ability to track social science information in coral reef jurisdictions. The socioeconomic component of the NCRMP addresses the first two priorities. Because the socioeconomic component of the NCRMP is situated within a larger social science program dedicated to a range of social science activities in United States (US) and international coral reef jurisdictions, the results of this monitoring have a wide range of applications.

The inclusion of socioeconomic indicators in the NCRMP represents a strong step forward for the CRCP, which has recognized the need to integrate socioeconomic information with biophysical indictors relevant to the conservation of coral reef resources. The main purpose of the Socioeconomic Component of the NCRMP is to answer the following questions: What is the status of human knowledge, attitudes, and perceptions regarding coral reefs? And, how are human uses of, interactions with, and dependence on coral reefs changing over time? Integration of socioeconomic information will strengthen national coral reef monitoring and improve the Program's ability to explain how people interact with coral reef resources, as well has how coral reef ecosystems and coral reef management strategies are perceived by the public -- issues of utmost interest to our partners, resource managers, and policy makers.

The NCRMP is an integrated long-term program designed to monitor the condition of coral reefs and coral reef ecosystems. The program now conducts sustained observations of biological, climatic, and socioeconomic indicators in US states and territories where coral reefs are present. More information about all components of the NCRMP can be explored in "NOAA Coral Reef Conservation Program: National Coral Reef Monitoring Plan" (NOAA CRCP 2014) available at: http://docs.lib.noaa.gov/noaa_documents/CoRIS/CRCP/noaa_crcp_national_coral_reef_monitoring_plan_2014.pdf.

Purpose of this Report

This technical memorandum presents the findings from the initial Puerto Rico NCRMP socioeconomic data collection. The report presents preliminary social indicators and provides examples of how indicators can be used to analyze changes over time in a long-term setting. The main objective is to lay the groundwork for combining and comparing socioeconomic variables with a goal of developing meaningful indicators that can be used to examine trends in human dimensions of coral reef resources and better understand human influences on effective coral reef conservation. It should be noted that this report presents information that, in many instances, is being collected for the first time. In all instances, the information represents baseline socioeconomic data for the NCRMP. Some of the variables presented in this report identify gaps in information, and we provide suggestions on how these gaps can be addressed in the future.

Overall Approach of the Socioeconomic Component of NCRMP

The socioeconomic component of NCRMP gathers and monitors a collection of socioeconomic variables, including demographics in coral reef areas, human use of and their interactions (over time) with coral reef resources, as well as knowledge, attitudes, and perceptions of coral reefs and coral reef management. The overall goal is to track relevant information regarding each jurisdiction's population, social and economic structure, society's interactions with coral reef resources, and the responses of local communities to coral management actions. The CRCP will use the information in future research, to assess and monitor socioeconomic status and change over time, to assess the socioeconomic outcomes of management activities, and to improve programs designed to protect coral reefs within each jurisdiction. Ultimately, in consultation with stakeholders, partners and other scientists, the information collected will inform the development of indicators. The development of composite indicators is a method that allows researchers to measure the complex two-way relationship between the environment and humans and track the various facets of this relationship over time by breaking down an intellectually complex and immeasurable concept into its various smaller and more measureable parts to improve communication and policy (Schirnding 2002).

Each indicator will be created using primary data from resident surveys in US coral reef jurisdictions and from existing socioeconomic data collected from secondary sources such as the US Census Bureau and local government agencies. These indicators will include information about the population, the social and economic structure, the impacts of society on coral reefs, and the contributions of healthy corals to nearby residents. The indicators can also be used to track and assess the status of human knowledge, attitudes, and perceptions regarding coral reefs and management activities related to coral reef resources. The indicators and the rationale for their selection are provided below in Table 1. The process of selecting and prioritizing these indicators can be further explored in the workshop report "Developing Social and Economic Indicators for

Monitoring the US Coral Reef Jurisdictions" (Lovelace and Dillard 2012) available at: http://data.nodc.noaa.gov/coris/library/.

Indicator Development

The indicators identified in Table 1 will be developed at the conclusion of the first full monitoring cycle (end of 2017) by combining data from **primary** and **secondary** sources. The assessment of all US coral reef jurisdictions will draw on indicators that may be composites of multiple distinct measures that address the same higher level concepts such as 'Attitudes towards coral reef management strategies.' For example, Dillard *et al.* (2013) established a methodology for creating composite indicators of well-being in coastal communities; and this work will be used as a guide for developing indicators for the well-being of populations living in US coral reef jurisdictions. Box 1 provides a description of the conceptual framework for developing the community well-being composite indicators, as an example of the way in which multiple measures can be used to assess a single composite indicator, such as Basic Needs or Economic Security, that ultimately captures aspects of a larger concept like well-being. It should be noted that the data presented in this report represent the current status of the collection, and are ultimately intended to contribute to the development of indicators. Once developed, these indicators will be used to assess all US coral reef jurisdictions at the conclusion of the first full monitoring cycle. Both the primary and secondary data presented in this report serve as a snapshot of the collection and analysis of the NCRMP socioeconomic monitoring component for Puerto Rico in 2015.

Primary Data

Primary data for the socioeconomic component of NCRMP are collected via a survey administered to individuals reporting on behalf of their households. The survey instrument is composed of one consistent set of questions for all US coral reef jurisdictions, as well as a sub-set of jurisdiction-specific questions relevant to local management needs. NCRMP socioeconomic data are collected using a variety of modes as appropriate to the context in each jurisdiction. For example, in Puerto Rico, a random digit dial (RDD) telephone survey method that utilized both landlines and cell phones was employed. For all jurisdictions, the aim is a representative sample of the population that meets a 95% confidence level with a minimum of a +/-5% margin of error. The survey methodology generally follows Dillman's Tailored Design Method (Dillman *et al.* 2009). It should be noted that the survey was developed by utilizing questions from a "bank" of over 120 questions. These questions were approved for use by the Office of Management and Budget (OMB), which is responsible for administering the Paper Work Reduction Act (1995), which ensures that the public is not unduly burdened (in terms of time) and that confidentiality is assured. Surveys are planned to be repeated in each US coral reef jurisdiction after the completion of a full monitoring cycle, approximately once every five to seven years.

Secondary Data

Not only is the use of secondary data ideal for the development of a sustainable, cost effective, and long term socioeconomic monitoring plan, but secondary data are also well suited for the development of indicators used to track population and environmental trends over time. Secondary data collection involves compiling data that were gathered by other organizations from multiple sources and across US coral reef jurisdictional geographies into a centralized database. The use of data sources that are collected in a standardized way over time (such as US Census Bureau data) can help facilitate the integration of social, economic, and biophysical data collected under the NCRMP because integration is aided by broad spatial and temporal coverage of social, economic, and biophysical data. Many of the secondary datasets that provide social and economic data have this quality and allow for more robust analyses with biophysical data.

Table 1: NCRMP Socioeconomic Indicators

	Indicators	Rationale
1	Participation in coral reef activities (including snorkeling, diving, fishing, harvesting)	Measuring participation in coral reef activities enhances understanding of the economic and recreational importance of coral reefs to local residents as well as the level of extractive and non-extractive pressures on reefs
2	Perceived resource condition	Assessment of perceived conditions is a complement to biophysical information and is key to evaluating differences in levels of support for various management strategies
3	Attitudes towards coral reef management strategies	Monitoring this information over time will be valuable to decision makers, as it will provide insight into possible changes in public perception concerning coral reef management strategies
4	Awareness and knowledge of coral reefs	Monitoring this information over time is key to tracking whether CRCP constituents understand threats to coral reefs and will help inform management strategies (and education/outreach efforts)
5	Human population trends (change) near coral reefs	Monitoring human population trends is important for understanding increasing pressure on coral reefs, as well as reef-adjacent populations
6	Economic impact of coral reef fishing to jurisdiction	Tracking the economic contributions of coral reefs can help justify funds allocated for coral reef protection
7	Economic impact of dive/snorkel tourism to jurisdiction	Tracking the economic contributions of coral reefs can help justify funds allocated for coral reef protection
8	Community well-being	Tracking changes in health, basic needs, and economic security enhances understanding of linkages between social conditions and coral reefs
9	Cultural importance of coral reefs	Measuring cultural importance improves understanding of traditional and cultural significance of coral reefs to jurisdictional residents, and whether this is changing over time
10	Participation in behaviors that may improve coral reef health (*e.g.*, beach cleanups, sustainable seafood choices)	Measuring participation improves understanding of positive impacts to coral reefs as well as negative impacts
11	Physical Infrastructure	Assessment of coastal development footprint, physical access to coastal resources, and waste management/water supply infrastructure provides general understanding of human impact on the coast
12	Knowledge of coral reef rules and regulations	Tracking this information over time at the jurisdictional/national level will inform investment in education and outreach
13	Governance	Measurement of governance provides information on the current status of local institutions involved in coral reef conservation, number of functioning management strategies, and percent area of coral reefs under protection

Box 1: Composite Indicator – Community Well Being

Well-being is a concept used to assess the status of people, either individually or collectively, at different scales (e.g., individual, community and national; Costanza *et al*. 2007). Well-being assessments can be used to determine how people are doing in relation to an optimum standard of life experience (Doyal and Gough 1991) and are generally used by decision-makers to inform policies and programs focused on improving the societal conditions. It provides a means of tracking the relationship between communities and the environment, and a better means of understanding the ecosystem as a whole. When the environment is providing ecosystem services that communities need and desire, well-being has positive gains. Conversely, if there is decline or disruption in ecosystem services, we may expect a decline in well-being, particularly with increased dependence on these services (Butler and Oluoch-Kosura 2006; Costanza *et al*. 1997; MEA 2005). Being able to predict the consequence to humans, both positive and negative, associated with changes in ecosystem states is critical to informed management.

Composite indicators that can ultimately be tracked alongside coral reef ecosystem condition will be employed. The composite indicators are shown in the figure below and each composite indicator is conceptually complex. At the conclusion of the first monitoring cycle, the coral reef jurisdictions like Puerto Rico will be scored on selected indicators of well-being. These scores will be compared across US coral reef jurisdictions and will then be used in statistical analyses with indicators of environmental condition to analyze the dynamic relationship between the ecosystem services that people regularly enjoy and community well-being.

Figure 1: Framework of composite indicators for well-being and ecosystem condition, adapted from Dillard *et al.* 2013

Geographic Scope

Overall, the NCRMP focuses on the CRCP's geographic priority areas; however, as some of those areas are uninhabited, the socioeconomic variables are being collected from only the inhabited areas. When feasible, indicators formulated at the sub-jurisdictional scale (i.e. an individual island and/or county) will be reported alongside biological indicators collected at the same scale. Efforts will be made to ensure sufficiently robust sample size to allow for reporting of socioeconomic indicators at appropriate sub-jurisdictional scales. Table 2 displays the seven US coral reef jurisdictions that are encompassed by the socioeconomic monitoring effort.

Table 2: Geographic scope of current NCRMP Socioeconomic Monitoring

Location	Sampling Units
American Samoa	Island of Tutuila
Florida	Martin, Palm Beach, Broward, Miami-Dade, and Monroe Counties
Hawai'i	Islands of Hawaii, Maui, Oahu, Kauai, Molokai, and Lanai
Puerto Rico	Islands of Puerto Rico, Vieques, and Culebra
Commonwealth of the Northern Mariana Islands	Islands of Saipan, Tinian and Rota
Guam	Entire island of Guam
US Virgin Islands	Islands of St. Croix, St. Thomas, and St. John

Jurisdiction Description

The island of Puerto Rico and the surrounding islands that include Vieques and Culebra (Figure 2), officially the Commonwealth of Puerto Rico, is an unincorporated United States territory that is located in the northeastern Caribbean Sea, extending south of the 18th parallel north. The coral reef ecosystem in Puerto Rico is a complex mosaic of interrelated habitats that includes seagrass beds and mangrove forests in addition to coral reefs (Garcia-Sais *et al*. 2008). Mangrove forests in Puerto Rico can be found on coral cays and along coastal shorelines, however the natural functions and processes of these coral reefs, mangrove forests, and other wetlands have been disturbed by coastal development and past large-scale agriculture. In addition to anthropogenic impacts to Puerto Rico's coral reef ecosystems, NOAA has been concerned with the decline in the health of important reef-building corals. In 2004, the NOAA Fisheries received a petition

from the Center for Biological Diversity to protect elkhorn, staghorn, and fused staghorn corals under the Endangered Species Act (ESA) of 1973. In addition, the massive coral bleaching event throughout the Caribbean in 2005 has highlighted concerns regarding the sensitivity of coral reefs to climate change (Garcia-Sais *et al*. 2008).

Puerto Rico's climate is classified as tropical (Kottek *et al.* 2006). Temperatures are moderate year round, with averages around 80 °F (27 °C) in lower elevations and 70 °F (21 °C) in the mountains and higher elevations. Easterly trade winds pass across the island throughout the year, and Puerto Rico has a defined rainy season that lasts from April to November. The mountains of the Cordillera Central are the chief reason for the rainfall and temperature variations that occur over very short distances, and about a quarter of the annual rainfall[1] for Puerto Rico, on average, occurs during tropical cyclones, which are more frequent during La Niña events (Rodgers *et al.* 2001).

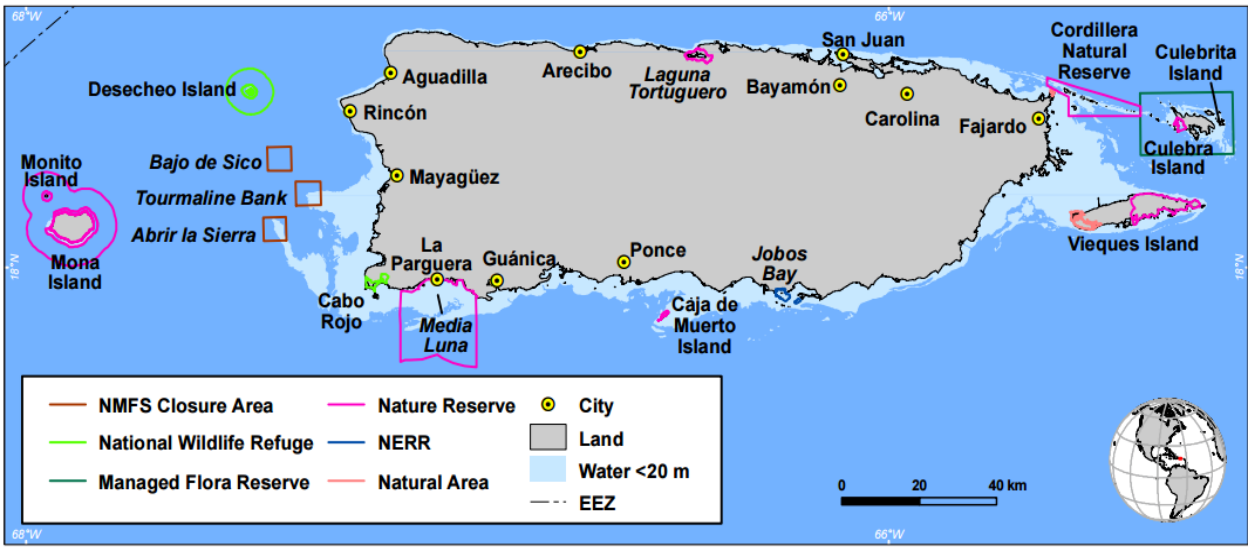


Figure 2: Map of Puerto Rico

Source: K. Buja, 2008

Puerto Rico is an archipelago consisting of the mainland, and the surrounding islands of Culebra and Vieques (inhabited), Mona and Caja de Muertos (under jurisdiction of Puerto Rico Department of Natural and Environmental Resources; DNER), Desecheo (under jurisdiction of US Fish and Wildlife Service; USFWS), and other minor islands and cays. Of the 78 municipalities in Puerto Rico (see Table 3), San Juan is the most populous and urbanized municipality, holding over 10% of the island's population, and containing the nation's capital

[1] Annual rainfall for Puerto Rico from 2000-2012 is 2,277 mm per year (World Bank)

(the city of San Juan), while Culebra is the most sparsely populated municipality and has remained more rural (US Census Bureau 2010). Especially important to Puerto Rico's coral reef ecosystems are the northeastern islands of Culebra and Vieques that lie just east of the Puerto Rican mainland near Fajardo. These islands were US Naval possessions for decades, which helped keep coastal development stagnant, and in turn, preserved the coral reefs around these islands in a more pristine condition than when compared to Puerto Rico's other coral reefs.

Tourism is an important part of the Puerto Rican economy, contributing over $2.4 billion in direct economic contributions, and over $7.4 billion in total economic contributions to the Puerto Rican economy in 2014 (World Travel and Tourism Council (WTTC) 2015). Owing to its island status and its favorable Caribbean climate, Puerto Rico is a frequently visited tourist destination for US and foreign travelers alike. These high rates of tourism, coupled with high population density near the coast, bring even more humans into contact with coral reef ecosystems in the region; thereby creating more opportunities for humans to derive ecosystem services from reefs, but also more opportunities for human-induced stressors to impact reefs.

Methodology

2015 NCRMP Survey

Resident surveys took place in Puerto Rico in the regions of Aguadilla, Arecibo, Bayamon, Caguas, Carolina, Humacao, Mayaguez, Ponce, and San Juan in late 2014 and early 2015. These nine regions encompassed Puerto Rico's 78 municipalities including the Puerto Rican mainland and the islands of Vieques and Culebra (Table 3). The potential respondent universe for this study was adults, eighteen years or older, who live in one of the nine above regions for at least 3 months out of the year. Due to the importance of understanding all potential users of the coral reefs who may be affected by activities related to NOAA's CRCP, the survey was not restricted to those who live directly on the coastline. Therefore, all adults in these regions were included in the potential respondent universe. The survey instrument utilized for the NCRMP socioeconomic data collection in Puerto Rico is found in Appendix 2 of this report.

The Puerto Rico survey data collection was focused on the following indicators:

- Participation in coral reef activities[2] (including snorkeling, diving, fishing, harvesting)
- Perceived resource condition
- Attitudes towards coral reef management strategies and enforcement
- Awareness and knowledge of coral reefs
- Cultural importance of reefs
- Participation in behaviors that may improve coral reef health
- Awareness/knowledge of coral reef rules and regulations

More information on the general survey methods applied can be found here: http://www.coris.noaa.gov/monitoring/resources/FAQs_NCRMP_Social_Survey.pdf, while details for the Puerto Rico effort are provided below.

Residents of the nine aforementioned socioeconomic regions (Figure 3) over the age of 18 and residing in Puerto Rico at least three months out of the year were surveyed via telephone from December 2014 to February 2015. Census data benchmarks were established to obtain a representative sample across the key geographical regions, and guidelines were developed to ensure proper representation of landlines and cell phone users. Phone number lists were purchased for the nine regions containing both landline and cell phone numbers to be representative of the distribution of the use of landlines and cell phones throughout the Puerto Rican population (approximately 80% cell phone and 20% landline). Each number from the list was called up to three times, at which point the number was dropped from the calling process if it had not yet been answered. Contracted surveyors used Computer Assisted Telephone Interviewing (CATI) software and offered the survey in two languages: English and Spanish. A total of 2,494 interviews were completed, yielding a response rate (the number of people who were interviewed by the total number of people in the sample who were eligible to participate) of approximately 2%. No names or personally identifiable information were collected during surveying.

A breakdown of the demographic results of the survey and the regional distribution of responses compared to the 2010 US Census is available in Appendix 3. While the NCRMP survey for Puerto Rico did a good job of aligning with most 2010 US Census benchmarks for demographics, there were a couple groups that were under-represented in the sample, namely less educated and less wealthy residents. Additionally, the regional distribution of the NCRMP survey for Puerto Rico matched closely with the 2010 US Census data concerning the regional

[2] The most direct linkage between beaches and coral reefs is through the protection afforded to beaches by coral reefs, which help protect beaches from erosion due to storm events. Additionally, reefs provide material for "natural beach replenishment" (NOAA CRCP 2015). As a result of these linkages, coral reefs are important to coastal residents' and visitors' use of the beach (Shivlani 2014).

distribution of Puerto Rico's population, except for slightly under-sampling the San Juan region and slightly over-sampling the Humacao and Mayaguez regions.

As a final note, the NCRMP survey takes a jurisdiction level approach (i.e. the entire archipelago of Puerto Rico), and that is the main sampling unit. However when funds/resources are available, the team aims to be representative of smaller geographies within the jurisdiction in addition to the jurisdiction level (i.e. island level, municipality level, etc.) in order to form relevant localized conclusions. In this instance, the NCRMP team did not have the resources to sample at the municipality level, however resources were available that allowed the attainment of a representative sample at the regional level. The regional approach in Puerto Rico was undertaken to align with the nine socioeconomic regional units of Puerto Rico (Nieves 2014). While this sampling design allows the team to obtain representative samples at smaller geographies, it must be noted that the upland areas associated with the regions could in some ways be separate (in terms of human use patterns, socioeconomics, etc.) from the coastal areas in the same region.

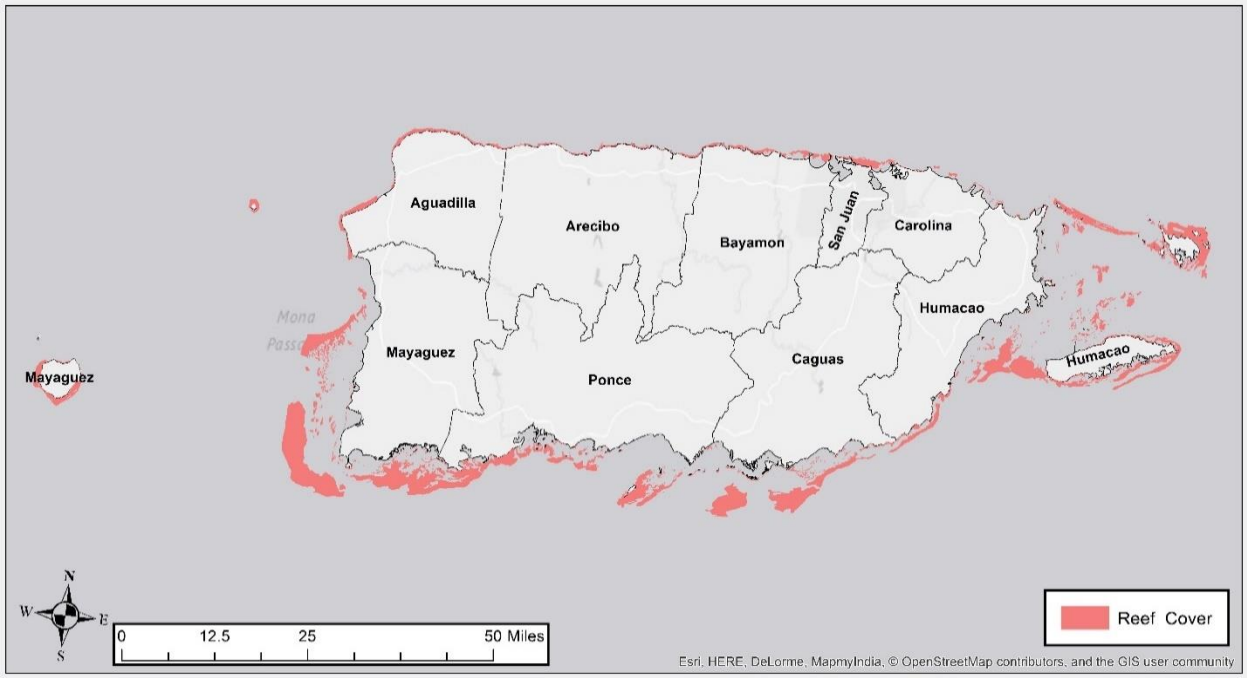


Figure 3: Location of sampled socioeconomic regions in Puerto Rico in relation to coral cover

Table 3: Puerto Rican socioeconomic regions and associated municipalities

Aguadilla	Arecibo	Bayamon	Caguas	Carolina	Humacao	Mayaguez	Ponce	San Juan
Aguada	Arecibo	Barranquitas	Aguas Buenas	Canovanas	Ceiba	Anasco	Adjuntas	Guaynabo
Aguadilla	Barceloneta	Bayamon	Aibonito	Carolina	Culebra	Cabo Rojo	Coamo	San Juan
Isabela	Camuy	Catano	Arroyo	Loiza	Fajardo	Hormigueros	Guanica	
Moca	Ciales	Comerio	Caguas	Rio Grande	Humacao	Lajas	Guayanilla	
Quebradillas	Florida	Corozal	Cayey	Trujillo Alto	Juncos	Las Marias	Jayuya	
Rincon	Hatillo	Dorado	Cidra		Las Piedras	Maricao	Juana Diaz	
San Sebastian	Lares	Morovis	Guayama		Luquillo	Mayaguez	Penuelas	
	Manati	Naranjito	Gurabo		Maunabo	Sabana Grande	Ponce	
	Utuado	Orocovis	Patillas		Naguabo	San German	Santa Isabel	
		Toa Alta	Salinas		Vieques		Villalba	
		Toa Baja	San Lorenzo		Yabucoa		Yauco	
		Vega Alta						
		Vega Baja						

This report presents a summary of select measures collected via the survey instrument and secondary data sources. A presentation on all survey data results and some selected statistical analyses for Puerto Rico is available at: http://www.coris.noaa.gov/monitoring/socioeconomic.html.

Secondary Data Collection

Socioeconomic data were compiled for Puerto Rico from secondary data sources including the US Census Bureau, the US Bureau of Economic Analysis (BEA), the US Bureau of Labor Statistics (BLS), the Environmental Protection Agency (EPA), the US Department of Health and Human Services (HHS), the National Weather Service (NWS), and local government agencies. These data were collected and analyzed at the jurisdiction level, though smaller geographies may be included in future analyses. Secondary data collection included cleaning and transforming data prior to analyses, maintaining documentation from original sources, evaluating data for errors, and other data proofing procedures.

The secondary data collection for Puerto Rico was focused on the following indicators:

- Human population change near coral reefs
- Community well-being
- Physical infrastructure
- Economic impact of coral reef fishing to jurisdiction
- Economic impact of dive/snorkel tourism to jurisdiction

Many of the secondary data presented in this report were taken from the NCRMP socioeconomic project collection as described above. More information about original sources for these data can be found in the data sources table (Appendix 4). Secondary data items included in this report, but not in Appendix 4, are not considered part of the formal NCRMP secondary data collection because they are unique to the jurisdiction or are not available in a standardized format over time.

As the data collection and final indicator development for Puerto Rico is in progress, there are several indicators that will be more comprehensively addressed by combining the survey (primary) and secondary data. These include indicators which benefit from both existing data from management plans, as well as survey data concerning the involvement of local residents in resource management decisions (e.g., Governance). At the conclusion of the first full cycle of monitoring, the following indicators will be developed using a combination of data:

- Governance
- Community well-being
- Economic impact of coral reef fishing to jurisdiction
- Economic impact of dive/snorkel tourism to jurisdiction
- Awareness/knowledge of coral reef rules and regulations

Data analysis

Data analysis of both survey and secondary data included descriptive analyses (e.g., measures of central tendency, examination of distribution), as well as examinations of statistical relationships between variables (e.g., cross tabulations, correlation, regression analyses). Additionally, geospatial analyses were used to examine the extent of governance and specifically, the amount of coral reef area under protected status. Some of the key findings will be discussed in the following sections of this report.

Coral reefs in Puerto Rico (Photo Credit: NOAA)

Results: Section 1

Results are reported by indicator in order to demonstrate which individual measures will be used to assess the indicators presented in Table 1. The first section of indicators presented includes those measured through the use of primary survey data; the first of which is the frequency of participation in marine activities related to coral reefs, as displayed in Table 4.

Frequency of participation in recreational and extractive activities

Table 4: Frequency of participation in various extractive and non-extractive reef activities (n=2,494)

	Non-extractive activities							Extractive Activities		
Frequency	**Swimming**	**Snorkeling**	**Diving (SCUBA or free)**	**Waterside/ beach camping**	**Beach recreation**	**Boating**	**Kayaking**	**Spearfishing**	**Fishing (for finfish)**	**Gathering of marine resources**
4 times a month or more	0.2%	0.0%	0.0%	0.1%	0.2%	0.1%	0.0%	0.0%	0.0%	0.0%
2-3 times a month	12.5%	4.1%	2.3%	5.7%	28.6%	6.6%	3.7%	1.2%	3.0%	1.2%
Once a month or less	38.7%	17.5%	6.1%	38.5%	54.0%	28.7%	15.3%	3.2%	10.8%	3.8%
Never	47.6%	77.5%	91.0%	53.6%	16.1%	62.5%	80.0%	95.0%	85.6%	94.4%
Not sure, Refused, or No response	1.0%	0.8%	0.6%	2.1%	1.0%	2.1%	1.0%	0.6%	0.6%	0.6%

Table 4 outlines respondents' self-reported frequency of participation in coral reef related activities. It must be noted that these results reflect only those residing in Puerto Rico at least three months out of the year, and do not take tourist activity participation into account. Participation in non-extractive recreational reef activities varies in Puerto Rico, with the two activities that residents participate in most frequently being beach recreation (83% participate) and swimming (51% participate). Participation in extractive activities such as spearfishing (5% participate), fishing (14% participate), and gathering of marine resources (6% participate) is less common.

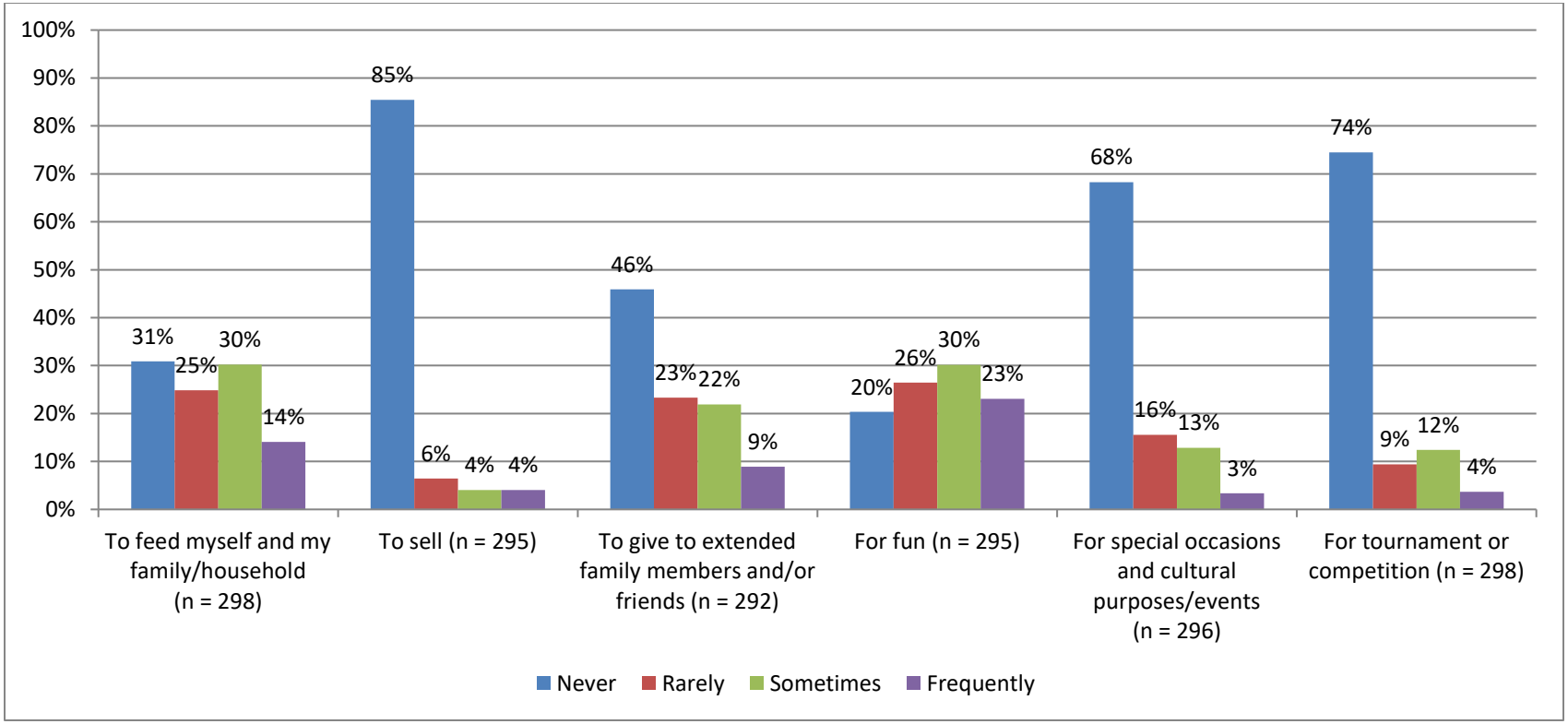


Figure 4: Frequency of fishing for various purposes in Puerto Rico

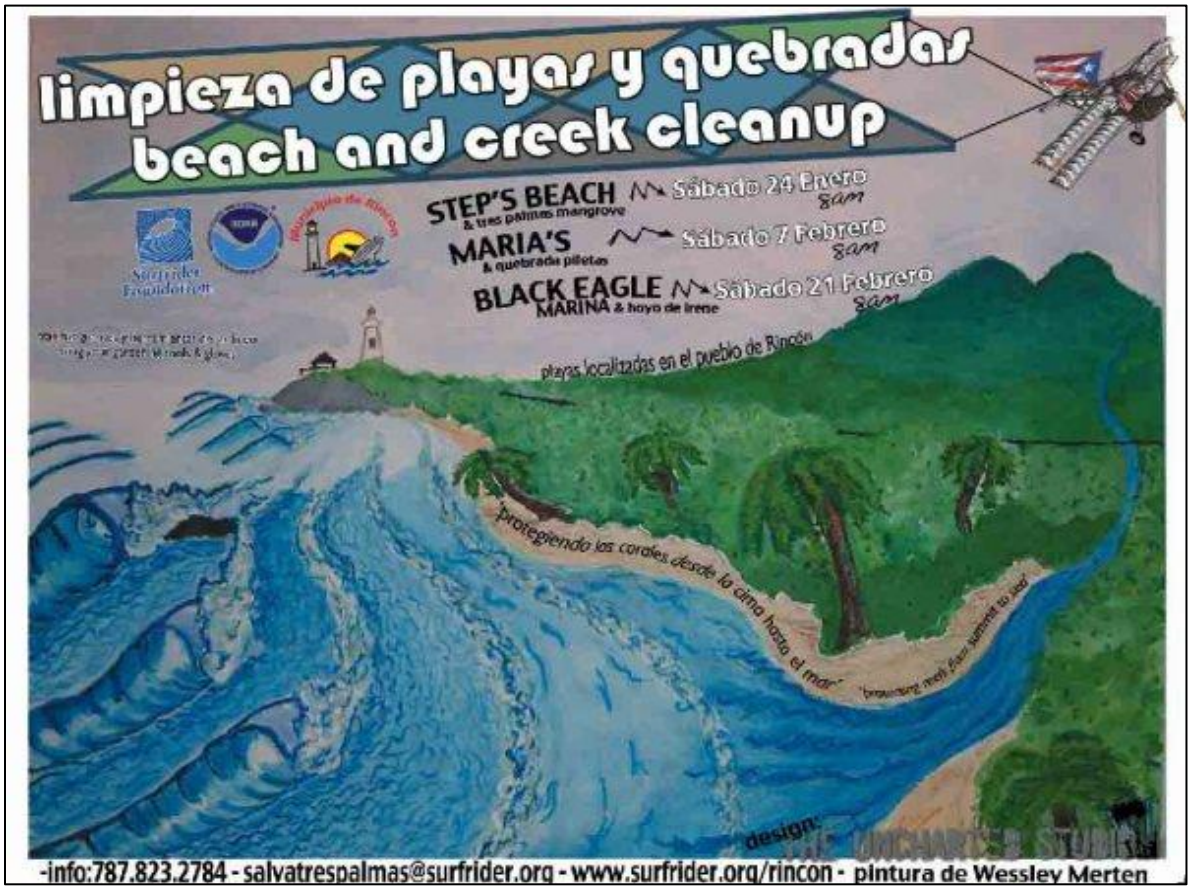
Figure 4 displays respondents' self-reported reasons for fishing. These questions were only answered by respondents that indicated that they fish and/or gather in the "activity" question (Table 4). Therefore, the sample size for this question is relatively small when compared to other questions in the survey. The most common reason for fishing among Puerto Rican respondents who fish is "for fun," with 23% of respondents that fish indicating that they fish "for fun" frequently, followed by "to feed myself and my family/household," with 14% of respondents that fish indicating that they fish "to feed myself and my family/household" frequently. Of respondents who fish, fishing "to sell" was the least chosen response, with 85% of respondents indicating that they never sell their catch.

Frequency of seafood consumption

Of the 2,480 people that responded to the question "How often do you or your family eat fish/seafood?" over 99% indicated that they consume seafood, with 58% indicating that they consume seafood at least once a week. When considering where respondents obtained their seafood from, "purchased by myself or someone in my household at a store or restaurant" was by far the most frequently encountered response, with almost 84% of respondents indicating that they use this source as one of their sources for seafood. This choice was followed by "purchased by myself or someone in my household at a market or roadside vendor" (62%).

Participation in behaviors that improve coral reef health

Respondents were also asked about pro-environmental behaviors, such as participating in beach clean-ups or volunteering for an environmental group. It is believed that these types of behaviors would help sustain and/or improve coral reef health in the region. Of the 2,383 that responded, over half (52%) indicated that they never participate in pro-environmental behavior, and 18% of respondents indicated that they participate in environmental behavior at least "several times a year."



Advertisement for beach clean-ups in Puerto Rico (Painting Credit: Wesley Merten; Ad credit: surfrider.org)

Perceived resource condition

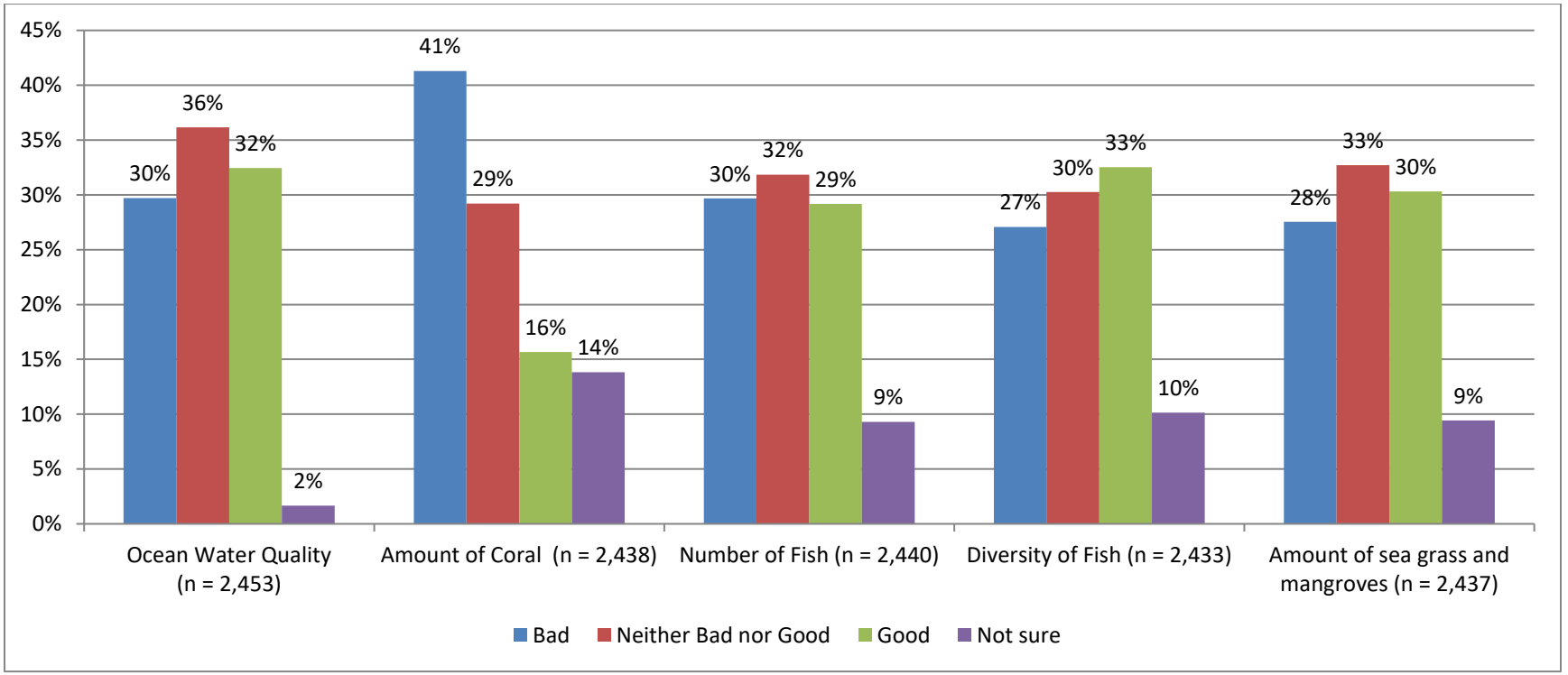


Figure 5: Resident opinions regarding current conditions of marine resources

Figure 5 illustrates respondents' perceptions of the current condition of marine resources in Puerto Rico. Residents responded most favorably when asked about their perceived condition of fish diversity, with one third of respondents indicating that current fish diversity condition was "good." Residents responded least favorably when asked about their perceived condition of the amount of coral, with 41% of respondents indicating that the current condition of the amount of coral was "bad;" however, amount of coral was also the resource that respondents were most unsure about as it relates to perceived condition (14%).

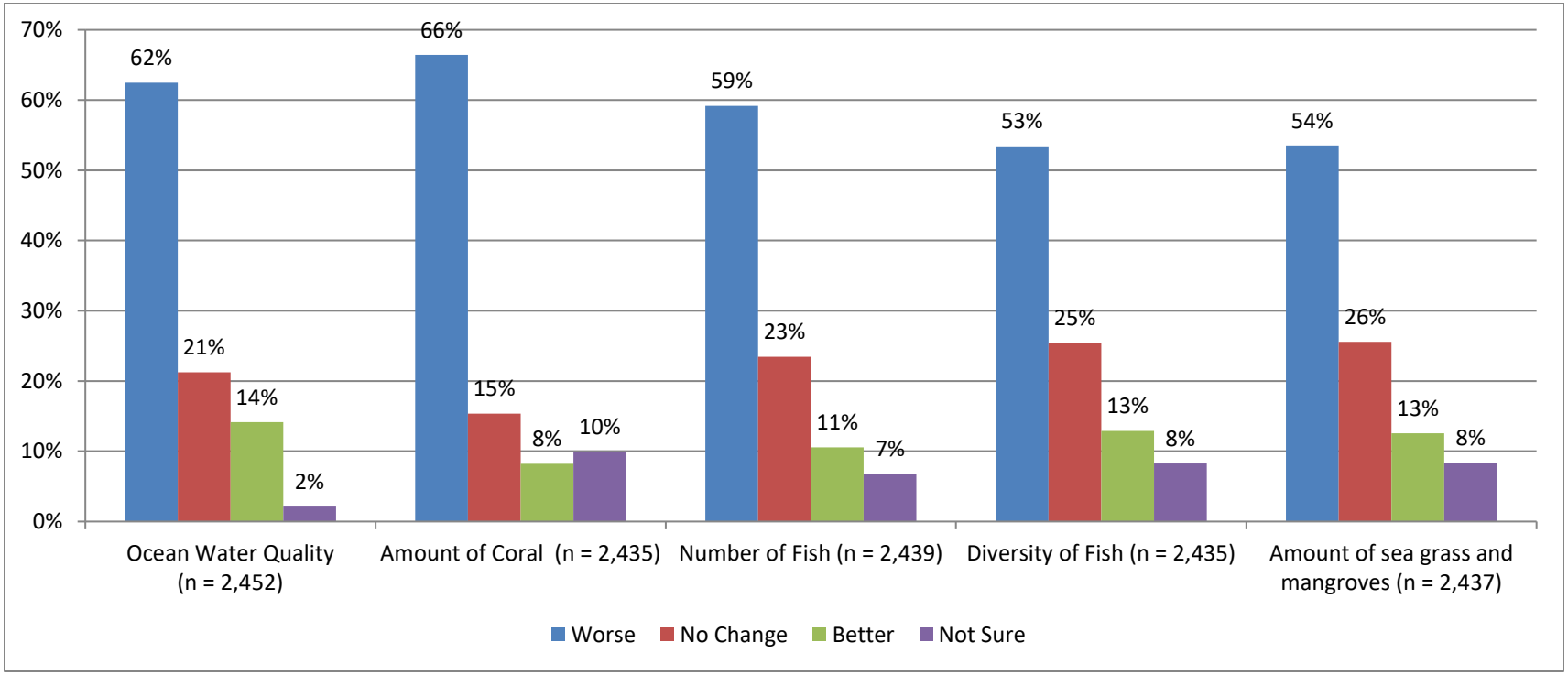


Figure 6: Resident opinions on change in condition of marine resources over past 10 years

Figure 6 illustrates respondents' perceptions concerning the change in the condition of marine resource over the last 10 years in Puerto Rico. Overall, a small proportion of respondents believed that the condition of these marine resources has gotten better over the last decade. "Amount of coral" was the marine resource that the highest proportion of respondents felt had gotten worse over the last decade (66%). When asked about the change in condition over the last decade, the marine resources that respondents were most unsure as it relates to perceived condition about was also "amount of coral" (10%).

Respondents were asked how they felt the condition of marine resources will change over the next 10 years as well. Of the 2,454 that responded, over half (55%) indicated that they thought the condition of marine resources will "get worse" over the next decade, while 25% felt the condition would "stay the same," and 17% believed the condition will "get better."

Knowledge of coral reef rules and regulations

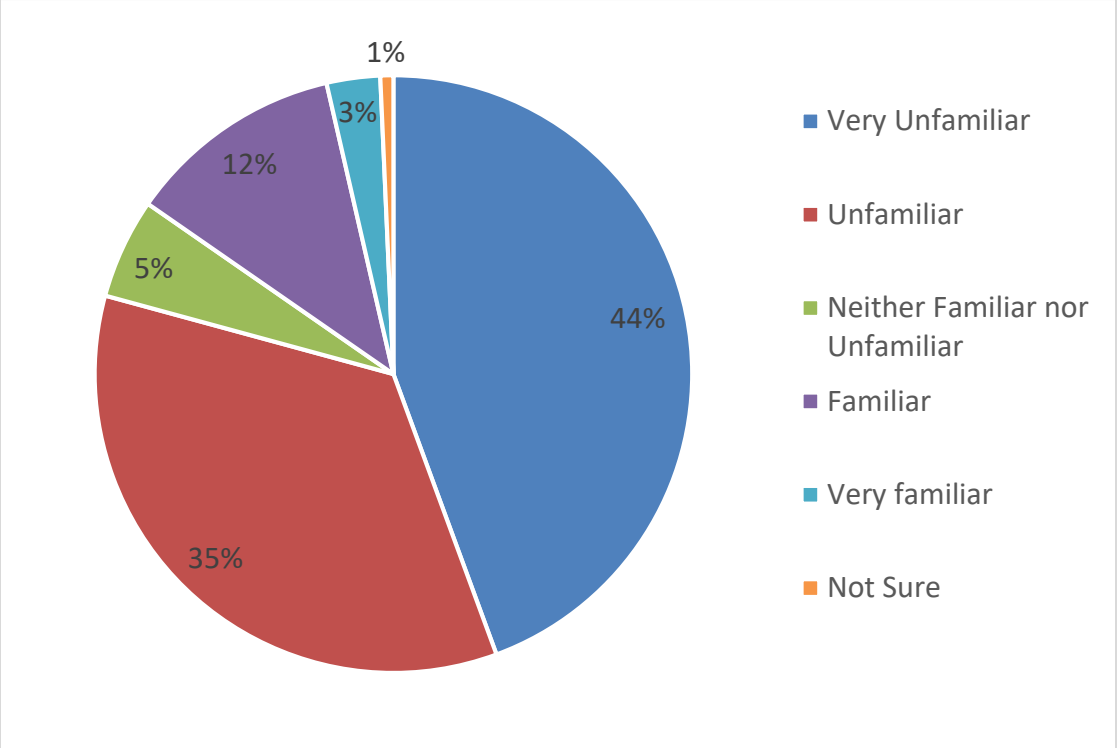


Figure 7: Residents' familiarity with Marine Protected Areas (MPAs) in Puerto Rico (n = 2,417)

In order to operationalize the indicator of "knowledge of coral reef rules and regulations," Figure 7 displays respondents' self-reported relative familiarity with MPAs in Puerto Rico. It was found that 15% of respondents indicated that they were familiar with MPAs, and 80% were either unfamiliar with MPAs or unsure of their familiarity.

Attitudes towards coral reef management strategies

Table 5: Resident opinions regarding marine protected areas in Puerto Rico

MPA Statement	Disagree	Neither Agree nor Disagree	Agree	Not Sure	Sample Size
MPAs protect coral reefs	4%	6%	89%	1%	489
MPAs increase the number of fish	4%	5%	90%	2%	489
There should be fewer MPAs in Puerto Rico	87%	5%	8%	1%	489
There should be more MPAs in Puerto Rico	3%	5%	92%	1%	487
There has been economic benefit to Puerto Rico from the establishment of MPAs	14%	25%	55%	6%	487
Fishermen's livelihoods have been negatively impacted from the establishment of MPAs in Puerto Rico	34%	27%	34%	5%	486
MPAs help increase tourism in Puerto Rico	8%	18%	71%	2%	483
The establishment of MPAs increases the likelihood that people will vacation in Puerto Rico	12%	19%	67%	2%	480
I would support adding new MPAs in Puerto Rico if there is evidence that the ones we have are improving Puerto Rico's marine resources	2%	5%	92%	1%	487
I generally support the establishment of MPAs	3%	5%	91%	1%	484

Table 5 above depicts respondent opinions regarding the various purposes and functions of marine protected areas (MPAs). Survey results indicated that just under 15% of respondents were familiar with MPAs. When examining respondent attitudes toward the above statements concerning MPAs, respondents most agreed with "I would support adding new MPAs in Puerto Rico if there is evidence that the ones we have are improving Puerto Rico's marine resources" (92%) and least agreed with "There should be fewer MPAs in Puerto Rico" (87% disagree). Respondents were the most unsure about "There has been economic benefit to Puerto Rico from the establishment of MPAs" (6%). It also must be noted this series of questions were only answered by respondents who indicated that they were "neither unfamiliar nor familiar," "familiar," or "very familiar" with MPAs (20% of the 2,417 respondents who answered the MPA familiarity question; see survey instrument in Appendix 2).

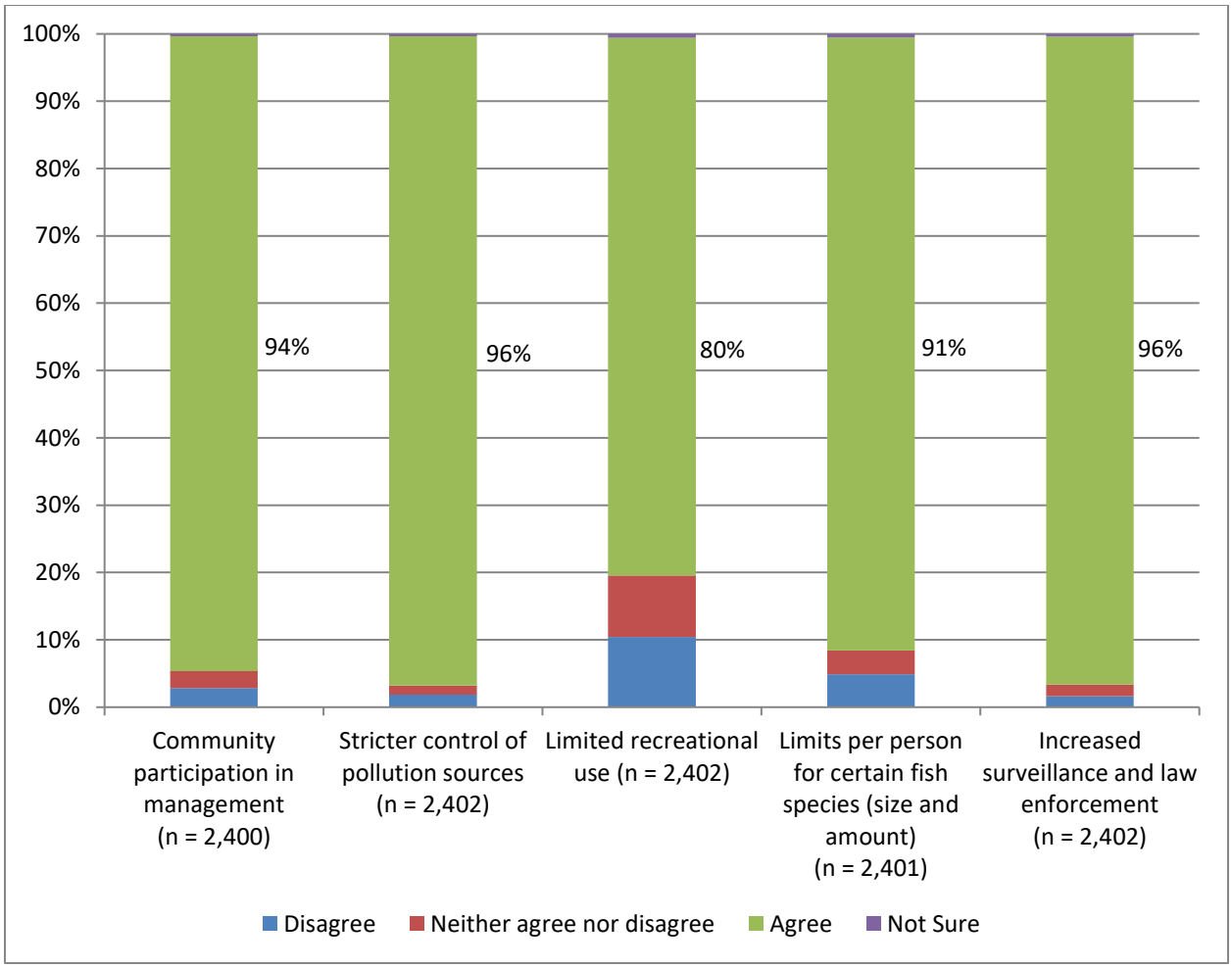


Figure 8: Resident opinions regarding potential management strategies for Puerto Rico

Figure 8 depicts respondents' attitudes toward various management options that were presented in the survey as common strategies used in the management of coral reef ecosystems. Overall, respondents were generally very supportive of all potential management strategies that could be used to improve the protection of coral reefs. The management option with the most support was "stricter control of sources of pollution to preserve water quality" (96% agreement). While the majority of respondents agreed with all of the presented management options, the option with the least support was "limited recreational use," with 10% of respondents disagreeing with this strategy. This management strategy was also the one that respondents expressed more ambivalence and uncertainty toward (10% indicated either "neither agree nor disagree" or "not sure").

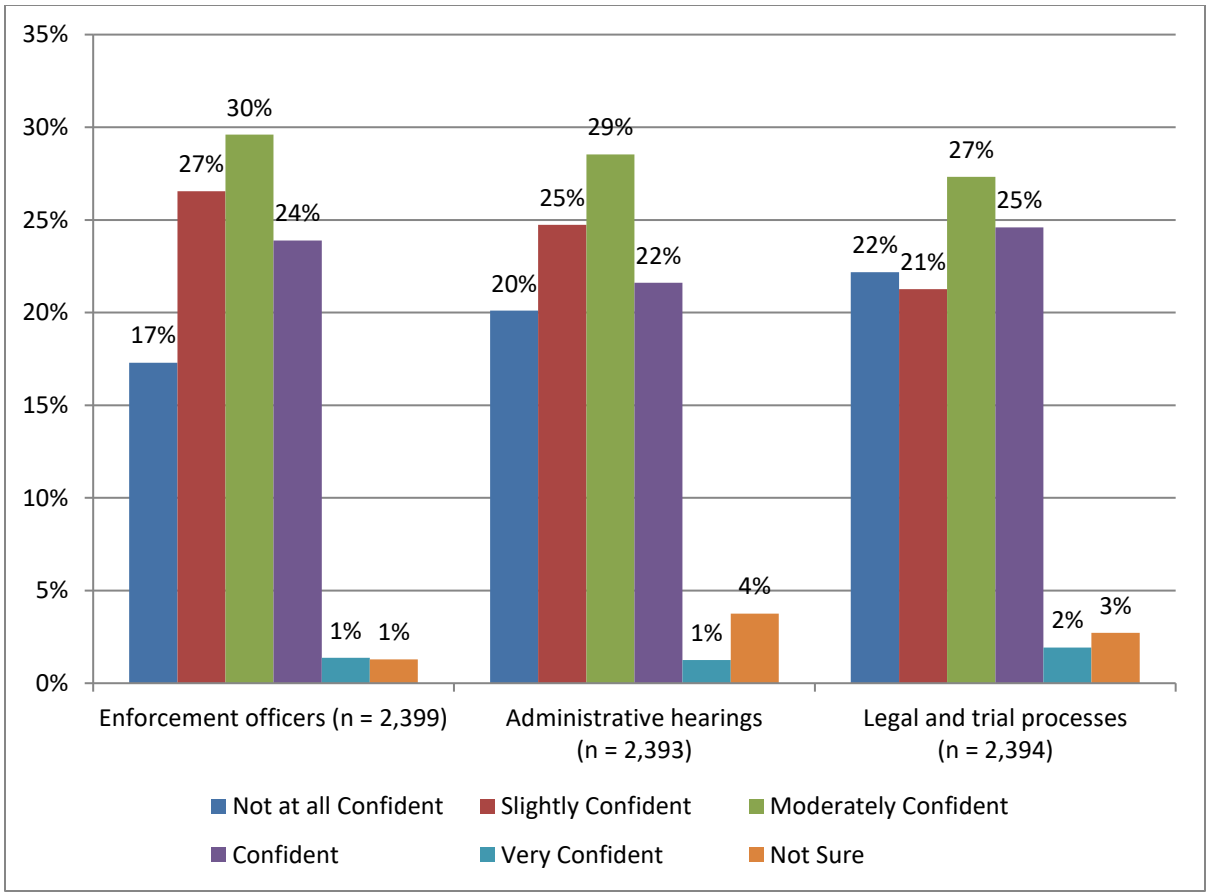


Figure 9: Residents' confidence in coral reef rules/regulations enforcement in Puerto Rico

Figure 9 displays respondents' relative confidence in the enforcement of coral reef rules and regulations. Respondents were most confident in "legal and trial processes," with 27% of respondents indicating that they were at least "confident." Respondents were least confident in "administrative hearings," with 45% of respondents indicating that they were "slightly confident" or less. Overall, there is a scarce number of residents who were "very confident" in the enforcement of coral reef rules and regulations, and there is a relatively even spread of responses across the other levels of confidence.

Awareness and knowledge of coral reef functions and threats

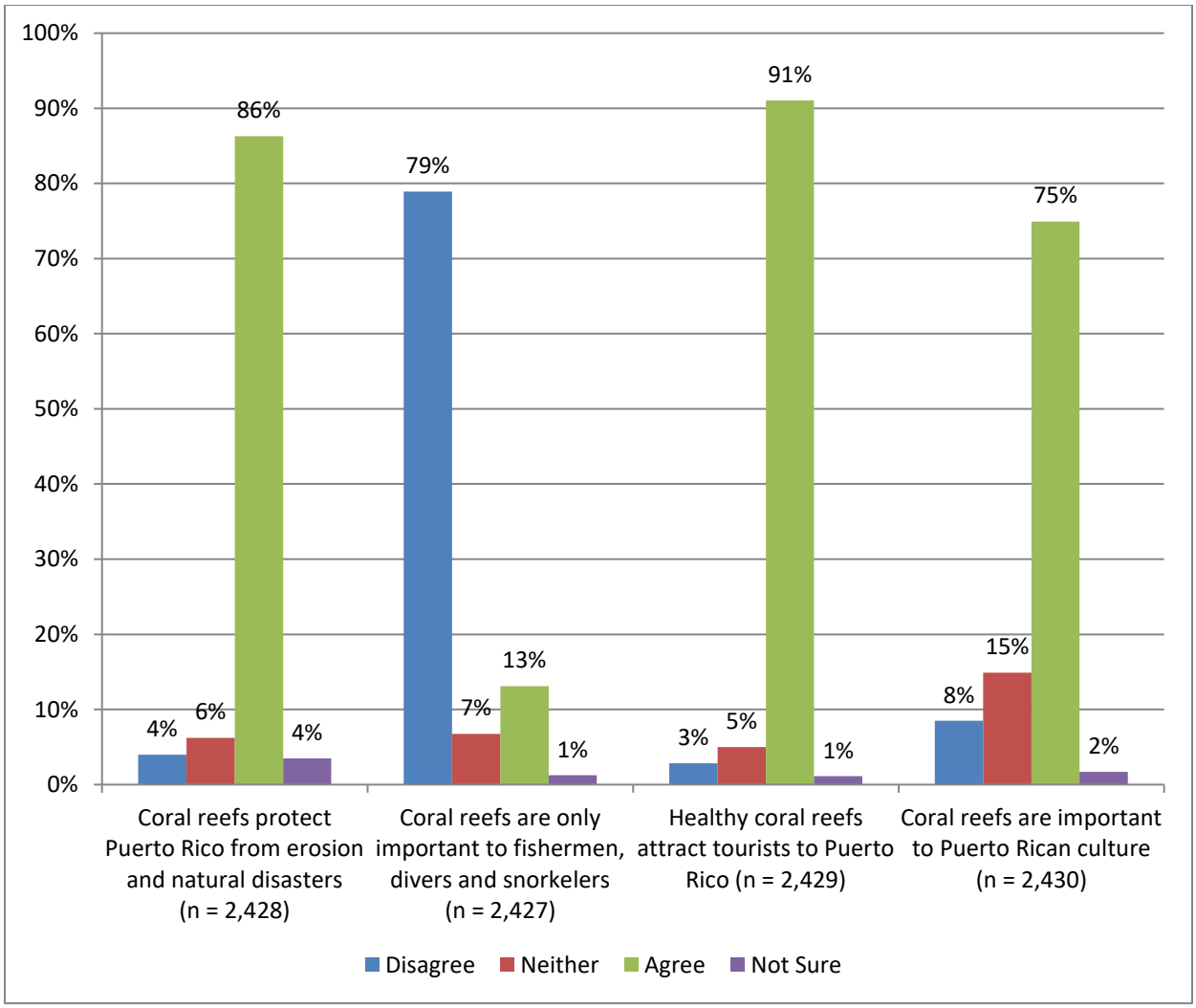


Figure 10: Resident perceptions regarding coral reef services

Figure 10 displays respondent attitudes pertaining to the services and byproducts of healthy coral reef ecosystems. The majority of respondents agreed with the statements depicted in the graph above, except for one item: 79% of respondents disagree with the statement "coral reefs are only important to fishermen, divers and snorkelers." The statement that respondents were most unsure about was "coral reefs protect Puerto Rico from erosion and natural disasters" (4%).

Familiarity with threats

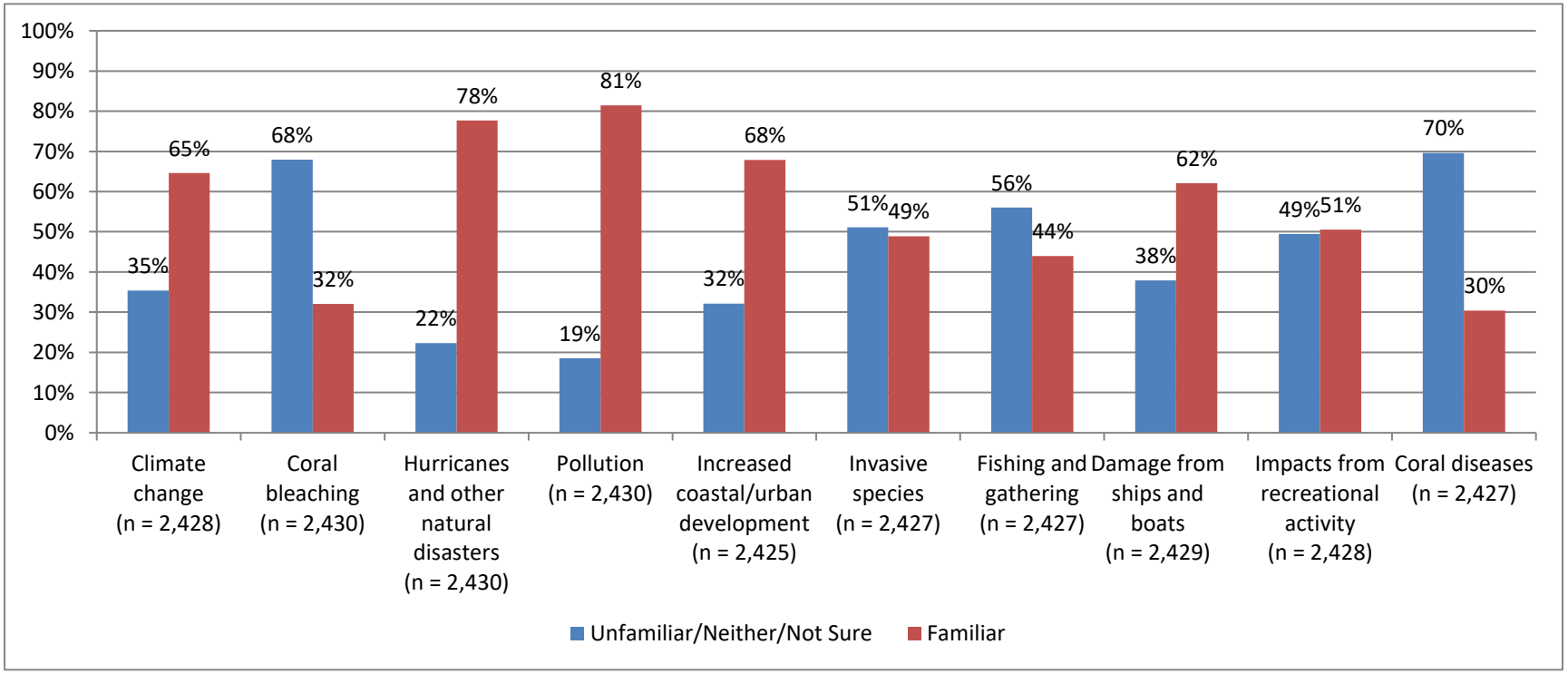


Figure 11: Residents' familiarity with threats to coral reefs

Respondents were also asked about their relative familiarity with issues that pose a threat to coral reef ecosystems. Overall, residents were mostly familiar with the various threats faced by coral reefs. The majority of respondents were familiar with most of the ten threats listed in the survey, however the majority were unfamiliar with four issues (coral bleaching, invasive species, fishing and gathering, and coral diseases). Figure 11 shows that respondents were most familiar with the threat of pollution (81%), followed by the threat of hurricanes and other natural disasters (78%).

Level of threats to coral reefs

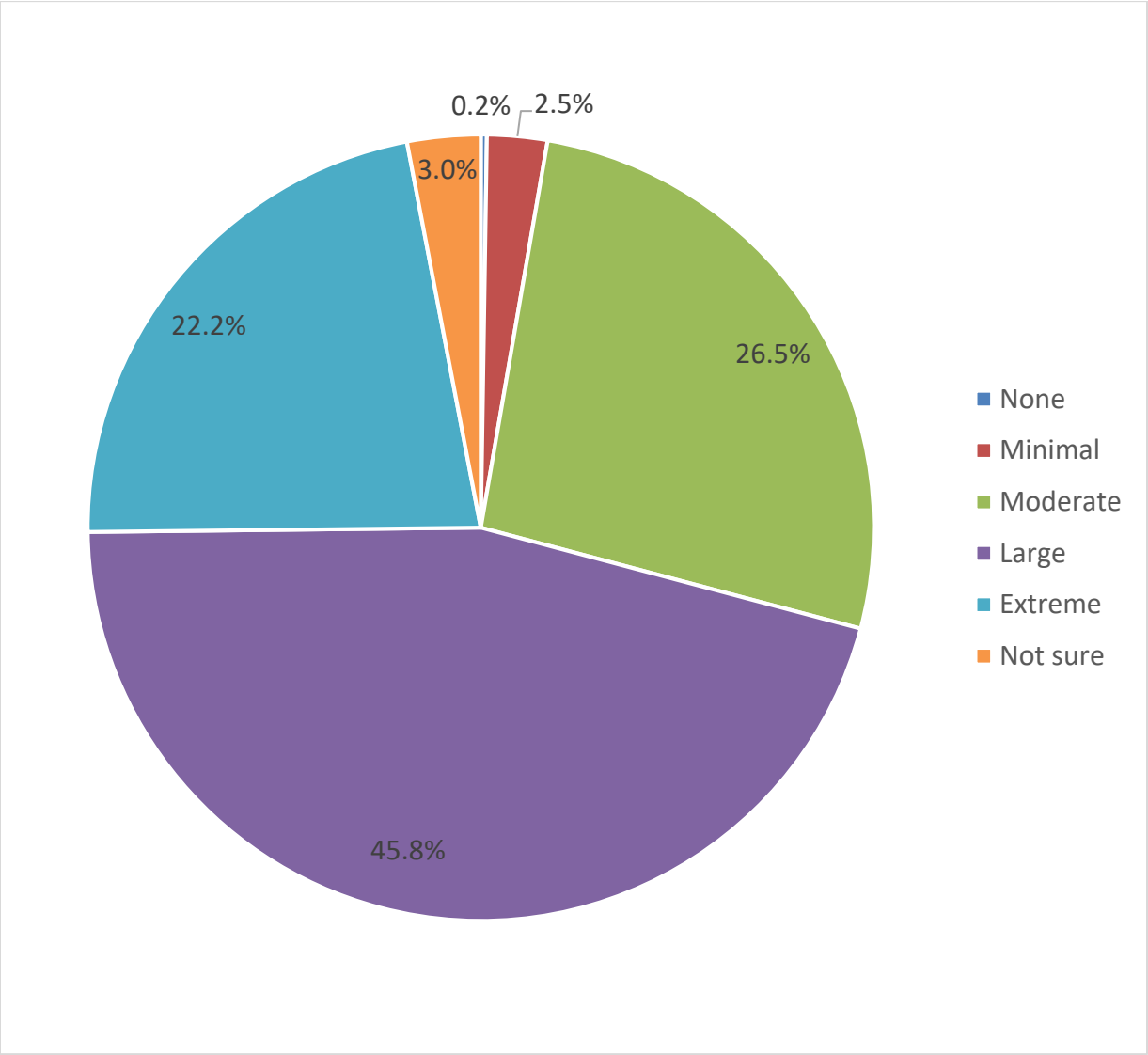


Figure 12: Residents' perceptions of the severity of threats to coral reefs (n = 2,423)

Figure 12 illustrates respondent perceptions concerning the level of threat severity facing coral reef ecosystems. Over two-thirds of the respondents (68%) believed that the threat severity to coral reefs is at least "large." Less than 1% of respondents indicated that they believe coral reefs are facing no threats at all. Additionally, 3% of respondents indicated that they are not sure about overall coral reef threat severity.

Results: Section 2

In the following section, the measures presented for each indicator originate from various secondary data sources. These indicators may be ultimately measured through secondary data alone or through a combination of primary and secondary data.

Human population composition and trends near coral reefs

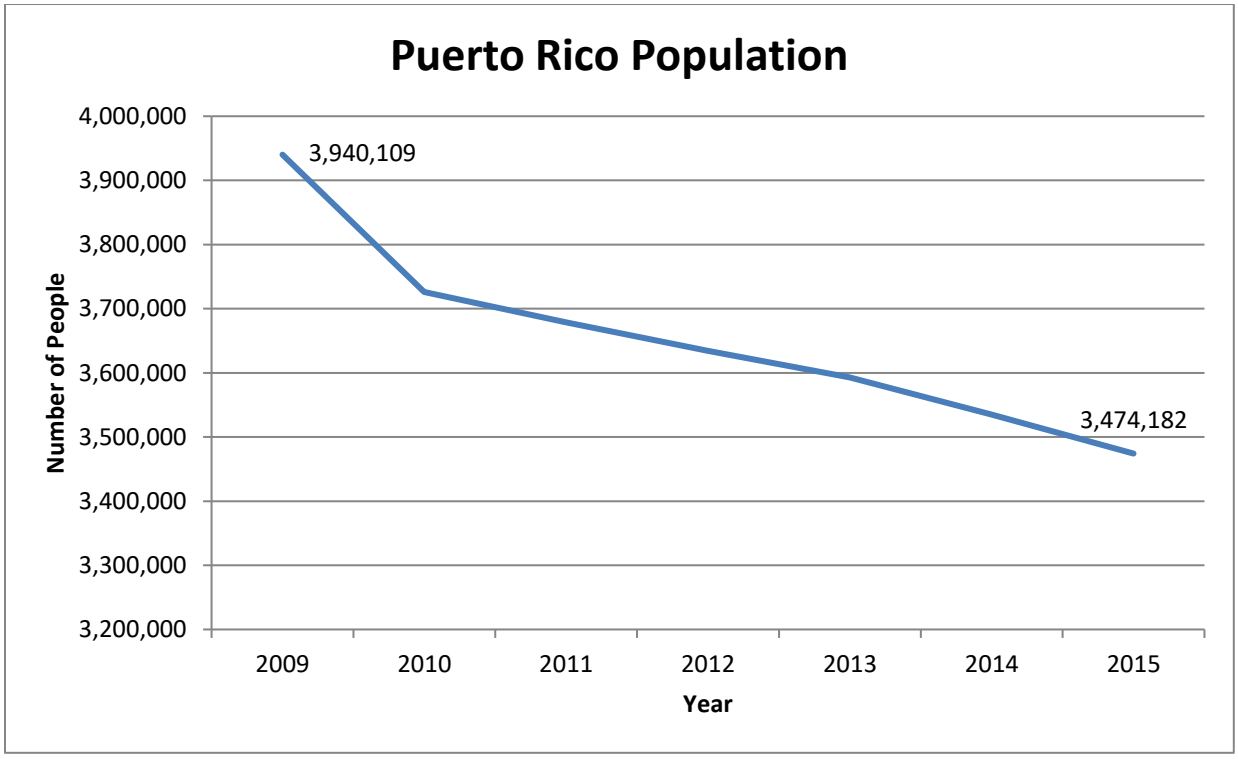


Figure 13: Puerto Rican population trend

Source: US Census Bureau, Annual Estimates of Resident Population

Figure 13 illustrates the recent trend in population numbers for Puerto Rico (US Census). The population of Puerto Rico has been steadily declining since 2009. The reported 2009 population of 3,940,109 people has decreased by 12% to 3,474,182 people in 2015.

Table 6: Population change for each Puerto Rican Region, 2009-2015

Region	Population change	Percent Change
Aguadilla	-41,968	-14%
Arecibo	-49,359	-14%
Bayamon	-68,226	-9%
Caguas	-33,647	-7%
Carolina	-52,813	-13%
Humacao	-28,876	-9%
Mayaguez	-36,710	-12%
Ponce	-72,887	-15%
San Juan	-81,441	-15%

Source: US Census Bureau, Annual Estimates of Resident Population

Table 6 indicates that the San Juan Region exhibited the largest population decline from 2009-2015 in both absolute and percentage terms when compared to the other Puerto Rican regions. All nine regions have experienced a net population decrease in recent years, with Humacao losing the smallest amount of people in absolute terms and Caguas losing the smallest amount of people in percentage terms (US Census).

Table 7: Population density in Puerto Rican regions, 2000-2010

	Population Density, 2000 (persons per square mile of land area)	Population Density, 2010 (persons per square mile of land area)	Percent change in population density, 2000-2010
Aguadilla	1,126.48	1,101.09	-2%
Arecibo	759.37	768.54	1%
Bayamon	3,033.57	2,851.84	-6%
Caguas	1,332.27	1,383.29	4%
Carolina	3,069.03	2,928.89	-5%
Humacao	993.45	1,008.38	2%
Mayaguez	875.65	837.74	-4%
Ponce	1,012.45	914.90	-10%
San Juan	8,074.17	7,326.91	-9%
Puerto Rico Total	**1,112.10**	**1,088.20**	**-2%**

Source: US Census Bureau, Decennial Census of Population and Housing

Table 7 shows that from 2000 to 2010, population density increased in Arecibo, Caguas, and Humacao, but decreased for the other six Puerto Rican regions (US Census). Caguas exhibited the largest growth in population density (4%) and Ponce exhibited the largest decrease in population density (-10%) over the course of the decade, and the overall population density of Puerto Rico decreased by 2% from 2000 to 2010.

Table 8: Migration Inflows and Outflows for Puerto Rican regions, 2008-2012

	In-Migration	Out-Migration	Net Migration
Aguadilla	6,604	8,307	-1,703
Arecibo	8,513	12,296	-3,783
Bayamon	19,993	28,311	-8,318
Caguas	15,103	20,593	-5,490
Carolina	17,535	21,694	-4,159
Humacao	12,748	16,330	-3,582
Mayaguez	8,210	9,222	-1,012
Ponce	11,643	15,721	-4,078
San Juan	23,734	28,560	-4,826
Puerto Rico Total	124,083	161,034	-36,951

Source: US Census Bureau, 2008-2012 American Community Survey 5-yr estimates

Table 8 illustrates the migration inflows and outflows (annual averages from 2008-2012) for each of the nine Puerto Rican regions. All regions exhibited an overall net-out migration over this period. Mayaguez exhibited the lowest average annual net out-migration with a figure of -1,012 people, followed by Aguadilla with an average annual net out-migration of -1,703 people. The highest annual net out-migration figure belonged to Bayamon (-8,318). Overall, Puerto Rico experienced an average annual net out-migration of -36,951 people in the years 2008-2012. This overall net out-migration is perhaps due to an island-wide economic downturn. The Puerto Rican economy decreased by 1.5% in terms of real gross domestic product (GDP) from 2009 to 2012 (Government Development Bank for Puerto Rico 2015).

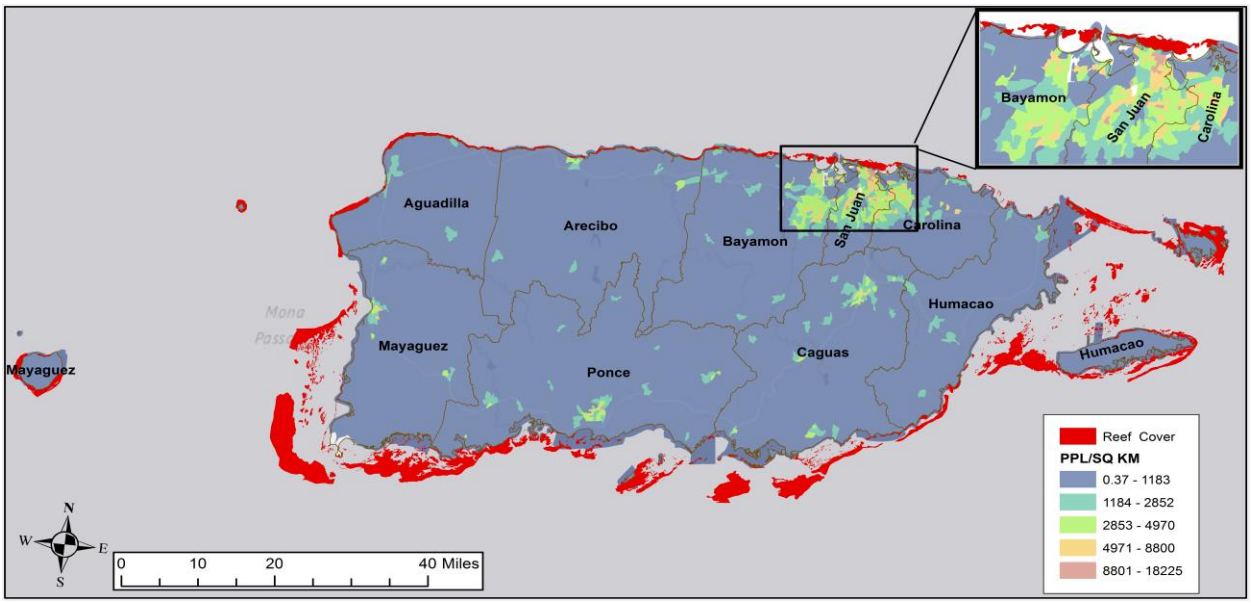


Figure 14: Population density (2010) in Puerto Rico by US Census Tract and proximity to coral cover.

Figure 14 above depicts Puerto Rico's population density (persons per square kilometer) at the Census tract level in relation to coral reef cover. It is widely understood that increased population density in proximity to coral reefs can lead to stress in the coral reef ecosystem (Brewer 2013). The inset map illustrates an area of high population density (the area of San Juan) in relation to coral cover, and shows how Puerto Rico contains areas of high population density that may impact its coral reef ecosystem through stressors from development, recreation, and other types of anthropogenic effects.

Racial Composition and Age Structure of Puerto Rico

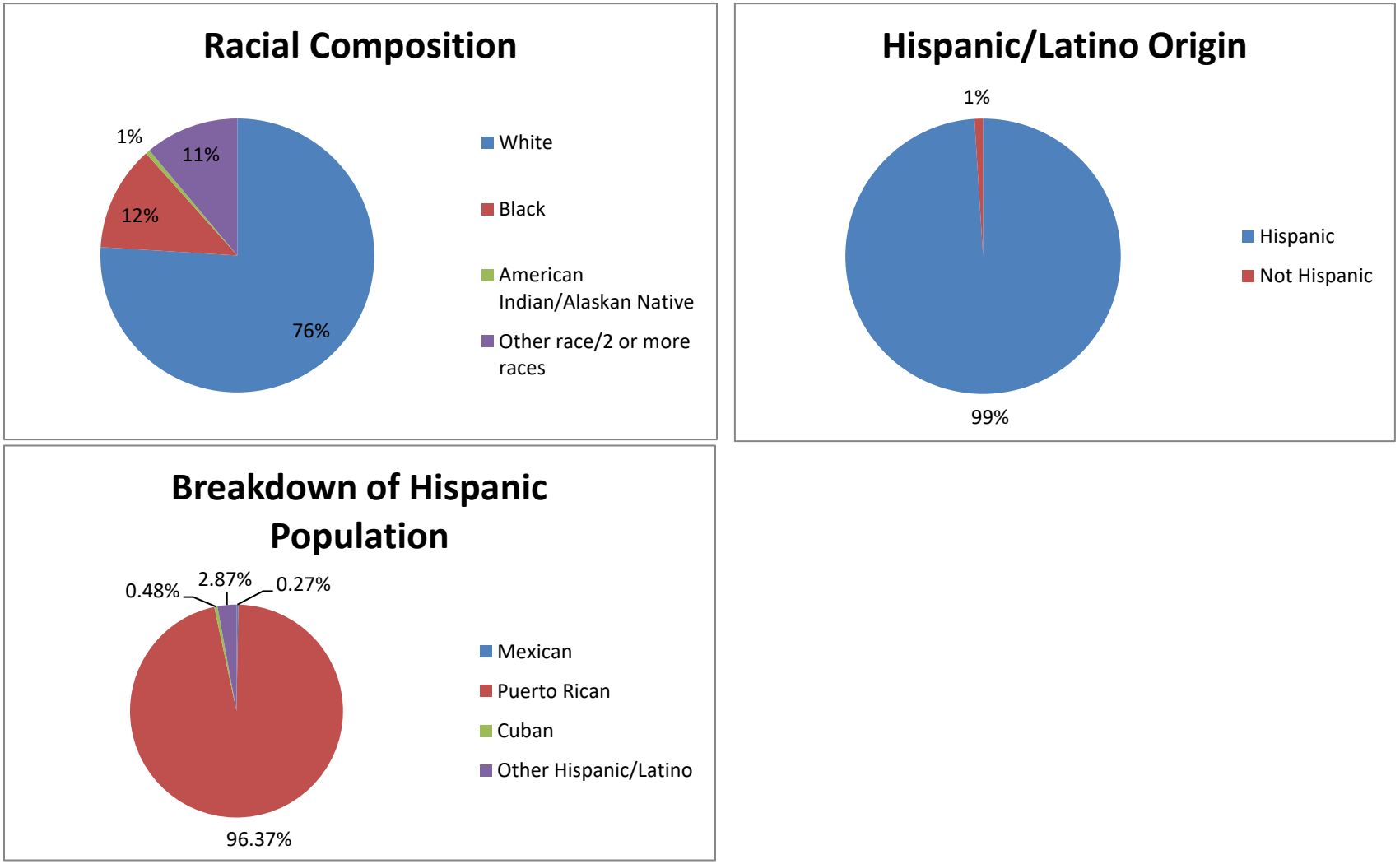


Figure 15: Racial and ethnic composition of Puerto Rico

Source: US Census Bureau, Decennial Census of Population and Housing

As evidenced by Figure 15, the racial composition of Puerto Rico is predominantly white (76%), followed by black/African American (12%), and other/two or more races (11%). Ninety-nine percent of Puerto Rico's population identified as Hispanic/Latino in 2010 US Census, and of the Hispanics, 96% are Puerto Rican.

As for the age structure of the population of Puerto Rico, the 2010 US Census Bureau reports that 24% of the population was under 18 years old (29% in the 2000 Census) and 15% of the population was 65 years or older (11% in 2000 Census). The 2010 US Census Bureau reports an overall median age of 36.9 years old for the Puerto Rican population (32.1 years old in 2000 Census).

Community well-being

In addition to the basic demographics described above, composite indicators can be utilized to further explain social variance. Eight composite indicators were included in the original well-being framework; a sub-set of these will be tracked alongside coral reef ecosystem condition. The composite indicators being applied to the NCRMP socioeconomic component are: Economic Security, Health, Basic Needs, Access to Social Services, and Education.

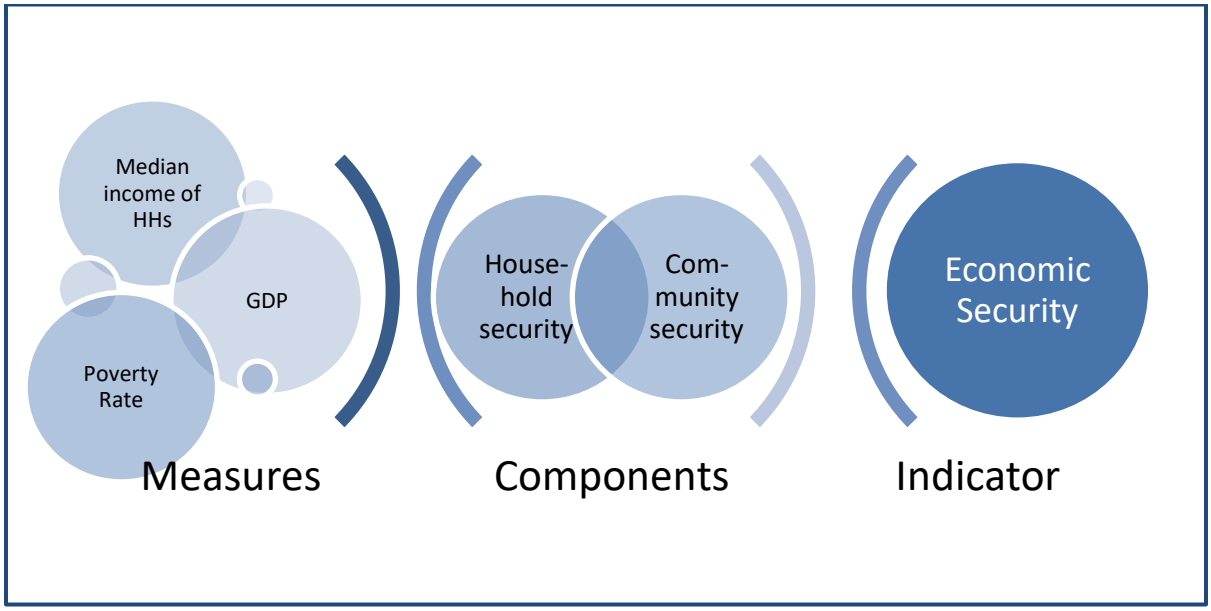


Figure 16: Economic Security presented as an example of operationalizing a composite indicator

Each composite indicator is conceptually complex. The indicators, demonstrated in Figure 16 with *Economic Security*, are comprised of multiple of measures that, in turn, operationalize multiple dimensions of the composite indicator.

At the conclusion of the first monitoring cycle, the coral reef jurisdictions will be scored on select indicators of well-being. These scores will allow for comparisons across jurisdictions, and will be used in statistical analyses with indicators of environmental condition to analyze the dynamic relationship between the ecosystem services that people regularly enjoy and community well-being. A selection of measures that will be used to operationalize the well-being indicators of Economic Security, Health, Basic Needs, Access to Social Services, and Education are presented and discussed below.

Economic Security

The measures used to operationalize economic security will include gross domestic product, median household income, the percent of the population in poverty, unemployment rate, and the amount of households receiving public assistance.

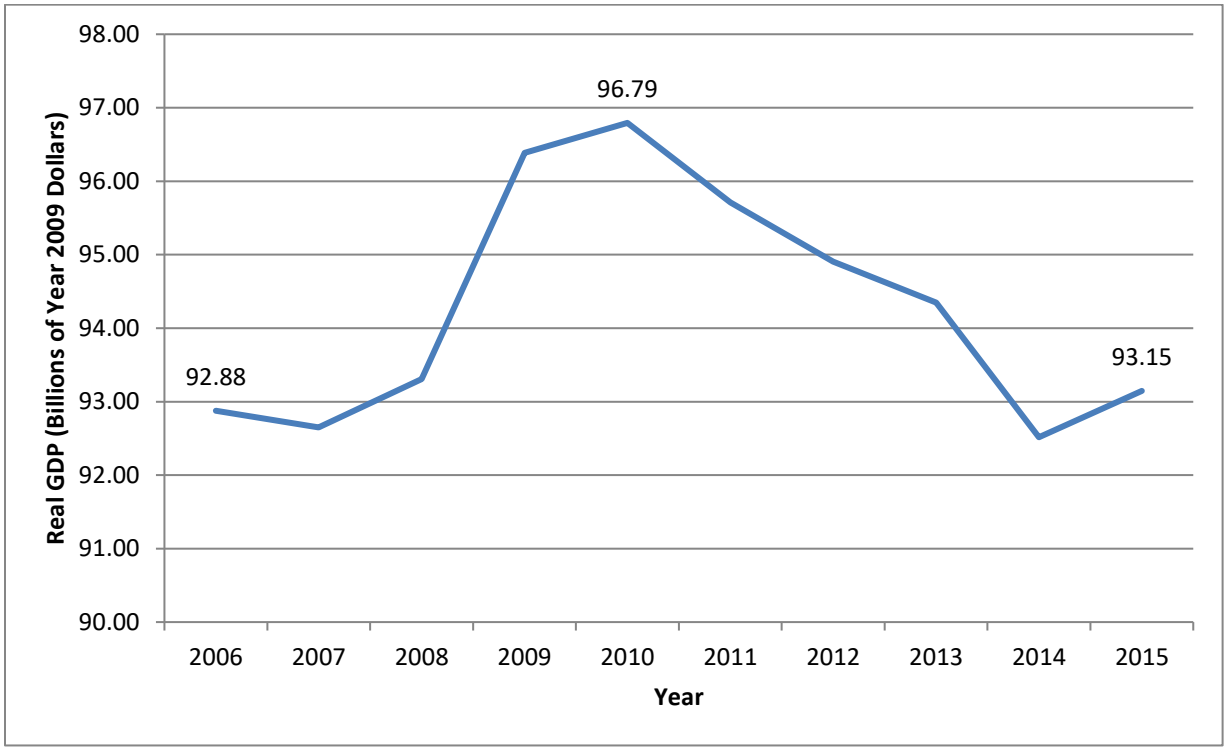


Figure 17: Real GDP trend in Puerto Rico

Source: Government Development Bank for Puerto Rico

One of the most telling measures of economic well-being is real GDP[3]. Figure 17 shows that from 2006 to 2015, real GDP increased by less than 1%; however, this ten year period was

[3] Real GDP is GDP adjusted for inflation. A single base dollar year (2009) based on the consumer price index is used to compare values across years.

marked by a 4.2% increase in real GDP from 2006-2010 and a 3.8% decrease in real GDP from 2010-2015. As a result, Puerto Rico's economy is roughly the same size as it was 10 years ago, and has been steadily declining since 2010 due the island's lagged recovery from the Great Recession. However, it also must be noted that although real GDP has declined in Puerto Rico since 2010, it increased slightly from 2014-2015. This trend is different from the nationwide US trend, in which there has been considerable growth over the last 10 years and a stronger recovery from the recession.[4]

According to the 2012 ACS five year estimates, 8.3% of the civilian population in Puerto Rico age 16 years and older were unemployed. This was an increase of 0.5% from the figure of 7.8% reported in the 2000 US Census.

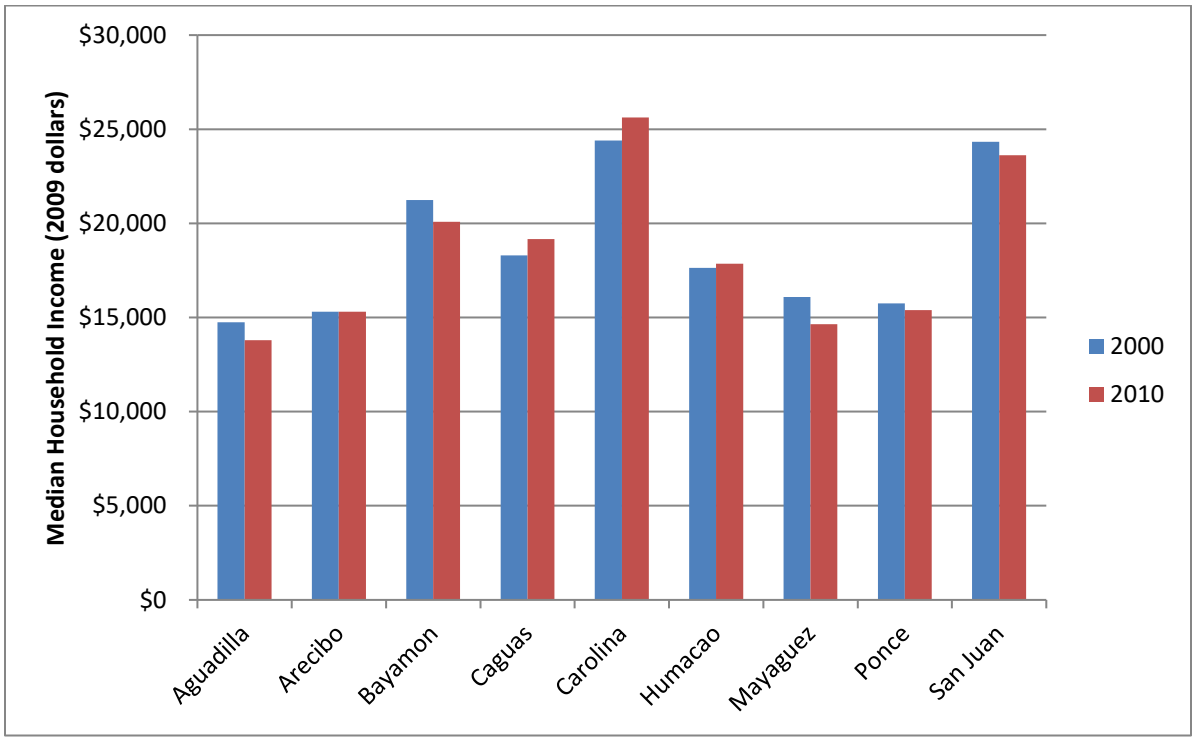


Figure 18: Median household income in Puerto Rican regions (inflation adjusted to 2009 dollars)

Source: US Census Bureau, Decennial Census of Population and Housing

[4] Right before the publication of this report, The Commonwealth of Puerto Rico filed for bankruptcy protection in order to combat rising debts and declining populations. Bankruptcy may not immediately change the day-to-day lives of Puerto Rico's people, but it may lead to future cuts in pensions and worker benefits, and possibly a reduction in health and education services. The bankruptcy process will also give Puerto Rico the legal ability to impose drastic discounts on creditor recoveries, but could also create reluctance among investors and prolong the island's lack of access to debt markets (Brown 2017).

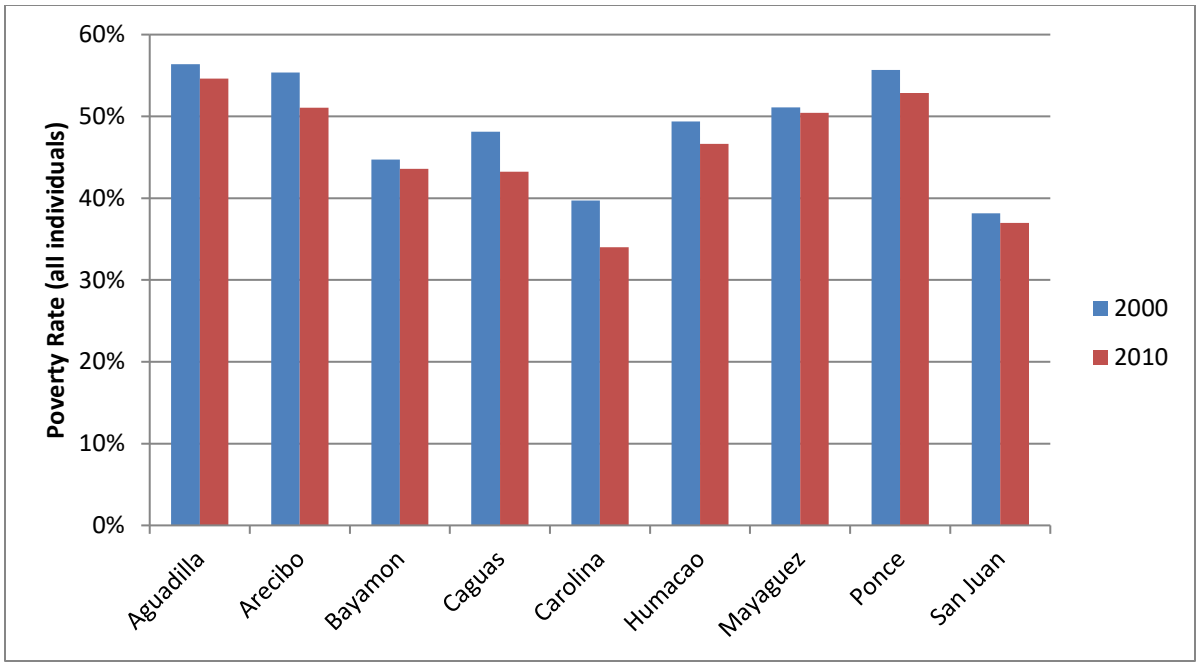


Figure 19: Level of poverty in Puerto Rican regions

Source: US Census Bureau, Decennial Census of Population and Housing

Figure 18 shows that real median household income, measured in 2009 dollars using the consumer price index, decreased in six out of nine Puerto Rican regions from 2000 to 2010 (US Census). The largest increase was observed in Carolina, where real median household income increased by 5% over the course of the decade, and the largest decrease was observed in Mayaguez, where real median household income decreased by 9% over the course of the decade. For Puerto Rico as a whole, real median household income decreased by 2% from $18,536 in 2000, to $18,235 in 2010. Additionally, Figure 19 shows that the percent of the population below the poverty line decreased in all Puerto Rican regions from 2000 to 2010, with the largest decrease observed in Carolina (US Census). In Carolina, the poverty rate decreased from 40% in 2000, to 34% in 2010. For Puerto Rico as a whole, the poverty rate decreased by 3% from 48% in 2000, to 45% in 2010. Although poverty rates have been declining, it must be noted that Puerto Rico exhibits a relatively high level of poverty compared to the US average, in which at least one third of all residents in each of the regions are below the poverty threshold (and in some cases, over half of a region's residents are below the poverty threshold).

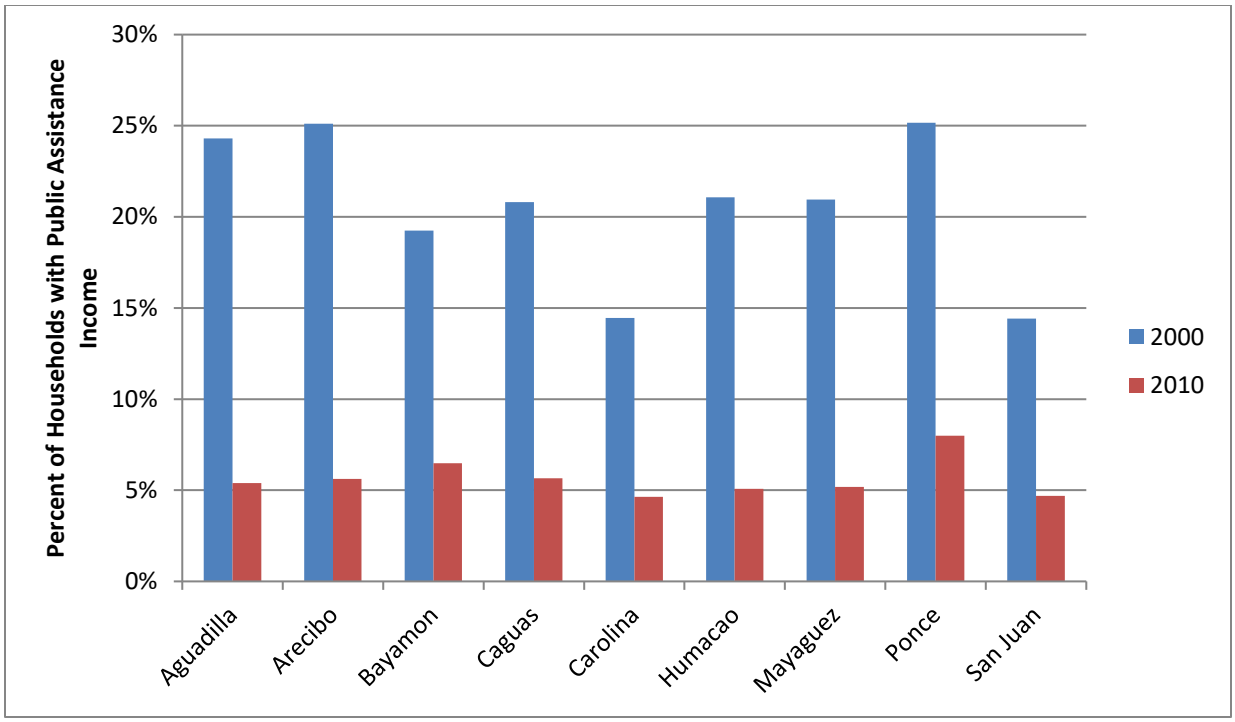


Figure 20: Public assistance in Puerto Rico

Source: US Census Bureau, Decennial Census of Population and Housing

Figure 20 indicates that the percentage of households receiving public assistance income[5] decreased in all nine Puerto Rican regions from 2000 to 2010 (US Census). The most drastic decrease was observed in Arecibo: 25% of households in Arecibo were receiving public assistance income in 2000, compared to just 6% of households receiving public assistance income in Arecibo in 2010. For Puerto Rico as a whole, the percentage of households receiving public assistance income decreased from 20% in 2000, to 6% in 2010. This large decrease in public assistance income dependence could be due, in part, to declining participation in the Temporary Assistance to Needy Families (TANF) Program throughout the 2000s. By 2009, only 32% of eligible families in the US (including Puerto Rico) received TANF benefits, compared to 52% in 2000 (US HHS 2010).

[5] Public assistance income provides cash payments to poor families and includes General Assistance and Temporary Assistance to Needy Families (TANF), which replaced Aid to Families with Dependent Children (AFDC) in 1997. Public assistance income does not include Supplemental Security Income (SSI), noncash benefits such as Food Stamps/SNAP, or separate payments received for hospital or other medical care (US Census Bureau 2011).

Health

Health, both physical and mental, contributes tremendously to individual and population well-being. Measures of life expectancy, mortality, and opportunity for a healthful lifestyle can be used to assess a population's health. Some of the measures that will be used as part of the indicator for health across all jurisdictions include leading cause of death, life expectancy, and three categories of age-adjusted death rates (from all cancers, from heart disease, and overall). The leading cause of death in Puerto Rico (2010-2012) was diseases of the heart, and the average life expectancy (2012) was 79.07 years of age. In 2010, the age-adjusted death rate from all cancers was 123.3 per 100,000 people (US average: 172.8 per 100,000 people), the age-adjusted death rate from heart disease was 124.9 per 100,000 people (US average: 179.1 per 100,000 people), and the overall age-adjusted death rate was 708.7 per 100,000 people (US average: 747 per 1000,000 people). It is important to track the overall health of the population in relation to the state of the environment, as the impact of environmental stressors on human health has been shown to result in severe consequences. For example, a recent report finds that "the air we breathe, the food we eat, the water we drink, and the ecosystems which sustain us are estimated to be responsible for 23% of all deaths worldwide" (UNEP 2016).

Basic Needs, Access to Social Services, and Education

Basic needs, access to social services, and education are important social dimensions of well-being. The measures for basic needs include those related to the adequacy of housing, access to healthy food, and clean water. Basic needs are linked to the environment and its ability to provide the regulating and provisioning services that are necessary for water, food, and shelter. Of the 2010 US Census Bureau reported figure of 1,636,946 housing units in Puerto Rico, 1,376,531 (84%) were occupied. Of the occupied housing units, 986,165 (72%) were owner-occupied and 390,366 (28%) were renter-occupied. In 2010, the median value of owner occupied housing units in Puerto Rico was $121,500 and the median age of housing units was 33 years. The average household size in 2010 was 3.05 persons per household, and this was an increase of 2.3% from the figure of 2.98 persons per household reported in 2000. Similarly, the average family size in Puerto Rico also increased by 5.6% from 3.41 persons per family in 2000 to 3.60 persons per family in 2010.

In 2010, 92% of the civilian non-institutionalized population in Puerto Rico had health insurance coverage. Also, as of 2010, 18.9% of occupied Puerto Rican households lacked access to a vehicle, and 7.0% of occupied households lacked access to telephone service. Additionally, 1.5% of occupied Puerto Rican households lacked access to complete plumbing (US Census, American Community Survey), and similarly, 1.7% of occupied Puerto Rican households lacked access to a complete kitchen (US Census). As of 2013, 56.8% of occupied households in Puerto Rico had access to a computer or laptop at home; of those, 78.7% had access to internet service (US Census, American Community Survey).

One of the key components of community well-being is education. K-12 enrollment, along with high school and college educational attainment will be combined to examine education. Figure 21 shows that in 2010, 70% of Puerto Rican residents aged 25 and older had completed high school or higher, and 23% of Puerto Rican residents aged 25 and older had completed a bachelor's degree or higher. Both of these figures represented an increase in educational attainment since 2000, in which 60% of Puerto Rican residents aged 25 and older had completed high school or higher, and 18% of Puerto Rican residents aged 25 and older had completed a bachelor's degree or higher (US Census).

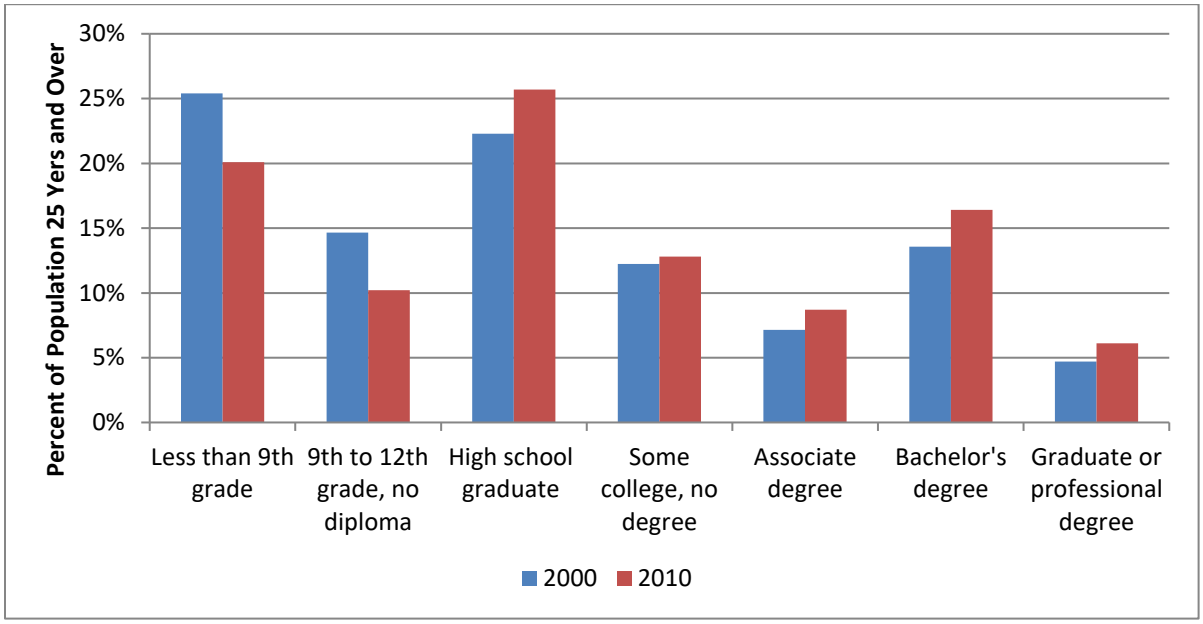


Figure 21: Levels of educational attainment in Puerto Rico

Source: US Census Bureau, Decennial Census of Population and Housing

Physical Infrastructure

In addition to the five community well-being indicators, an indicator of physical infrastructure will be monitored in order to track coastal development, access to coastal resources, and waste management/water supply infrastructure. Indicators for physical infrastructure relate to both the human development footprint, as well as measures in place to mitigate human impacts to the marine environment (e.g., point and non-point sources of land-based pollution, as well as sewage treatment and abatement). Some key aspects of physical infrastructure in Puerto Rico are outlined below.

Pollution

Water

The Puerto Rico Environmental Quality Board monitored 100% of all beaches in Puerto Rico in 2012. Of these, 45% were impacted by a beach advisory action; however, only 4% of beach days were impacted (EPA). And as evidenced by Table 9, of the coastal shoreline water bodies that were assessed, 64% were deemed to be "impaired" in 2012 (EPA). A waterbody is considered "impaired" if any one of its uses is not met ("uses" include aquatic life, recreation, fish/wildlife propagation water supply, fish consumption, etc. and "impairments" can be caused by a variety of things including bacteria, fecal coliforms, dissolved oxygen, sulfate, algal blooms, metal content, mercury, etc.). Along with the prevalence of pollution in Puerto Rico's non-coastal water bodies, this fact indicates that water pollution in Puerto Rico is fairly widespread.

Table 9: Puerto Rico water quality assessment report; 2012

	Rivers and Streams (miles)	Lakes, Reservoirs, and Ponds (acres)	Bays and Estuaries (sq miles)	Coastal Shoreline (miles)
Good waters	209.5	0.0	0.1	152.1
Previously impaired waters now attaining all uses	260.9	0.0	0.0	18.9
Threatened Waters	0.0	0.0	0.0	0.0
Impaired Waters	4,978.9	8,441.6	6.2	273.2
Total Assessed Waters	5,188.4	8,441.6	6.3	425.2
Total Waters	5,394.0	12,146.0	N/A	550.0
Percent of Waters Assessed	96.2%	69.5%	N/A	77.3%
Percent of Assessed Waters that are impaired	96.0%	100.0%	98.4%	64.3%

Source: US Environmental Protection Agency; Assessment and Total Maximum Daily Load Tracking and Implementation System (ATTAINS)

Air

According to the 2014 EPA National Emissions Inventory, Puerto Rico produced 444,316.9 short tons of "Tier 1" emissions in the year 2014 (a 21.5% decrease since 2011), 62.1% of which was carbon monoxide and 12.4% of which was volatile organic compounds. Other emissions included in this figure include ammonia, nitrogen oxide, particulate matter, and sulfur dioxide. The EPA tracks daily air quality through its Air Quality Index (AQI), and Table 10 illustrates the number of days under each quality condition as defined by the EPA for selected municipalities in Puerto Rico (if not listed, data were unavailable for that municipality). In 2014, these 11 Puerto Rican municipalities experienced a total of three days in which the air was "unhealthy" or "very unhealthy," and similarly in 2015, there were three days in which the air was "unhealthy." This indicates that air pollution is not a major threat to Puerto Rico's environmental health.

Table 10: Puerto Rico air quality days

	2015						2014					
Municipality	# Days with AQI	Good	Moderate	Unhealthy for Sensitive Groups	Unhealthy	Very Unhealthy	# Days with AQI	Good	Moderate	Unhealthy for Sensitive Groups	Unhealthy	Very Unhealthy
Adjuntas	91	85	6	0	0	0	42	40	2	0	0	0
Bayamon	268	253	14	1	0	0	274	274	0	0	0	0
Catano	365	336	27	1	1	0	365	345	20	0	0	0
Fajardo	322	302	20	0	0	0	303	282	21	0	0	0
Guayama	110	102	8	0	0	0	106	100	6	0	0	0
Guayanilla	111	101	10	0	0	0	27	27	0	0	0	0
Guaynabo	333	296	37	0	0	0	329	299	29	0	0	1
Juncos	342	335	4	3	0	0	365	365	0	0	0	0
Ponce	365	333	32	0	0	0	350	317	33	0	0	0
Salinas	344	339	2	1	2	0	343	339	2	0	2	0
San Juan	329	325	4	0	0	0	358	358	0	0	0	0

Source: US Environmental Protection Agency, Air Quality Index

Land cover

Impervious land cover[6] is a good indicator of development and may also be associated with land-based pollution that can damage coral reefs. Puerto Rico had a total of 834 square kilometers of impervious cover out of a total of 8,973 square kilometers of land area in 2010; or, approximately 9.3% of Puerto Rico is impervious cover (NOAA Digital Coast, C-CAP). Bayamon has the most impervious land cover out of the nine Puerto Rican regions in absolute terms, while the San Juan region has the largest amount of impervious cover in percentage terms (Table 11). However, it must be noted that because of the size of the regions, there are those that have significant impervious areas along the coast but are largely rural inland. So although Humacao has only 7.9% impervious cover, it includes the heavily developed northeastern coast (Luquillo to Ceiba), which has a significant impact on the adjacent coral reefs.

Table 11: Impervious surfaces by region, 2010

Region	Total Land Area (Sq. km)	Impervious Cover (Sq. km)	Percent of Impervious Cover
Aguadilla	732.88	75.92	10.4%
Arecibo	1401.05	93.51	6.7%
Bayamon	1130.06	142.20	12.6%
Caguas	1270.74	113.51	8.9%
Carolina	470.76	67.13	14.3%
Humacao	993.61	78.90	7.9%
Mayaguez	1132.42	78.12	6.9%
Ponce	1644.28	106.59	6.5%
San Juan	197.61	78.44	39.7%
Puerto Rico Total	**8973.41**	**834.32**	**9.3%**

Source: 2010 NOAA C-CAP

As of 2000, the development of man-made shorelines in Puerto Rico reached a total of 193.66 km (120.34 miles), or about 11% of the recorded total (NOAA/OR&R 2000). For the purposes of this report, man-made shorelines include: sheltered solid man-made structures (wooden or concrete seawalls, boat docks, and the like that are not directly exposed to the ocean); riprap (large stones or other large, rough-cut solid materials placed on the shore to prevent or reduce erosion due to wave action); and exposed, solid, man-made structures (wooden or concrete seawalls, boat docks, and the like that are directly exposed to the ocean).

[6] Impervious surfaces are mainly artificial structures—such as pavements (roads, sidewalks, driveways and parking lots) that are covered by impenetrable materials such as asphalt, concrete, brick, or stone. These types of materials do not let water drain through them.

Most of the development in mainland Puerto Rico lies on the coast, with the island's most densely populated and urbanized region being in the San Juan/Bayamon area on the northern coast of the main island. As one ventures inland from the coast in mainland Puerto Rico, communities become more rural as development becomes progressively less dense. The elevation increases as well when examining the inland areas of the Puerto Rican mainland. The main mountain range in the center of the mainland is the La Cordillera Central (The Central Range). The existence of military bases and operations on Culebra (from 1939-1975) and Vieques (from 1941-2003) necessarily precluded civilian coastal development on military lands. Conversely, coastal development in mainland Puerto Rico has led to more degradation of mainland adjacent coral reefs when compared to coral reefs adjacent to Culebra and Vieques, in which a 'sanctuary-like effect' emerged due to military presence (Geo-Marine, Inc. 2005). Culebra and Vieques remain inhabited, but not densely populated.

Construction Permits

Construction permits are indicative of development trends and data concerning these permits are utilized here to further operationalize the indicator of physical infrastructure. As of 2015, the number of construction permits granted has decreased by 62% and the value of construction permits (in inflation adjusted dollars) has decreased by 66% since 2006 (Table 12). The number of construction permits granted in Puerto Rico has decreased every year since 2006, and although the value of construction permits has varied year to year, the overall trend is downward (Government Development Bank for Puerto Rico 2016). These figures indicate a declining emphasis on built development in Puerto Rico in terms of permit support.

Table 12: Construction Permits in Puerto Rico; 2006-2015

Fiscal Year	Number of construction permits	Value of construction permits (nominal dollars)	Value of construction permits (constant 2015 dollars)
2006	9,451	$2,819,039,000	$3,314,286,541
2007	8,997	$2,192,688,000	$2,507,015,589
2008	7,897	$2,475,845,000	$2,725,541,931
2009	6,261	$1,783,411,000	$1,970,283,564
2010	5,310	$1,261,858,000	$1,371,582,518
2011	4,758	$1,190,905,000	$1,254,850,117
2012	4,084	$1,526,816,000	$1,576,179,464
2013	4,039	$899,235,000	$914,906,966
2014	3,651	$840,009,000	$841,006,071
2015	3,623	$1,143,261,000	$1,143,261,000

Source: Government Development Bank for Puerto Rico; Puerto Rico Planning Board

Waste Management and Water Supply

According to the latest data available, of the 1,418,476 housing units in Puerto Rico, 84,186 (6%) lacked complete plumbing facilities (US Census 2000), and as of 2016, there were 32 landfill facilities in Puerto Rico (EPA 2016). However, a portion of these landfills are not in compliance with EPA regulations and will be closing soon (Luis Villanueva; personal communication; April 25, 2017). Another facet of waste management is recycling: it was found that only 10% of solid waste in Puerto Rico is recycled (Puerto Rico Solid Waste Authority 2010). Additionally, Puerto Rican residents generate more waste than people living in the mainland US, and recycling rates in Puerto Rico are lower (EPA 2015). Two Commonwealth agencies--the Puerto Rico Solid Waste Management Authority and the Environmental Quality Board have local responsibility for managing the island's solid waste.

According to the US Geological Survey (2010), 360,341 people (10%) in Puerto Rico were served by groundwater while 3,327,451 people (89%) were served by surface water. An additional 37,997 people (1%) were reported to be self-serviced. As of 2016, there were 38 dams in Puerto Rico (US Army Corps of Engineers 2016). As of 2012, there were 123 publically and privately owned wastewater treatment facilities in Puerto Rico (Figure 22), serving approximately 3.7 million people (EPA 2012). Figure 22 displays the proximity of these wastewater treatment facilities to coral reef cover within Puerto Rico.

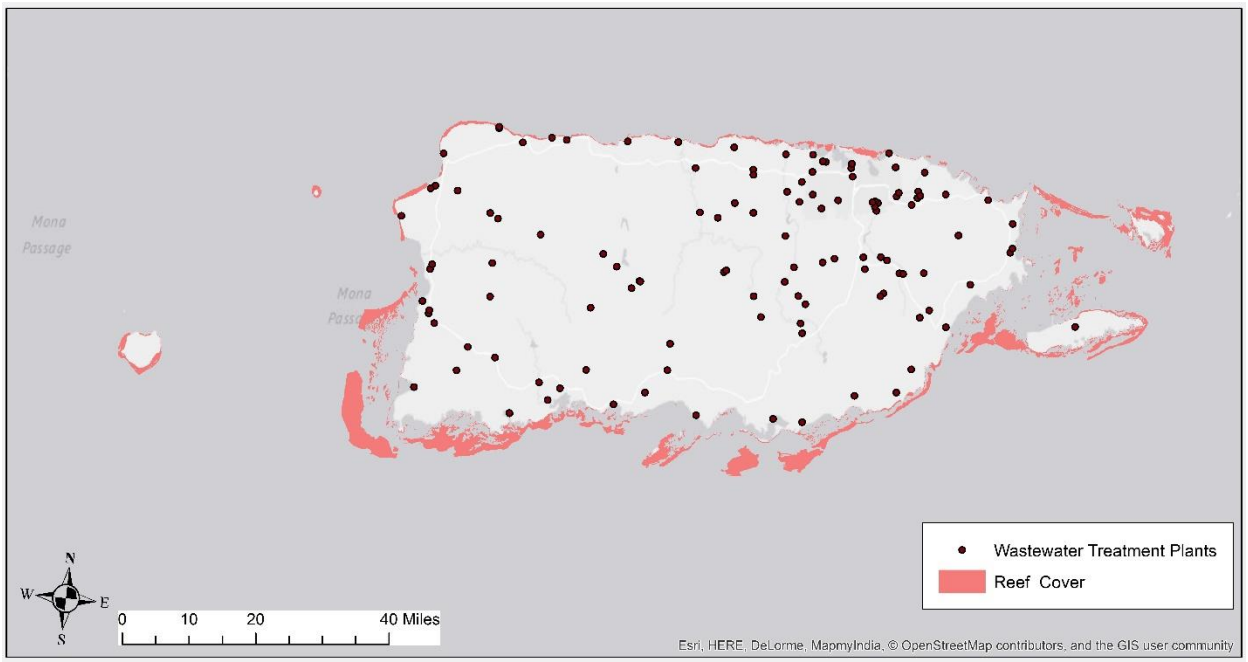


Figure 22: The proximity of wastewater treatment facilities to coral reef cover in Puerto Rico
Source: US Environmental Protection Agency

Physical Access to Coastal Resources

Forty-one percent of Puerto Rico's coastline has been classified as beach, and as of 2009, there were 231 identified beaches in 42 of the 44 coastal municipalities of Puerto Rico. Of these 231 beaches, 97 were considered to be accessible or swimmable (DNER 2009). According to the coastal municipalities and agencies within the central government of Puerto Rico, the most common factors negatively affecting beach access are beach erosion and solid waste management (NOAA/OCM 2015). Nevertheless, beach accessibility is widespread and mostly consistent across Puerto Rico.

Economic activities related to reefs

Also relevant to the NCRMP socioeconomic monitoring component are the various economic activities taking place along the coast. These activities can have direct and indirect impacts on coral reefs, and are outlined below.

Ocean-Related Industry

Table 13: Puerto Rico Ocean Sector Economy, 2012[7]

Sector	Number of establishments	Number of employees	Total Wages
Living Resources	14	10	$145,331
Marine Construction	19	642	$19,816,175
Marine Transportation	123	3,406	$103,046,969
Offshore Mineral Resources	43	14	$334,582
Ship and Boat Building	5	N/A	N/A
Tourism and Recreation	4,091	62,645	$798,495,848
Puerto Rico Total	**4,295**	**66,720**	**$921,838,905**

Source: NOAA Digital Coast, ENOW

Table 13 shows a snapshot of the ocean sector economy in Puerto Rico for the year 2012. These numbers reflect the sum of all economic activities related to the following industries: marine construction, living resources, offshore mineral extraction, ship/boat building, tourism/recreation, and marine transportation. The ocean sector economy supported almost 67,000 employees (7.2% of total employment) at 4,295 establishments (8.8% of total establishments) and provided over $900 million in total wages (3.7% of total annual wages) throughout Puerto Rico in 2012 (Abt Associates 2016).

[7] At the time of this report, there were no available data concerning Puerto Rico's ocean economy's gross domestic product.

Fishing

Fishing in Puerto Rico, both commercial and recreational, is coral reef dependent. Coral reefs provide necessary habitat for several commercially important fish species such as snapper, grouper, spiny lobster, and parrotfish. There is a strong correlation between healthier, more expansive reefs and increases in fish biomass and abundance (Vincent *et al.* 2011, Friedlander and DeMartini 2002), and this suggests that the health of coral reefs is an important driver of commercial and recreational fishing harvest and value.

Matos-Caraballo and Agar (2011) report that there were 1,129 licensed fishers in Puerto Rico in 2009. Based on their survey of 868 fishers, they found that commercial fishermen, on average, derived over 75% of their household income for fishing, and 77% of commercial fishermen targeted reef fish, indicating a high dependency on marine resources from coral reefs. Additionally, over 70% of the survey respondents in this study self-reported that they operated on a full-time basis, which is 39% higher than the levels reported in the 2002 census of commercial fishermen in Puerto Rico. This indicates an increased dependency on marine resources over time.

Table 14: Commercial fishing harvest for all fish species in Puerto Rico, 2000-2012[8]

Year	Harvest (in lbs)	Ex-vessel revenue[9] (nominal dollars)	Ex-vessel revenue (Constant 2015 dollars)
2000	5,745,811	$12,520,668	$17,233,514
2001	4,986,372	$11,316,180	$15,144,704
2002	3,807,498	$8,741,779	$11,517,233
2003	4,181,053	$9,714,130	$12,513,119
2004	3,986,703	$9,857,222	$12,368,074
2005	6,201,473	$16,767,962	$20,349,678
2006	2,412,597	$6,715,499	$7,895,275
2007	2,204,064	$6,343,087	$7,252,385
2008	3,355,399	$9,482,060	$10,438,356
2009	2,850,501	$8,359,394	$9,235,323
2010	2,813,245	$8,707,551	$9,464,714
2011	2,058,912	$6,872,215	$7,241,216
2012	2,310,195	$8,206,840	$8,472,175

Source: Fleming *et al.* 2014

[8] NOAA NMFS Commercial Fisheries Statistics Database does not report landings or harvest value data for Puerto Rico; therefore, data were obtained through a NOAA Technical Memorandum concerning economic activities in the Southeast United States and United States Caribbean (Fleming *et al.* 2014).

[9] These values are adjusted for under-reporting and non-reporting.

Table 14 displays time-series data concerning commercial fish harvest in Puerto Rico for the years 2000-2012. Although the overall trend is downward, there have been spikes upward (2002-2005 and 2007-2008) throughout this time period as well. Since 2000, the Puerto Rico fishery harvest in pounds has decreased by 60%, and the Puerto Rico fishery harvest value in inflation-adjusted 2015 dollars has decreased by 51%, indicating that the coral reef ecosystem has lost some of its commercial fishing value over this time.

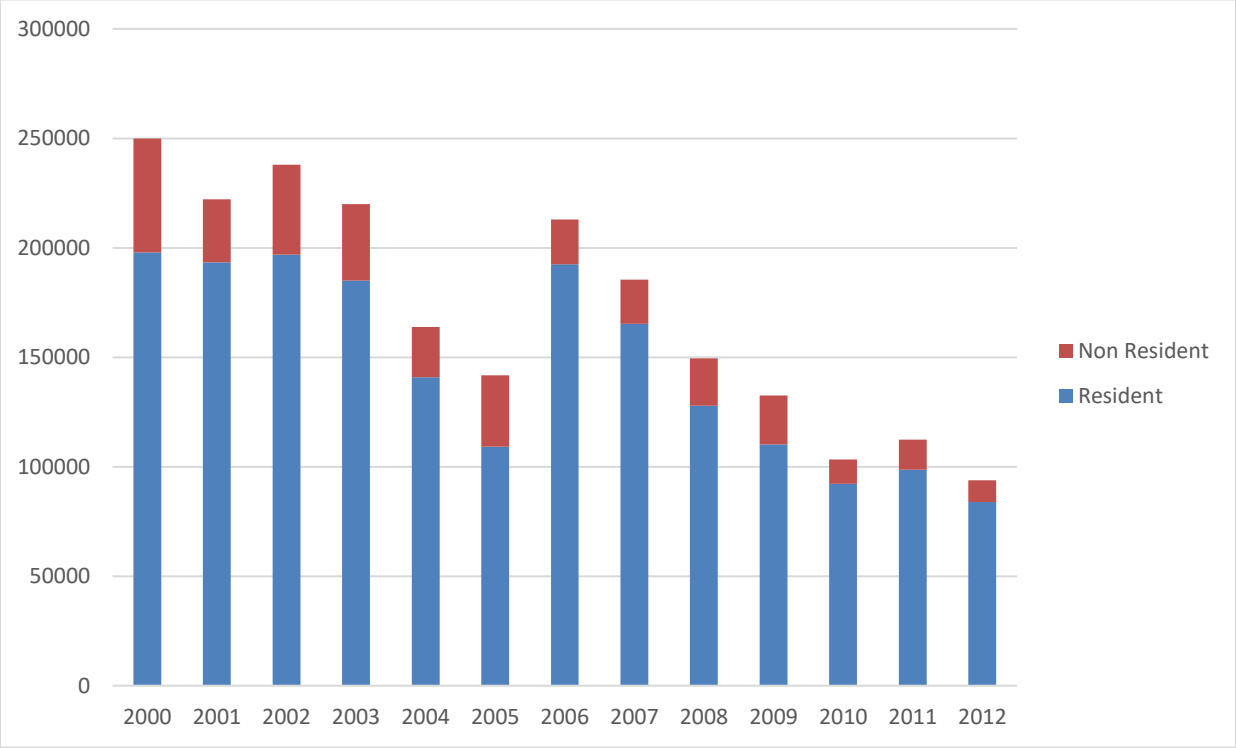


Figure 23: Number of recreational fishing anglers by resident status, 2000-2012

Source: NOAA NMFS Marine Recreational Fisheries Statistics Survey (MRFSS)

Figure 23 shows the recent trend in the number of reported recreational anglers delineated by residency status in Puerto Rico, as collected through NOAA National Marine Fisheries Service's (NMFS) Marine Recreational Fisheries Statistics Survey (MRFSS). Since 2006, the number of recreational anglers in Puerto Rico has been steadily declining except for a slight uptick in the number of recreational anglers from 2010 to 2011. In 2000, 79% of recreational anglers in Puerto Rico were Puerto Rican residents; however, that figure increased to 89% in 2012.

Table 15: Recreational fishing harvest (in lbs) by mode of fishing for all fish species in Puerto Rico, 2000-2012

Year	Shore	Charter boat	Private/Rental boat	Total
2000	358,431	48,173	4,248,827	4,655,431
2001	526,990	23,283	2,754,919	3,305,191
2002	193,104	22,437	2,238,810	2,454,351
2003	405,731	28,251	3,333,598	3,767,579
2004	166,042	40,436	1,943,387	2,149,865
2005	93,710	41,690	1,838,497	1,973,897
2006	128,394	154,381	2,119,646	2,402,422
2007	134,827	43,063	2,197,797	2,375,686
2008	77,204	39,971	1,794,136	1,911,312
2009	67,777	10,961	1,087,450	1,166,187
2010	46,309	3,442	734,317	784,068
2011	59,073	2,957	829,631	891,662
2012	36,683	2,563	1,206,772	1,246,019

Source: NOAA NMFS Marine Recreational Information Program (MRIP)

Table 16: Number of recreational fishing angler trips by mode of fishing in Puerto Rico, 2000-2012

Year	Shore	Charter boat	Private/Rental boat	Total
2000	792,890	16,899	552,914	1,362,704
2001	896,675	10,919	504,349	1,411,943
2002	693,938	34,277	572,844	1,301,059
2003	617,900	21,764	471,741	1,111,405
2004	638,802	22,028	389,469	1,050,298
2005	468,843	17,969	379,910	866,723
2006	507,026	16,823	431,274	955,123
2007	615,455	10,734	453,907	1,080,097
2008	423,190	12,622	362,739	798,551
2009	345,584	2,610	287,957	636,151
2010	219,651	4,113	312,419	536,183
2011	232,917	4,730	186,939	424,587
2012	140,266	1,839	208,462	350,568

Source: NOAA NMFS Marine Recreational Information Program (MRIP)

Tables 15 and 16 also exemplify the decrease in recreational fishing effort in Puerto Rico from 2000-2012. The number of angler trips taken and the weight of fish harvested have both steadily decreased since 2000, with harvest weight decreasing by 73% and the number of trips taken decreasing by 74% by 2012. Overall, the most frequently utilized mode of fishing in terms of number of trips is fishing from shore; however, the greatest amount of fish harvest in weight comes from anglers who fish from private or rental boats.

A study commissioned by NOAA's National Marine Fisheries Service (NMFS) found that recreational anglers generated $72 million in direct expenditures for the state of Puerto Rico (Lovell et al. 2013) in 2011 (approximately $75.9 million in 2015 dollars). This analysis included residents of and visitors to Puerto Rico. Residents spent $14 million on trip expenses: $68,000 on for-hire trips, $11 million on private boat trips, and $3.4 million on shore trips. Non-residents spent $2 million on trip expenses: $1.5 million on for-hire trips, $441,000 on private boat trips, and $48,000 on shore trips. Economic impacts such as jobs supported and GDP contribution for marine recreational expenditures were not able to be estimated for Puerto Rico, as there was no available input-output model for Puerto Rico at the time of this report.

Snorkeling/Diving

Garcia-Moliner *et al.* (2001) found that there were 68 different dive operations in Puerto Rico in 1999, 14 of which were based in San Juan. Based on information provided by the dive operators concerning the average number of dives per week and the average number of people that go on a dive, the same study found that the maximum number of potential dives was 196,664 dives per year in Puerto Rico. These numbers can be considered conservative estimates because they do not take local diving activity into account (i.e. local divers who own boats and equipment who dive on weekends and participants in local dive clubs).

Tourism

Tourism is an integral aspect of the Puerto Rican economy. In 2014, annual visitor arrivals reached 3,246,000 (World Bank 2014), and the tourism and travel industry in Puerto Rico directly produced a GDP of $2.43 billion (approximately 2.4% of Puerto Rico's total GDP) and directly supported approximately 20,000 jobs. When indirect and induced effects are taken into account, Puerto Rico's tourism sector contributed $7.4 billion to the total economy (approximately 7.3% of Puerto Rico's total GDP) and supported approximately 67,000 jobs. Additionally, visitor exports (money spent by foreign visitors to a country) generated over $3.8 billion in Puerto Rico, and tourism generated almost $1.5 billion in capital investments. By 2025, international tourist arrivals are forecasted to be 5,115,000, while tourism's total economic contribution to Puerto Rico's economy is projected to rise to over $9.7 billion (WTTC 2015).

Cruise ship tourism in San Juan, Puerto Rico (Photo Credit: Jarrod Loerzel)

Results: Section 3

The final section of results presents Governance as an example of an indicator that will be measured through a combination of the NCRMP survey data as well as secondary data. Below, examples of both types of measures are featured. The measurements concerning the sources of coral reef-related information, the level of trust for each information source, and involvement in coral reef decision making come from the NCRMP survey data, while all other facets of the governance indicator were derived from secondary data sources.

Governance

Governance measures such as public trust, percent area of coral reefs under management or protection, level of community involvement in decision making/local reef governance, and the presence, longevity, and focus of MPAs and other marine managed areas were used to assess governance related to coral reefs and the marine environment for Puerto Rico.

Sources of coral reef-related information and level of trust

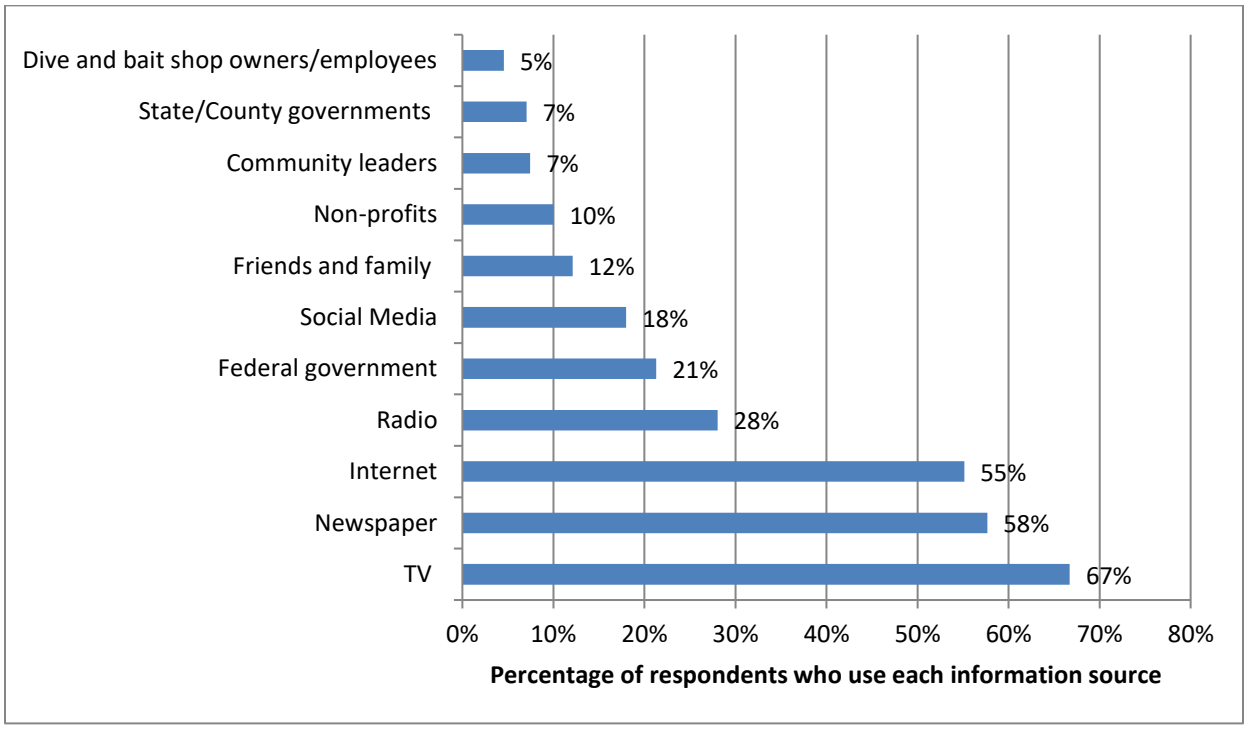


Figure 24: Top sources of information on coral reefs (n = 2,494)

Figure 24 shows that 67% of respondents indicated that they use TV as a source for information pertaining to coral reefs (first, second, or third choice). Respondents' top three sources for information about coral reefs and the environment were TV, newspaper, and the internet. The least used information sources were the state/local government and dive/bait shops.

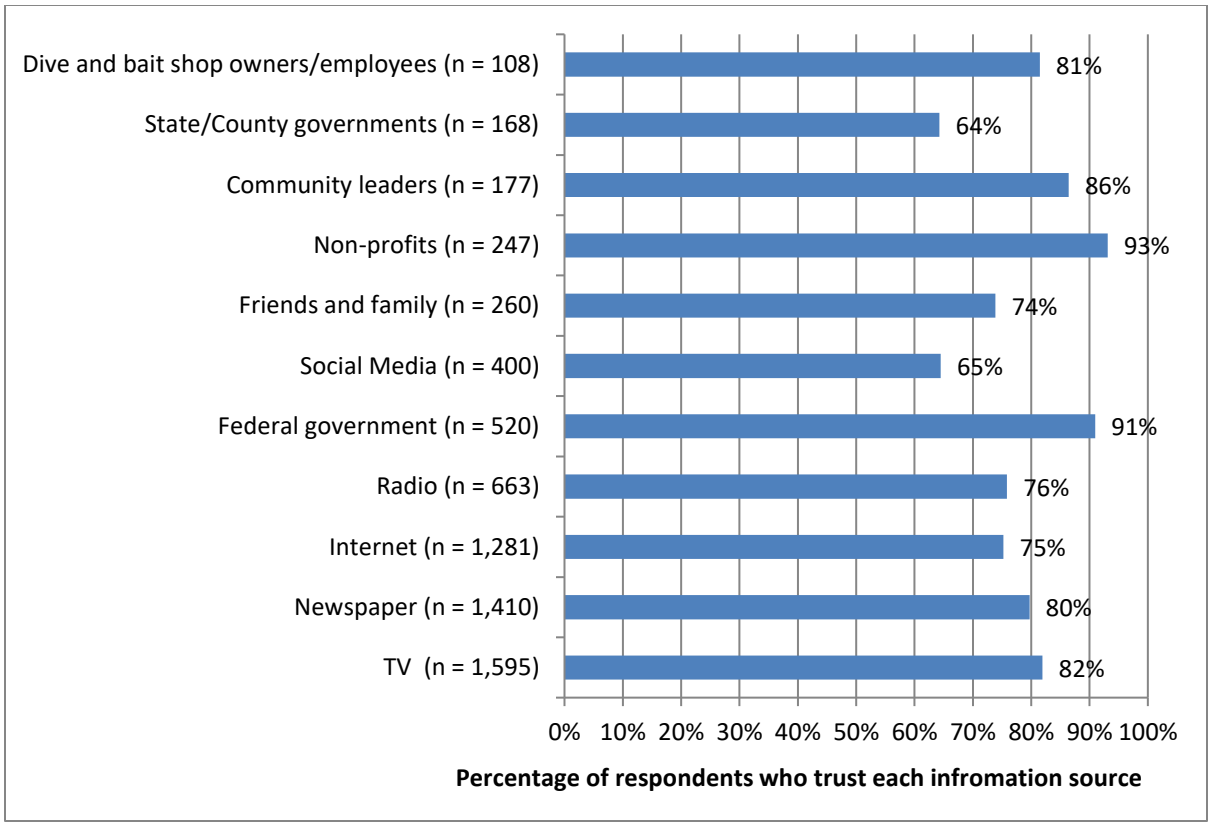


Figure 25: Respondent level of trust in each coral reef information source

Figure 25 indicates the degree to which respondents trust the information sources that they use (respondents were only asked to rate their trustworthiness of an information source if they indicated that they used the particular information source). Respondents demonstrated high degrees of trust ("very trustworthy" or "trustworthy") for newspaper (80%), television (82%), and internet (75%). Respondents who obtained information from non-profits and the federal government believed these sources to be the most trustworthy (93% and 91%, respectively), whereas the information sources found to be least trustworthy ("very untrustworthy" or "untrustworthy") were state/local governments (20%) and social media (14%).

Involvement in coral reef management decision making

Survey respondents in Puerto Rico were asked how much they felt their communities were involved in protecting and managing coral reefs. Of the 2,375 that responded, 12% stated that communities were at least "moderately involved," and 21% stated that communities were "slightly involved." Respondents were also asked this question at the individual level, and of the 341 that responded, 23% indicated that they themselves were at least "moderately involved" in decisions related to protecting and managing coral reefs, while 42% indicated that they were "slightly involved." With respect to quantifying the opportunities in place for residents to get involved in the protection and management of coral reefs in Puerto Rico, 86% of the 2,384 individuals that responded indicated that there were "never" any opportunities to get involved, and zero respondents felt that there were "frequent" opportunities to get involved.

Other governance indicators

Based on the NOAA Marine Protected Areas (MPA) Inventory, 100% of all marine managed areas in Puerto Rico had management plans in place (2014) (Table 17). The oldest inventoried marine managed area was established in 1972, while others were established as recently as 2012. Additionally, commercial and recreational fishing were prohibited at three of the marine managed areas and investigation shows that 29% of the mapped coral reef ecosystems (defined as "Coral Reef and Colonized Hardbottom") in and around Puerto Rico were under some form of management regime. However, it should be noted that this analysis of known coral reef habitat falling within management boundaries is not intended to equate to an assessment of management adequacy or efficacy. Additional metrics would be required for this type of evaluation. This analysis and consolidation of information concerning Puerto Rico's marine managed areas was limited to areas that protect coral reef habitat and is not meant to include every marine managed area in the jurisdiction.

Table 17: Details of the Marine Managed Areas of Puerto Rico

Site Name	Year Estbl.	Area (sq km)	Coral cover (sq km)
Reseva Marina Arrecife de la Isla Verde	2012	0.9	0.17
Reserva Natural (Marina) Aguas Costeras Isla Desecheo	2000	7.4	3.92
Reserva Natural (Marina) Tres Palmas	2004	0. 9	0.84
Reserva Natural Arrecifes de la Cordillera	1985	100.5	26.33
Reserva Natural Arrecifes de Guayama	1980	8.1	4.97
Reserva Natural Arrecifes de Tourmaline	1998	75.0	28.37
Reserva Natural Bahía Bioluminiscente de Vieques	1989	80.0	2.68
Bosque Estatal de Boquerón	1998	173.6	10.34
Bosque Estatal de Guánica	1985	14.3	7.72
Reserva Natural Las Cabezas de San Juan	1975	268.3	0.65
Reserva Natural Isla Caja de Muertos	1980	55.4	31.20
Reserva Natural Canal Luis Peña	1999	6.4	2.916
Reserva Natural Caño La Boquilla	2002	106.4	1.79
Reserva Natural Corredor Ecológico del Noreste (west)	2011	237.4	2.13
Reserva Natural Corredor Ecológico del Noreste (east)[10]	2011	27.1	5.52
Reserva Natural Cueva del Indio	1992	15.6	0.08
Reserva Natural Finca Belvedere	1978	40.3	1.60
Reserva Natural Hacienda La Esperanza	1987	50.9	0.36
Reserva Natural La Parguera	1979	325.8	68.57
Aguas Costeras Isla de Mona y Monito	1972	1520.9	19.71
Reserva Natural Pantano de Cibuco	1993	20.0	0.31
Rerserva Natural Punta Cucharas - Marino	2008	13.9	2.20
Reserva Natural Punta Guaniquilla	1976	8.7	0.23
Reserva Natural Punta Petrona	1985	31.1	1.06
Reserva Natural Punta Yeguas	1975	263.8	4.41
Reserva Natural del Río Espíritu Santo	2001	118.3	0.82
Jobos Bay National Esturaine Research Reserve	1981	9.2	0.34
Total		**3,579.3**	**229.24**

Source: 2014 NOAA Marine Protected Areas Inventory and Schärer-Umpierre et al. (2014); area calculations performed in Eckert IV WGS84 projection

[10] There are two separate entries for the Reserva Natural Corredor Ecológico del Noreste due to the fact that two separate entities were delineated to create the contiguous "Northeast Ecological Corridor."

Discussion

Based on the survey findings, a few general conclusions about the population of Puerto Rico and their interactions with and knowledge/awareness of coral reefs can be made. These can be considered preliminary findings, and more detailed analyses of these data is planned for the future. This section is concluded by proposing directions for future research.

With respect to participation in reef activities, study findings indicate that Puerto Rican residents participate in purely recreational coral reef related activities (SCUBA diving, snorkeling) at a low frequency, with the exception of swimming and beach recreation. It is believed that the reported activity participation rates are conservative estimates for Puerto Rico's coastal communities, as these estimates do not take the participation rates of tourists into account.

Fishing, spearfishing, and gathering of resources were three of the less common nearshore reef related activities in which residents of Puerto Rico participated. Our findings show that 15% of households stated that they engaged in fishing, spearfishing, or gathering. All things held equal, residents of the Ponce and Arecibo regions were more likely to engage in fishing, and residents of the San Juan and Bayamon regions were less likely to engage in fishing. The survey found that 58% of households consumed fish/seafood once a week or more, and that most fishers (85%) did not sell the fish they catch; however, it is uncertain what proportion of fishing targeted coral reef species, and what proportion of fish protein consumed came from coral reef versus non-coral reef fish species, as these distinctions were not specified in the survey. The need for this clarification has been noted, and as a result, the survey question will be adjusted in future iterations. Additionally, seafood consumed by Puerto Rican residents is predominantly purchased in supermarkets, grocery stores, and restaurants.

Survey respondents were asked about their perceptions of the health of Puerto Rico's coral reef resources. The findings showed that residents were generally divided in their perception of **marine resource conditions**, with the exception of the amount of coral, which was perceived by more residents as being in bad condition. However, residents tended to have a more negative perception concerning the change in marine resources over the last decade (that is, residents perceived that the condition of marine resources have worsened over time). When examining the effect of tenure (i.e. how long a resident has lived in the jurisdiction), it was found that residents who have lived in Puerto Rico for their entire life had a more positive perception concerning the change in condition of marine resources over the last decade, as well as a more positive perception concerning the current condition of ocean water quality. Differences in perceptions concerning marine resource condition were identified between respondents based on region of residence as well. All thing held equal, residents of Bayamon were more likely to have a more negative perception concerning the current condition of marine resources, while residents of San Juan were more likely to have a more positive perception concerning the change in condition of marine resources. This is an interesting finding as both San Juan and Bayamon are relatively urbanized, but have somewhat different perceptions of marine resource condition. This could, in

part, be driven by the regional sampling design of the NCRMP survey as in some cases, coastal and inland areas are encompassed in one region which can perhaps create a division in perceptions that may not exist closer to the coast. Furthermore, it was found that Puerto Rican residents who fish/gather marine resources have a more positive perception concerning marine resource condition when compared to those who do not fish/gather marine resources. The initial results provide strong support for continued exploration and analysis of the parameter "differences in perception" as future data collections allow for greater sample sizes. If perceptions of coral reef health truly vary by location, this may correlate to differing resource quality in different regions, which could, in part, explain the lack of consensus across regions concerning the condition of marine resources. It will also be interesting to see if the overall decline in Puerto Rico's population will have an effect on the quality of near shore coral reefs and associated ecosystems. There have been some conflicting studies on the status of coral reefs with respect to their proximity to large population centers (Smith *et al.* 2016, Bruno and Valdivia 2016). If the population continues to decline, the impact, if any, on coral reef health should be correlated.

Regarding the public's **awareness and knowledge of coral reefs**, this study found that the majority of the population stated that they are familiar with threats facing coral reefs (except coral bleaching, invasive species, coral diseases, and fishing/gathering impacts). That being said, over half of the respondents believed that the condition of coral reef resources would get worse in the next 10 years, and over half believed that the threats to coral reefs are "large" or "extreme." This suggests a lack of confidence amongst Puerto Rican residents that current threats to coral reefs are being (or can be) effectively addressed by current efforts. Another interesting finding is that residents in non-coastal municipalities (i.e. the municipality of residence does not border the coast) were more familiar with the threat of coral bleaching as well as the threat posed to coral reefs by too much fishing and gathering. Additionally, residents of coastal municipalities were more likely to agree that coral reefs protect Puerto Rico from erosion and natural disasters.

The study found that the public's **attitudes towards coral reef management strategies and enforcement** were largely positive. Residents expressed support for all of the potential marine management measures. In particular, 96% of the respondents supported stricter control of pollution sources. The least supported management option was "limited recreational use" (although 80% still support this, further exemplifying the widespread resident support for management). When examining resident perceptions of MPAs, the overall sentiment toward them was positive: 92% agreed that there should be more MPAs in Puerto Rico, and 90% agreed that MPAs increase the number of fish. However, there was some disagreement on whether MPAs have brought an economic benefit to Puerto Rico (55% agree, 14% disagree, 25% neither), and additionally, over one third of respondents agreed that fishermen's lives have been negatively impacted by the establishment of MPAs. Furthermore, residents that were found to be more reliant on coral reefs for sustenance were less likely to agree that MPAs increase fish and residents who fish/gather for marine resources were more likely to agree that there should be

fewer MPAs in Puerto Rico. There were also differences across region as it pertains to attitudes toward MPAs: residents of Humacao were more likely to be familiar with MPAs when compared to resident of the San Juan region. Given the substantial range of management options presented in the survey and the potential for these options to be applied in various combinations, this question was developed to provide a range of important feedback to resource managers. The responses allowed for evaluation of both support for each option, as well as the reaction to the particular words used to describe the management strategy. For example, although some marine protected areas may limit recreational use, 91% of respondents indicated that they "generally support the establishment of MPAs," however, when asked about limited recreational use alone, 80% of respondents agreed with this option.

With respect to **confidence in the enforcement of coral reef rules and regulations** in Puerto Rico, residents indicated that they were most confident ("confident" or "very confident") in legal and trial processes (27%), which indicates greater confidence (albeit slightly) when cases reach the court system. Overall, the most frequent choice for each facet of enforcement was "moderately confident," which indicates that resident confidence in enforcement is neither high, nor low, and that there is no true consensus amongst Puerto Rican residents concerning their confidence in the enforcement of coral reef rules and regulations. Additionally, residents of coastal municipalities tended to be slightly more confident in the enforcement of coral reef rules and regulations. We also attempted to track public participation and attitudes with respect to the **governance** of coral reefs and their resources. It was found that 100% of all marine managed areas in Puerto Rico had management plans in place, and 29% of all coral reef habitat was under some form of management. There appeared to be a low level of community involvement in coral reef decision making, as well as a low involvement in pro-environmental behavior aimed at improving the health of the marine environment and coral reefs (52% of survey respondents indicated that they never participate in pro-environmental behavior). The survey also found that Puerto Rican residents rarely relied on the local government for information regarding coral reef topics. In contrast, use of the federal government for information was more prevalent, as this was considered a more trustworthy source for information, whereas the local government was considered to be the least trustworthy of all information sources presented in the survey.

The collection of **secondary data,** including economic impacts of tourism and fishing, as well as data contributing to the development of some of the community well-being indicators, will continue over time. As updated data sets are produced by other NOAA offices and relevant agencies, these will be collected, synthesized, and housed within a centralized database, and will be used to track changes over time. These data may be incorporated into indicators that combine or compare biophysical parameters (e.g., fish biomass) with commercial landings data and public perceptions of general reef health. It is notable that the net increase in population density in Puerto Rico from 2000-2010 may have a potential impact on coral reef resources. Net growth could result in increased demand for coral reef ecosystem services including recreation and provisioning (food, products). Growth could also result in increases in impervious surfaces due

to general urbanization, as well as higher volumes of solid and sewage waste production, which in turn, can add more stress to coral reef ecosystems in Puerto Rico.

Future approaches and research ideas

There were a few lessons learned from the first NCRMP socioeconomic data collection in Puerto Rico. As similar surveys are implemented across other US coral reef jurisdictions, the NCRMP team will be adjusting the data collection effort to improve on the type of information generated. These findings should be considered as a starting point to develop more detailed research questions for future work. For example, there is a need to fine-tune the survey question on fish consumption and fishing activity to make it more specific to coral reef related fish and invertebrate species, as well as a need to distinguish between locally caught and imported fish. Anecdotally, the team observed some residents' negative perceptions of locally caught seafood and a strong preference for store bought, farm raised seafood products. This observed preference was due in part to resident perception concerning the impact of water pollution on adjacent seafood supply. More detailed questions would support assessment of the strength and extent of such perceptions. Also, within the confidence in the enforcement of coral reef rules and regulations section, jurisdictional partners in Puerto Rico expressed a need to delineate between federal and local forms of marine regulation enforcement to gain a greater understanding of Puerto Rican residents' confidence in the various facets of marine regulation enforcement. Additionally, the NCRMP team plans to refine the community involvement question in order to make the definition of "community" less ambiguous. Finally, some more context and explanation of what residents perceive to be climate change impacts is needed. For instance, 65% of survey respondents indicated they were familiar with climate change, but only 32% indicated that they were familiar with the climate change impact of coral bleaching. What this shows is that although residents are mostly familiar with climate change in a general sense, perhaps they are not as familiar with some of the more nuanced manifestations of climate change. The monitoring team will also aim to improve the level of comparability of questions across the different jurisdictions while maintaining questions that will provide information specifically relevant to the local context and management needs in Puerto Rico.

Another future research direction is to conduct analyses that explore relationships between different socioeconomic indicators, as well as comparisons between sub-populations as defined by the sampled respondents. These may include categories such as: age, gender, or familiarity with coral reefs, among others. For example, our results showed that there was a difference in the perceptions of those who fish versus those who do not fish in relation to their attitudes towards some coral reef management measures (fishermen tended to agree less with limited use and catch limits). The study also found that resource extraction was more common in Ponce and Arecibo than it was in the other regions. Additional future analysis will include an examination of the possible statistically significant differences in resident agreement levels pertaining to limited entry and access management measures versus top-down management measures in order to

understand what types of management strategies are best suited to foster support and adherence amongst the population.

Other potential improvements include the elicitation of public awareness of climate change and ocean acidification and their potential impacts on humans. This might include adaptation measures that are perceived to be more effective for community resiliency. Additional parameters for future consideration is the impact of invasive marine species, in particular the lionfish (*Pterois volitans*), for its detrimental effects on the coral reef ecosystem. Subsequent improvements to the survey instrument might include better distinguishing the sources of information on coral reefs and level of trustworthiness. This would provide information that could be incorporated into specific public outreach and education programs for current and future management measures.

The NCRMP socioeconomic data collection builds upon and supplements the considerable social science research that has been conducted in Puerto Rico to date. Integrating the NCRMP data with these studies, or comparing and contrasting findings, has the potential to provide a more complete understanding of human interactions with coral reef resources in the territory. For example, Brander and van Beukering (2013) found that Puerto Rico's coral reefs provide an estimated $1.093 billion in ecosystem service benefits per year to humans in year 2007 dollars (includes small scale fishing, recreation/tourism, coastal protection, education and research, existence, future, bequest, and biodiversity value). The socioeconomic monitoring data collected through the NCRMP provides further evidence of the contribution of Puerto Rico's coral reefs to the economic stability of the communities of the island.

Pendleton *et al.* (2016) also articulates the significant economic, provisioning, and protection value that coral reefs provide to local communities in Puerto Rico. This study found that in 2007, 897,188 people (24% of Puerto Rico's total 2007 population) received storm and wave protection from coral reefs and that 1,163 fishermen were involved in coral reef fisheries that generated a dockside revenue of $11,208,717 in 2005 ($13,602,952 in 2015 dollars). By coupling studies like these with socioeconomic monitoring of coral reef-adjacent communities, we can help provide managers with useful information for determining resource management needs that will align to communities' use and value for the resource. At the highest level, the NCRMP socioeconomic data are intended to allow for analyses across jurisdictions and regions (e.g. comparisons of Pacific to Caribbean) and within a single jurisdiction over time. These investigations will be, in large part, aimed at answering questions related to the success of US coral reef conservation efforts.

In future years, the NCRMP will continue to increase sampling in order to be statistically significant at smaller geographic scales within the jurisdictions. Expanding our survey sample will improve our ability to compare the NCRMP socioeconomic data to biophysical data collected through the NCRMP and jurisdictional agencies (for instance, comparing perceived coral reef resource condition to biological indicators), and to inform coral reef management and

monitoring across the entire jurisdiction. Finally, ongoing analyses of the individual metrics presented here will advance us toward reporting the survey and secondary data collection results for a variety of composite indicators such as governance and perceived resource condition. These indicators will aid in comparisons across jurisdictions, where individual metrics may not be the same. Further, the use of indicators will support communication of complex data in a way that facilitates resource management decision making.

Coral Reefs in Puerto Rico (Photo credit: NOAA)

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Appendix 1: National Coral Reef Monitoring Program

Understanding Socioeconomic Connections

The Socioeconomic Component of the National Coral Reef Monitoring Plan (NCRMP) gathers and monitors a collection of socioeconomic variables, including demographics in coral reef areas, human use of coral reef resources, as well as knowledge, attitudes, and perceptions of coral reefs and coral reef management. The overall goal of the socioeconomic monitoring component is to track relevant information regarding each jurisdiction's population, social and economic structure, the impacts of society on coral reefs, and the impacts of coral management on communities. NOAA's Coral Reef Conservation Program (CRCP) will use the information for research and to improve the results of programs designed to protect coral reefs.

The main purpose of the Socioeconomic Component of NCRMP is to answer the following questions: What is the status of human knowledge, attitudes, and perceptions regarding coral reefs? And, how are human uses of, interactions with, and coral dependence on coral reefs changing over time?

More details can be found here: http://www.coris.noaa.gov/monitoring/socioeconomic.html

Appendix 2: The NCRMP Survey Instrument

OMB SUBMISSION

NOAA Coral Reef Conservation Program
National Coral Reef Monitoring Program (NCRMP)
Resident Coral Reef Survey
OMB Control Number 0648-0646

Puerto Rico Survey

Survey conducted in (circle one): *English* *Spanish*

Introduction: *[greeting specific to jurisdiction]*

Hello, my name is [interviewer name]. I'm calling from [CONTRACT COMPANY] on behalf of the National Oceanic and Atmospheric Administration (NOAA) and the National Coral Reef Monitoring Program. We are interested in obtaining your opinions on important issues related to coral reefs in Hawaii. You were selected because you live in a coastal area near coral reefs.

This survey is being conducted in accordance with the Privacy Act of 1974 and the Paperwork Reduction Act. Your participation is voluntary, your answers are confidential and you can stop the interview at any time. The interview is expected to take less than 20 minutes. If you have questions or would like to know more about the survey I will provide you with contact information.

Notwithstanding any other provisions of the law, no person is required to respond to, nor shall any person be subjected to a penalty for failure to comply with, a collection of information subject to the requirements of the Paperwork Reduction Act, unless that collection of information displays a currently valid OMB Control Number. The OMB Control number for this survey is 0648-0646

The 20 minute estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information.

Please send comments regarding this burden estimate or any other suggestions for reducing this burden to Peter Edwards, National Oceanic and Atmospheric Agency, National Ocean Service, Coral Reef Conservation Program, (1305 East West Highway, Silver Spring, MD, 20910, USA).

1. Are you at least 18 years of age?

IF "YES" CONTINUE TO SCREENING QUESTION 2. IF "NO", END SURVEY.

2. Do you live in Puerto Rico at least 3 months of the year?

IF "YES" CONTINUE WITH QUESTION #1 OF THE SURVEY.

Now that we have established that you are qualified, we will continue with the survey. Remember that you can stop at any time.

PARTICIPATION IN REEF ACTIVITIES

1. How often do you usually participate in each of the following activities?

	Never	Once a month or less	2-3 times a month	4 times a month or more	No Response
Swimming/wading					
Snorkeling					
Diving (SCUBA or free diving)					
Waterside/ beach camping					
Beach recreation (beach sports, picnics, sunbathing, general beachgoing)					
Boating					
Kayaking					
Spearfishing					
Fishing [*interviewer prompt: fishing for finfish*]					
Gathering of marine resources (lobsters, conch, seaweed)					

SKIP PATTERN-- If respondent answers 'never' to BOTH fishing and gathering of marine resources, then skip to #3:

CORAL REEF RELIANCE / CULTURAL IMPORTANCE OF REEFS

2. How often do you fish or harvest marine resources for each of the following reasons?

	Never	Rarely	Sometimes	Frequently	No Response
To feed myself and my family/ household					
To sell [INTERVIEWER CAN PROMPT: "or for work" to include fishing/harvesting as part of employment]					

	Never	Rarely	Sometimes	Frequently	No Response
To give to extended family members and/or friends					
For fun					
For special occasions and cultural events					
For tournament or competition					

3. How often do you or your family eat fish/seafood?

    a. Every day
    b. A few times a week
    c. About once a week
    d. 1-3 times a month
    e. Less than once a month
    f. Never

SKIP PATTERN-- If respondent answers f. Never, skip to question #5

4. Where do you get the fish or seafood your family eats? Please pick the top 2.

    a. Purchased by myself or someone in my household at a store or restaurant
    b. Purchased by myself or someone in my household at a market or roadside vendor
    c. Caught by myself or someone in my household
    d. Caught by extended family members
    e. Other, please specify _____

PERCEIVED RESOURCE CONDITION

5. In your opinion, how are Puerto Rico's marine resources currently doing? Please rank from very bad to very good.

	Very Bad	Bad	Neither Bad nor Good	Good	Very Good	Not sure
Ocean Water Quality (clean)						
Amount of Coral						
Number of Fish						
Diversity of Fish						
Amount of sea grass and mangroves						

6. How would you say the condition of each of the following has changed over the last 10 years: from 1=it has gotten a lot worse to 5=it has gotten a lot better.

	A lot Worse	Somewhat Worse	No Change	Somewhat Better	A lot Better	Not Sure
Ocean Water Quality (clean and clear)						
Amount of Coral						
Number of Fish						
Diversity of Fish						
Amount of sea grass and mangroves						

7. In the next 10 years, do you think the condition of the marine resources in Puerto Rico will get worse, stay the same or improve?
    a. Get worse
    b. Stay the same
    c. Improve
    d. Not sure

AWARENESS AND KNOWLEDGE OF CORAL REEFS

8. Please say whether you disagree or agree with each of the following statements.

	Strongly Disagree	Disagree	Neither	Agree	Strongly Agree	Not Sure
Coral reefs protect Puerto Rico from erosion and natural disasters.						
Coral reefs are only important to fishermen, divers and snorkelers.						
Healthy coral reefs attract tourists to Puerto Rico.						
Coral reefs are important to Puerto Rico cultures.						

9. How familiar are you with each of the following potential threats facing the coral reefs in Puerto Rico?

	Very Unfamiliar	Unfamiliar	Neither Familiar nor Unfamiliar	Familiar	Very Familiar	Not sure
Climate change						
Coral bleaching						
Hurricanes and other natural disasters						
Pollution (stormwater, wastewater, chemical runoff, trash/littering, fuel spills)						
Increased coastal/urban development (includes construction)						
Invasive species						
Fishing and gathering						
Damage from ships and boats						
Impacts from recreational activity (damage caused by inexperienced divers)						
Coral diseases						

10. Do you believe that the threats to coral reefs in Puerto Rico are:

    a. Extreme
    b. Large
    c. Moderate
    d. Minimal
    e. None
    f. Not sure

ATTITUDES TOWARDS CORAL REEF MANAGEMENT STRATEGIES AND ENFORCEMENT

11. A Marine Protected Area is an area of the ocean where human activity is typically restricted to protect living, non-living, cultural, and/or historic resources. How familiar are you with Marine Protected Areas (MPAs)?

    a. Very Unfamiliar
    b. Unfamiliar
    c. Neither Unfamiliar nor Familiar
    d. Familiar
    e. Very Familiar
    f. Not sure

SKIP PATTERN-- If respondent answers a 'Very unfamiliar' or b 'Unfamiliar', then skip to #13:

12. Please indicate how much you disagree or agree with each of the following statements.

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree	Not Sure
MPAs protect coral reefs						
MPAs increase the number of fish						
There should be fewer MPAs in Puerto Rico						
There should be more MPAs in Puerto Rico						
There has been economic benefit to Puerto Rico from the establishment of MPAs						
Fishermen's livelihoods have been negatively impacted from the establishment of MPAs in Puerto Rico						
MPAs help increase tourism in Puerto Rico						

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree	Not Sure
The establishment of MPAs increases the likelihood that people will vacation in Puerto Rico						
I would support adding new MPAs in Puerto Rico if there is evidence that the ones we have are improving Puerto Rico's marine resources						
I generally support the establishment of MPAs						

13. The following are common strategies used to manage the marine environment. We are interested in your opinion about the use of these strategies to improve the protection of coral reefs. Please indicate how much you disagree or agree with each of the following:

Example Management Strategies	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree	Not Sure
Community participation in management						
Stricter control of sources of pollution to preserve water quality						
Limited use (fishing, diving, snorkeling, boating)						
Limits per person for certain fish species (size and amount)						
Increased surveillance and law enforcement						

AWARENESS OF CORAL RULES AND REGULATIONS / MANAGEMENT

14. Please rate your confidence level that each of the following is accurately and fairly enforcing coral reef rules and regulations.

	Not at all Confident	Slightly Confident	Moderately Confident	Confident	Very Confident	Not Sure
Enforcement officers						
Administrative hearings						
Legal and trial processes						

PARTICIPATION IN BEHAVIORS THAT MAY IMPROVE CORAL HEALTH

15. How often do you participate in any activity to protect the environment (for example, beach clean ups, volunteering with an environmental group, recycling)?

    a. Not At All
    b. Once a year or Less
    c. Several times a year
    d. At least once a month
    e. Several Times a Month or more
    f. Not Sure

16. Which of the following would you consider to be your top 3 sources of information about coral reefs and the environment in Puerto Rico?
    Interviewer checks the top 3 sources of information in box below.

17. To what degree do you trust each of your top rated sources of information to provide you the most accurate information on coral reefs and coral reef related topics in Puerto Rico?
    Respondent rates only the top 3 sources of information in box below.

Top 3	Sources	Very untrustworthy	Untrustworthy	Neither Trustworthy nor Untrustworthy	Trustworthy	Very Trustworthy	Not sure
	Newspapers, other print publications						
	Radio						
	TV						
	Internet						
	Social Media						

Top 3	Sources	Very untrustworthy	Untrustworthy	Neither Trustworthy nor Untrustworthy	Trustworthy	Very Trustworthy	Not sure
	Friends and family						
	Community leaders						
	Dive and bait shop owners/employees						
	State and/or County governments						
	Federal government agencies (NOAA, EPA)						
	Non-profit organizations						
	Other						

18. How involved is the local community in protecting and managing coral reefs?

    a. Not at all involved
    b. Somewhat involved
    c. Moderately involved
    d. Involved
    e. Very involved
    f. Not sure

19. How involved are you in making decisions related to the management of coral reefs in Puerto Rico?

    a. Not at all involved
    b. Slightly involved
    c. Moderately involved
    d. Involved
    e. Very involved
    f. Not sure

DEMOGRAPHICS

I just have a few more questions that will help us to interpret our results. As a reminder, the information you provide is completely <u>confidential</u>.

20. Are you male or female?
    a. Male
    b. Female

21. What is your year of birth? _____

22. How long have you lived in Puerto Rico?
    a. 1 year or less
    b. 2-5 years
    c. 6-10 years
    d. more than 10 years, but less than all my life
    e. all my life

23. Including your primary language, please name each language you speak.

    a. English
    b. Spanish
    c. French
    d. German
    e. Italian
    f. Portuguese
    g. Arabic
    h. Chinese
    i. Japanese
    j. Korean
    k. Tagolog
    l. Hindi
    m. Hawaiian
    n. Hawaii Pidgin English
    o. Sāmoan
    p. Chamorro
    q. Carolinian
    r. Creole
    s. Crucian
    t. Tongan
    u. Other: Please list
       _____
    v. 22. No Response

24. What race/ethnicity do you consider yourself?

a. American Indian or Alaskan Native
b. Asian
c. Black or African American
d. Puerto Rican
e. Carolinian
f. Chamorro
g. Chinese
h. Cuban
i. Filipino
j. Japanese
k. White
l. Korean
m. Mexican
n. Native Hawaiian or other Pacific Islander
o. Samoan
p. Taino
q. Thai
r. Tongan
s. Vietnamese
t. Hispanic or Latino
u. Other/Mixed
v. No response

25. What is the highest level of education you have completed?
    a. 8th Grade or Less
    b. Some high school
    c. High School Graduate, GED
    d. Some college, community college or AA
    e. College Graduate
    f. Graduate School, Law School, Medical School
    g. No Response

26. What is your current employment status?
    a. Unemployed
    b. Student
    c. Employed full-time
    d. Homemaker
    e. Employed part-time
    f. Retired
    g. None of the above: Please specify _____
    h. No Response

27. What is your occupation? [***open ended***] _____

28. May I ask, what is your annual household income?
    a. Under $10,000
    b. $10,000-19,999
    c. $20,000-29,999
    d. $30,000-39,999
    e. $40,000-49,999
    f. $50,000-59,999
    g. $60,000-74,999
    h. $75,000-99,999
    i. $100,000-149,999
    j. $150,000 or More
    k. No Response

THANK YOU FOR YOUR TIME

If you would like a copy of the results, please provide us with your mailing address or email address (write on separate contact sheet that is not linked to survey answers).

SPANISH VERSION

Programa de Conservación de Arrecifes de Coral de NOAA
Programa Nacional de Monitoreo de Arrecifes de Coral (NCRMP)
Encuesta sobre los Arrecifes de Coral para Residentes
Número de Control de OMB 0648-0646

Encuesta para Puerto Rico

Encuesta realizada en (circule la respuesta): Inglés Español

Hola, mi nombre es [nombre del entrevistador]. Vengo de [organización] en nombre de la Administración Nacional Oceánica y Atmosférica (NOAA, por sus siglas en inglés) del Programa Nacional para el Monitoreo de los Arrecifes de Coral. Nos interesa conocer su opinión acerca de temas importantes relacionados con los arrecifes de coral del Puerto Rico. Usted ha sido seleccionado/a dado que vive en un área costera cercana a arrecifes de coral.

Esta encuesta se realiza de acuerdo con la Ley federal sobre Privacidad de 1974 y la Ley federal de Reducción de Trámites Burocráticos. Su participación es voluntaria, sus respuestas son confidenciales y puede detener la entrevista en cualquier momento. Se estima que la entrevista demore menos de 20 minutos. Si tiene alguna pregunta o si desea conocer más sobre la encuesta, le proporcionaremos información al respecto.

1. ¿Es usted mayor de 18 años?

   NOTA: SI RESPONDE "SÍ" CONTINÚE CON A LA PREGUNTA, SI RESPONDE "NO", FINALICE LA ENCUESTA.

2. ¿Vive por lo menos 3 meses del año en Puerto Rico?

   SI RESPONDE "SÍ", PREGUNTE Y REGISTRE EL NOMBRE DEL CONDADO, CONTINÚE CON LA PREGUNTA 1 SIGUIENTE. SI EL ENCUESTADO DICE "NO" O NO ES NINGUNO DE ESTOS CONDADOS, FINALICE LA ENCUESTA.

Ahora que hemos establecido que usted reúne los requisitos, continuaremos con la encuesta. Recuerde que puede detener la entrevista en cualquier momento.

PARTICIPATION IN REEF ACTIVITIES

El primer grupo de preguntas tiene como objetivo medir la frecuencia con la cual usted participa en actividades en arrecifes de coral o en torno a ellos.

3. ¿Con qué frecuencia al mes normalmente participa usted en cada una de las siguientes actividades?
   NOTA: ***El entrevistador no debe leer las alternativas "No está seguro" y "No contesta."***

	Nunca	Una vez al mes o	2-3 veces al mes	4 veces al mes o más	No está seguro	No contesta
Natación						
Buceo de superficie /Snorkel						
Buceo submarino (SCUBA, buceo libre o buceo a pulmón)						
Acampar a la orilla del agua/en la playa						
Recreación en la playa (deportes en la playa, picnics, tomar sol, ir a la playa en general)						
Paseos en bote						
Pesca por peces con aletas						
Recolección de otros recursos marinos (langostas, carrucho, algas, etc.)						
Pesca submarina						
Paseos en kayak						

NOTA: Si el encuestado responde "Nunca" TANTO A "Pesca" COMO A "Recolección de otros recursos marinos," continúe a la pregunta #3.

CORAL REEF RELIANCE / CULTURAL IMPORTANCE OF REEFS

Ahora, hablemos sobre las razones por las que pesca o recolecta recursos marinos…

4. Favor indicar con qué frecuencia usted pesca o recolecta recursos marinos de acuerdo a cada una de las siguientes razones.

	Nunca	Rara vez	En ocasiones	Frecuentemente	No está seguro	No contesta
Para alimentarse y/o alimentar a su familia/hogar						
Para vender [QUIEN ENTREVISTA PUEDE AGREGAR: "o para un trabajo" que incluya pescar/recolectar como parte del empleo]						
Para distribuir a miembros de la familia y/o a amigos						
Por diversión						
Para ocasiones especiales y eventos culturales						
Para torneos o competencias						

5. En general, ¿con qué frecuencia usted o su familia comen pescado/mariscos? Nota: El entrevistador debe enfatizar que la pregunta incluye no sólo los peces y mariscos que la encuestado pesca.
    a. Nunca
    b. Menos de una vez por mes
    c. 1-3 veces por mes
    d. Una vez por semana
    e. Algunas veces por semana
    f. Todos los días
    e. No está seguro
    f. No contesta

    NOTA: Si el encuestado responde "a. Nunca", continúe a la pregunta #5.

6. ¿Cuáles son las dos fuentes principales de pescado y mariscos que usted y su familia consumen? [ENTREVISTADOR: CODIFICAR LAS RESPUESTAS DE ACUERDO CON LAS CATEGORÍAS DE RESPUESTA PROVISTAS. PRESENTE EJEMPLOS, DE SER NECESARIO.]
    a. Comprado por mí mismo o por alguien de mi familia en una tienda o restaurante
    b. Comprado por mí mismo o por alguien de mi familia en un mercado o vendedor ambulante

c. Capturado por mí o por alguien de mi hogar
d. Capturado por miembros de mi familia
e. Capturado por amigos o vecinos
f. Otra, por favor especifique _____
g. No está seguro
h. No contesta

PERCEIVED RESOURCE CONDITION

7. Las siguientes preguntas piden su opinión acerca de la condición actual de los recursos marinos en Puerto Rico. En su opinión, ¿usted diría que la condición es actualmente: muy mala, mala, ni mala ni buena, buena o muy buena?

	Muy mala	Mala	Ni mala ni buena	Buena	Muy buena	No está seguro	No contesta
Calidad del agua del océano (ejemplos: limpia)							
Cantidad de corales							
Cantidad de peces							
Diversidad de pescado							
Cantidad de yerbas marinas y maglares							

8. ¿Cómo diría usted que ha cambiado la condición de cada uno de los siguientes temas en los últimos 10 años? Por favor, indique si empeoró mucho, empeoró algo, no cambió, mejoró algo o mejoró mucho.

	Empeoró mucho	Empeoró algo	No cambió	Mejoró algo	Mejoró mucho	No está seguro	No contesta
Calidad del agua del océano (ejemplos: limpia y clara)							
Cantidad de corales							
Cantidad de peces							
Diversidad de pescado							
Cantidad de yerbas marinas y maglares							

9. En los próximos 10 años, ¿usted piensa que la condición de los recursos marinos del Puerto Rico empeorará, permanecerá igual o mejorará?
    a. Empeorará
    b. Permanecerá igual
    c. Mejorará
    d. No está seguro
    e. No contesta

AWARENESS AND KNOWLEDGE OF CORAL REEFS

Las siguientes preguntas tienen como objetivo saber acerca de su conocimiento de los arrecifes de coral de Puerto Rico.

10 Para cada una de las siguientes afirmaciones, indique por favor si está totalmente en desacuerdo, si está en desacuerdo, si está ni en desacuerdo ni de acuerdo, si está de acuerdo o si está totalmente de acuerdo.

NOTA: ***El entrevistador no debe leer las alternativas "No está seguro" y "No contesta."***

	totalmente en desacuerdo	en desacuerdo	ni en desacuerdo ni de acuerdo	de acuerdo	totalmente de acuerdo	No está seguro	No contesta
Los arrecifes de coral protegen a Puerto Rico de la erosión y de desastres naturales.							
Los arrecifes de coral son solamente importantes para los pescadores, buzos y quienes hacen buceo de superficie /"snorkelers."							
Los arrecifes de coral en buen estado atraen a turistas a Puerto Rico.							
Los arrecifes de coral son importantes para la cultura de Puerto Rico.							

11. ¿Cuán familiarizado está usted acerca de cada una de las siguientes amenazas potenciales que enfrentan los arrecifes de coral en Puerto Rico? Por favor, indique si está muy poco familiarizado, poco familiarizado, ni poco ni muy familiarizado, familiarizado o muy familiarizado.
NOTA: ***El entrevistador no debe leer las alternativas "No está seguro" y "No contesta."***

Amenazas	Muy poco familiarizado	Poco familiarizado	Ni poco ni muy familiarizado o muy familiarizado	familiarizado	Muy familiarizado	No está seguro	No contesta
Decoloración de los corales/ Blanqueamiento de corales							
Huracanes y otros desastres naturales							
Contaminación (ejemplos: aguas pluviales, aguas residuales/negras, residuos químicos, basura, derrames de combustible)							
Mayor desarrollo costero/urbano (incluye construcción)							
Especies invasivas/ invasoras (ejemplo: pez león)							
Pesca y recolección							
Daño causado por barcos y botes							
Cambio climático							
Los impactos de la actividad recreativa (ejemplos: Daño causado por buzos inexpertos)							
Enfermedades de corales							

12. ¿Considera que las amenazas a los arrecifes de coral en Puerto Rico son:

a. Mínimas
b. Moderadas
c. Grandes
d. Extremas
e. Ninguna
f. No está seguro

g. No contesta

13. A Marine Protected Area (MPA) is an area of the ocean where human activity is typically restricted to protect living, non-living, cultural, and/or historic resources. How familiar are you with Marine Protected Areas?

    a. Very Unfamiliar
    b. Unfamiliar
    c. Neither Unfamiliar nor Familiar
    d. Familiar
    e. Very Familiar
    f. Not sure

14. Favor indicar cuán en desacuerdo o acuerdo está usted con cada una de las siguientes aseveraciones. Recuerde que las áreas protegidas pueden tener diferentes regulaciones/prohibiciones (ejemplo, pesca limitada, no pesca, no anclaje).

	totalmente en desacuerdo	en desacuerdo	ni en desacuerdo ni acuerdo	de acuerdo	totalmente de acuerdo	No está seguro
Las áreas marinas protegidas benefician a los arrecifes de coral.						
Las áreas marinas protegidas aumentan la cantidad de peces.						
Deben haber menos áreas marinas protegidas en Puerto Rico.						
Deben haber más áreas marinas protegidas en Puerto Rico.						
Ha habido un beneficio económico en Puerto Rico por el establecimiento de áreas marinas protegidas.						
El diario vivir de los pescadores se ha afectado negativamente por el establecimiento de áreas marinas protegidas en Puerto Rico.						
Las áreas marinas protegidas aumentan el turismo en Puerto Rico.						
El establecimiento de áreas marinas protegidas aumenta la probabilidad de que las personas vengan a Puerto Rico de vacaciones.						

	totalmente en desacuerdo	en desacuerdo	ni en desacuerdo ni acuerdo	de acuerdo	totalmente de acuerdo	No está seguro
Yo apoyaría añadir nuevas áreas marinas protegidas en Puerto Rico si hay evidencia de que las que tenemos han mejorado o conservado los recursos marinos de Puerto Rico.						
Generalmente yo apoyo el establecimiento de áreas marinas protegidas.						

AWARENESS OF CORAL RULES AND REGULATIONS

Las siguientes preguntas indagan acerca de su conocimiento de las leyes, reglamentos, regulaciones y manejo con respecto a los arrecifes de coral en Puerto Rico.

15. Las siguientes son estrategias comunes utilizadas para administrar el ambiente marino. Nos interesa conocer su opinión acerca del uso de estas estrategias para mejorar la protección de los arrecifes de coral. Por favor, indique el grado de desacuerdo o de acuerdo con cada una de las siguientes estrategias:

Ejemplos de Estrategias de Administración	totalmente en desacuerdo	en desacuerdo	ni en desacuerdo ni acuerdo	de acuerdo	totalmente de acuerdo	No está seguro	No contesta
Participación de la comunidad en el manejo del ambiente							
Control más estricto de fuentes de contaminación para preservar la calidad del agua							
Uso limitado para la recreación (ejemplos: buceo, navegación, pesca)							
Límites de pesca para ciertas especies (cantidad o tamaño) por persona							

Ejemplos de Estrategias de Administración	totalmente en desacuerdo	en desacuerdo	ni en desacuerdo ni acuerdo	de acuerdo	totalmente de acuerdo	No está seguro	No contesta
Mayor vigilancia y ejecución de las leyes							

16. Por favor califique su nivel de confianza que cada uno de los siguientes es exacta y justamente la aplicación de las normas de los arrecifes de coral y las regulaciones.

	Not at all Confident	Slightly Confident	Moderately Confident	Confident	Very Confident	Not Sure
Enforcement officers						
Administrative hearings						
Legal and trial processes						

PARTICIPATION IN BEHAVIORS THAT MAY IMPROVE CORAL HEALTH

Hablemos ahora sobre la participación en conductas que pueden mejorar el estado de los corales.

17. ¿Con qué frecuencia usted participa en alguna actividad para proteger el medio ambiente (por ejemplo, limpieza de playas o servicio voluntario en un grupo ambientalista)? Usted diría:

    a. Nunca
    b. Una vez por año o menos
    c. Varias veces por año
    d. Al menos una vez por mes
    e. Varias veces por mes o más
    f. No está seguro
    g. No contesta

18. ¿Cuáles consideraría que son las 3 fuentes principales de información acerca de los arrecifes de coral y el medio ambiente en Puerto Rico?

Nota: El entrevistador marca las 3 fuentes principales de información de la tabla en la pregunta #15.

19. ¿A cuál grado confía que [1era opción marcada] le proporciona la información más precisa acerca de los arrecifes de coral y temas relacionados con éstos en Puerto Rico? ¿Diría usted muy poco confiable, poco confiable, ni poco confiable ni confiable, confiable o muy confiable?

    ¿Y [2da opción marcada]?

    ¿Y [3ra opción marcada]?

    Nota: El encuestado clasifica sólo las 3 fuentes principales de información del siguiente cuadro.

3	Fuentes principales	Muy poco confiable	Poco confiable	Ni poco confiable ni confiable	Confiable	Muy confiable	No está seguro	No contesta
	Periódicos, otras publicaciones impresas							
	Radio							
	TV							
	Internet							
	Medios de comunicación social							
	Familiares y amigos							
	Líderes comunitarios							
	Propietarios/empleados de tiendas de buceo, carnada y aparejos de pesca							
	Gobierno estatal o municipal							
	Agencias federales de gobierno (ejemplos: NOAA, EPA)							
	Organizaciones sin fines de lucro							
	Otra							
	No sabe							
	No contesta							

20. ¿Cuán involucrada se encuentra su comunidad local en la protección y manejo de los arrecifes de coral?
    Diría…
    a. Nada involucrada
    b. Algo involucrada
    c. Moderadamente involucrad
    d. Involucrada
    e. Muy involucrad
    f. No está segur
    g. No contesta

21. ¿Con qué frecuencia tiene la oportunidad de involucrarse en la toma de decisiones respecto al manejo de los arrecifes de coral de Puerto Rico?
    Diría…
    a. Nunca
    b. Raras veces
    c. En ocasiones
    d. Frecuentemente
    e. No está seguro
    f. No contesta

    NOTA: Si el encuestado responde "a. Nunca," continúe a la pregunta #19.

22. ¿Cuán involucrado/a se encuentra en la toma de decisiones acerca del manejo de los arrecifes de coral en Puerto Rico?
    Diría…

    a. Nada involucrado/a
    b. Levemente involucrado/a
    c. Moderadamente involucrado/a
    d. Involucrado/a
    e. Muy involucrado/a
    f. No está seguro/a
    g. No contesta

DEMOGRAPHICS

Tengo otras preguntas que nos ayudarán a interpretar los resultados. Como recordatorio, la información que nos proporcione es completamente <u>confidencial pero usted no está obligado a contestar las mismas</u>.

23. ¿Es usted de sexo femenino o masculino?
    a. Masculino
    b. Femenino
    c. No contesta

24. ¿En qué año nació? _____ No contesta

25. ¿Cuánto hace que vive en Puerto Rico?
    a. 1 año o menos
    b. 2-5 años
    c. 6-10 años
    d. Más de 10 años
    e. Toda mi vida
    f. No contesta

26. Incluyendo su lengua materna, por favor indique otros idiomas que habla.
    Nota: ***El entrevistador no debe leer las siguientes opciones, sino que debe dejar que el encuestado responda.***]

1. Inglés
2. Español
3. Francés
4. Alemán
5. Italiano
6. Portugués
7. Árabe
8. Chino
9. Japonés
10. Coreano
11. Tagalo
12. Hindi
13. Hawaiano
14. Inglés Pidgin Hawaiano
15. Samoano
16. Chamorro
17. Carolinio
18. Creole
19. Cruciano
20. Tongano
21. Otro: Por favor, indicar _____

99. No contesta

27. ¿Es usted de origen hispano, latino o español? "Hispano o latino" se refiere a una persona de origen cubano, mexicano, puertorriqueño, sudamericano o centroamericano u otra cultura u origen español, independientemente de la raza.

    1. No, no soy de origen hispano, latino ni español
    2. Sí: mexicano, estadounidense mexicano, chicano
    3. Sí: puertorriqueño
    4. Sí: cubano
    5. Sí: otro origen hispano, latino o español
    6. No sabe
    7. No contesta

28. ¿Qué categoría racial lo/la describe a usted? (Por favor, marque todas las opciones que correspondan).
    1. Blanco
    2. Negro o afroamericano
    3. Indio estadounidense o nativo de Alaska
    4. Indo asiático
    5. Chino
    6. Filipino
    7. Japonés
    8. Coreano
    9. Vietnamita
    10. Otra raza asiática [especificar]
    11. Nativo hawaiano
    12. Guamano o Chamorro
    13. Samoano
    14. Habitante de otras islas del Pacífico [especificar]
    15. Otra raza [especificar]
    98. No sabe
    99. No contesta

29. ¿Cuál es el máximo nivel de educación alcanzado?
    a. 8vo grado o algún grado inferior
    b. Algún año de escuela secundaria/superior
    c. Graduado de escuela secundaria/superior, GED
    d. Algún año de la universidad, centro de estudios superiores o grado asociado
    e. Graduado universitario
    f. Escuela de posgrado, Universidad de Derecho, Universidad de Medicina
    g. No contesta

30. ¿Cuál es su estatus laboral actual?
    a. Desempleado
    b. Estudiante
    c. Empleado tiempo completo
    d. Ama de casa
    e. Empleado medio tiempo
    f. Jubilado

g. Ninguna de las anteriores: Favor especificar _____
h. No contesta

31. ¿Cuál es su ocupación? [***Favor especificar***] _____ No contesta

32. Si puedo preguntar, ¿qué intérvalo describe mejor su ingreso anual familiar?
    a. Por debajo de $10,000
    b. $10,000-19,999
    c. $20,000-29,999
    d. $30,000-39,999
    e. $40,000-49,999
    f. $50,000-59,999
    g. $60,000-74,999
    h. $75,000-99,999
    i. $100,000-149,999
    j. $150,000 o más
    k. No está seguro
    l. No contesta

GRACIAS POR SU TIEMPO

Si desea una copia de los resultados favor indicar su dirección postal o de correo electrónico. Entrevistador: Anotar la dirección en una hoja de papel aparte que no se relacione con las respuestas a la encuesta. ¿Tiene usted preguntas o comentarios por los cuales desea que le proporcione nuestra información de contacto? Muchas gracias por su tiempo y participación. Que tenga buen día.

Appendix 3: Puerto Rico NCRMP Survey Demographic Results

Region	Percent of Total Sample	Percent of Puerto Rico Population (2010 US Census)
Aguadilla	11.3%	7.3%
Arecibo	7.5%	9.1%
Bayamon	18.2%	19.1%
Caguas	11.1%	13.2%
Carolina	7.5%	10.3%
Humacao	13.9%	7.9%
Mayaguez	12.1%	7.8%
Ponce	12.5%	12.1%
San Juan	6.0%	13.2%

Gender	Sample	2010 US Census
Male	49%	48%
Female	46%	52%
No Response	6%	N/A

Age	Sample	2010 US Census
18-24 year olds	7%	10%
25-44 year olds	33%	26%
45-64 year olds	33%	25%
65-84 year olds	18%	13%
85+ years old	1%	2%
No Response	8%	N/A

Education Level	Sample	2010 US Census
Less than high school	2%	31%
High School Graduate, GED	21%	27%
Some college, community college or AA	21%	15%
College Graduate	39%	17%
Graduate School, Law School, Medical School	9%	6%
No Response	7%	N/A

Annual Household Income	Sample	2010 US Census
Under $10,000	9%	30%
$10,000 to $19,999	17%	20%
$20,000 to $29,999	13%	13%
$30,000 to $39,999	9%	12%
$40,000 to $49,999	6%	8%
$50,000 to $59,999	3%	6%
$60,000 to $74,999	3%	4%
$75,000 to $99,999	1%	3%
$100,000 to $149,999	1%	2%
$150,000 or More	<1%	1%
No Response/Not Sure	38%	N/A

Languages Spoken[11]	Sample
Spanish	74%
English	60%
French	2%
Italian	1%
Other	2%

Race/Ethnicity[12]	Sample
Puerto Rican	69%
Hispanic/Latino	12%
White	9%
Black	2%
Other	1%
No Response	6%

[11] 2010 US Census data concerning languages spoken in Puerto Rican households were not available.
[12] The NCRMP survey collects race information in a different fashion from that of the US Census. For example, in the US Census, the "Puerto Rican" race is housed under the Hispanic/Latino ethnicity, but these were two separate choices in the NCRMP survey because it was articulated that "Puerto Rican" is considered its own race/ethnicity by Puerto Rican residents during the stakeholder engagement process.

Year(s) of Residence[13]	Sample
1 year or less	<1%
2-5 years	1%
6-10 years	1%
More than 10 years (less than all my life)	14%
All my life	78%
No Response	7%

Employment Status[14]	Sample
Unemployed	6%
Student	4%
Employed full-time	42%
Homemaker	10%
Employed part-time	6%
Retired	21%
No Response	11%

[13] The 2010 US Census did not collect this type of information.
[14] The 2010 US Census did not collect this type of information.

Appendix 4: NCRMP Secondary Data Sources for Puerto Rico

Source (originator)	*Data Set Title*	*Publication Date*	*Abstract*	*Data Year(s)*	*URL*
Caribbean Tourism Organization	Caribbean Tourism Organization Individual Country Statistics and Latest Tourism Statistics Tables	2004-2014	Arrival statistics refers to the measurement of international inbound visitors (tourists (stay-over visitors), excursionists (same-day visitors) and cruise passengers) into a destination. Tourists are visitors who stay at least 24 hours in the country visited whereas Same-day visitors stay less than 24 hours in the country visited. Cruise Passengers are regarded as a special type of same-day visitor (even if the ship overnights at the port). The dataset includes Visitor summary, Tourist arrivals figures, Same day visitors, Length of stay, Arrivals by purpose of visit, Average daily expenditure, Visitor expenditure, Tourism budget, GDP at factor cost, Consumer Price Index, Hotel and Restaurant contribution to GDP; Rooms, Occupancy rates; Land Area (square Kilometres); Population (thousand, mid year 2004); Tourist arrivals by main markets; Monthly tourist arrivals.	2003-2014	http://www.onecaribbean.org/statistics/
Central Intelligence Agency	The World Factbook Life	2013	These data represent the average number of years to be lived by a group of people born in the same year, if mortality at each age remains constant in the future.	2014	https://www.cia.gov/library/publications/the-world-

Source (originator)	*Data Set Title*	*Publication Date*	*Abstract*	*Data Year(s)*	*URL*
	Expectancy at Birth				factbook/rankorder/2102rank.html
Central Intelligence Agency	The World Factbook Inflation Rate (Consumer Prices)	2014	Inflation rate (consumer prices) compares the annual percent change in consumer prices with the previous year's consumer prices.	2003-2014	https://www.cia.gov/library/publications/the-world-factbook/rankorder/2092rank.html
Commonwealth of Puerto Rico Government Development Bank of Puerto Rico	Puerto Rico Economic Indicators - Construction Permits	2015	This report contains a selection of nearly 150 key indicators in Puerto Rico's economy, and for comparison purposes present monthly data for the last ten years. Major indicators include, among others, labor, prices, manufacturing, and trade data.	2006-2015	http://www.gdb-pur.com/economy/pr-monthly-economic-indicators-time-series.html
Department of Commerce (DOC), National Oceanic and Atmospheric Administration (NOAA), Ocean and Coastal Resource Management (OCRM), National	MPA Inventory Database (10/2014)	2014	The MPA Inventory is a comprehensive catalog that provides detailed information for existing marine protected areas in the United States. The inventory provides geospatial boundary information (in polygon format) and classification attributes that seek to define the conservation objectives, protection level, governance and related management criteria for all sites in the database. The comprehensive inventory of federal, state and territorial MPA	2014	http://marineprotectedareas.noaa.gov/dataanalysis/mpainventory/

Source (originator)	*Data Set Title*	*Publication Date*	*Abstract*	*Data Year(s)*	*URL*
Marine Protected Areas Center (MPAC)			sites provides governments and stakeholders with access to information to make better decisions about the current and future use of place-based conservation. The information also will be used to inform the development of the national system of marine protected areas as required by Executive Order 13158.		
Department of Commerce (DOC), National Oceanic and Atmospheric Administration (NOAA), National Ocean Service (NOS), Office for Coastal Management (OCM)	Time-Series Data on the Ocean and Great Lakes Economy for Counties, States, and the Nation between 2005 and 2012 (Sector Level) (ENOW)	2015	Economics: National Ocean Watch (ENOW) contains annual time-series data for over 400 coastal counties, 30 coastal states, 8 regions, and the nation, derived from the Bureau of Labor Statistics and the Bureau of Economic Analysis. It describes six economic sectors that depend on the oceans and Great Lakes and measures four economic indicators: Establishments, Employment, Wages, and Gross Domestic Product (GDP).	2005-2012	http://coast.noaa.gov/dataregistry/search/dataset/C3722030-943C-4BEE-B063-06715F815891
Department of Commerce (DOC),	Spatial Trends in	2013	These market data provide a comprehensive set of measures of changes in economic activity	1990-2011	http://coast.noaa.gov/dataregistry/s

Source (originator)	*Data Set Title*	*Publication Date*	*Abstract*	*Data Year(s)*	*URL*
National Oceanic and Atmospheric Administration (NOAA), National Ocean Service (NOS), Coastal Services Center (CSC)	Coastal Socioeconomics (STICS): Total Economy of Coastal Areas		throughout the coastal regions of the United States. In regard to the sources of data, establishments, employment, and wages are taken from the Quarterly Census of Employment and Wages (QCEW). These data series also is known as the ES-202 data. These data are based on the quarterly reports of nearly all employers in the United States. These reports are filed with each state's employment or labor department, and each state then transmits the data to the Bureau of Labor Statistics (BLS), where the national databases are maintained. The data for the Coastal Economies have been taken from the national databases at BLS (except in the case of Massachusetts). Gross State Product (GSP) data are taken from the Bureau of Economic Analysis (BEA), which develops the estimates of GSP from a number of sources. In regard to "employment," data are reported by employers, not employees, and does not contain any information about age. There is no difference between "employed" and "employment". The source is known as the payroll survey, a survey filed by employers every 3 months showing the number of people employed at each establishment in each of the preceding 3 months.		earch/dataset/info/coastaleconomy

Source (originator)	*Data Set Title*	*Publication Date*	*Abstract*	*Data Year(s)*	*URL*
Environmental Protection Agency	EPA Assessment and Total Maximum Daily Load Tracking and Implementation System (ATTAINS)	2012	The Assessment and Total Maximum Daily Load (TMDL) Tracking and Implementation System (ATTAINS) is an online system for accessing information about the conditions in the Nation's surface waters. The Clean Water Act requires states, territories and authorized tribes (states for brevity) to monitor water pollution and report to EPA every two years on the waters they have evaluated. This process is called assessment. Part of this process is deciding which waters do not meet water quality standards because they are too polluted. These degraded waters are called impaired (polluted enough to require action) and are placed on a State list for future actions to reduce pollution. This information reported to EPA by states is available in ATTAINS. The information is made available via the ATTAINS web reports, as well as through other EPA tools. The ATTAINS web reports provide users with easy access to view the information on the status of waters at the national, state and site-specific waterbody levels. To access this information, click the Get Data/Tool tab above.	2002, 2004, 2006, 2008, 2010, 2012	https://www.epa.gov/waterdata/assessment-and-total-maximum-daily-load-tracking-and-implementation-system-attains
Environmental Protection Agency	EPA Annual Beach Notification	2007, 2011, 2012	These fact sheets summarize beach monitoring and notification data submitted to EPAfor each swimming season. Beach water monitoring is conducted primarily to detect bacteria that indicate the possible presence of disease-	2006, 2010, 2011	http://water.epa.gov/type/oceb/beaches/2011_season.cfm

Source (originator)	*Data Set Title*	*Publication Date*	*Abstract*	*Data Year(s)*	*URL*
	Summary Reports -- Closures and Advisories		causing microbes (pathogens) from sewage or fecal pollution. People swimming in water contaminated with these types of pathogens can contract diseases of the gastrointestinal tract, eyes, ears, skin, and upper respiratory tract. When monitoring results show levels of concern, the state or local government issues a beach advisory or closure notice until further sampling shows that the water quality is meeting the applicable standards. Beach water pollution can occur for a number of reasons including stormwater runoff after heavy rainfall, treatment plant malfunctions,sewer system overflows, and pet and wildlife waste on or near the beach. To help minimize beachgoers' risk of exposure to pathogens in beachwaters, EPA is helping communities build and properly operate sewage treatment plants, working to reduce overflows as much as possible, and working with the U.S. Coast Guard to reduce discharges from boats and larger ships. Under the Beaches Environmental Assessment and Coastal Health (BEACH) Act of 2000, EPA provides annual grants to coastal and Great Lakes states, territories, and eligible tribes to help local authorities monitor their coastal and Great Lakes beaches and notify the public of water		

Source (originator)	*Data Set Title*	*Publication Date*	*Abstract*	*Data Year(s)*	*URL*
			quality conditions that may be unsafe for swimming.		
Environmental Protection Agency	Environmental Protection Agency; Air Quality Index Report	2016	This data set provides the number of days per year that air advisories were in effect (i.e. the number of "good" days, the number of "moderate" days, the number "unhealthy for sensitive groups" days, "unhealthy" days, and "very unhealthy" days). The data can be delineated by county or by city. The pollutants examined are CO, PM2.5, PM10, NO2, O3, and SO2.	1980-2016	https://www3.epa.gov/airquality/airdata/ad_rep_aqi.html
Environmental Protection Agency; Technology Transfer Network Clearinghouse for Inventories & Emissions Factors.	The 2014 National Emissions Inventory	2015	This data set summarizes ammonia, carbon monoxide, nitrogen oxide, particulate matter, sulfur dioxide, volatile organic compounds, mercury, acid gas, greenhouse gases, glycol ether, metals, VOC, PCBs, POM, and PAH emissions at the national, state, and county level for 2011. Data is measured in tons.	2011, 2014	https://www.epa.gov/air-emissions-inventories/2014-national-emissions-inventory-nei-data
HML Project Team	Environmental Use and Dependence - HML Project	2014	This data set is comprised of uses occurring in study areas as well as attendance figures for parks located in the study areas. Park visitation to national, state, and county parks as well as National Wildlife Refuge areas are included in this data set. Use data includes fishing, diving, and boating in the study area. Sources:	2013	

Source (originator)	*Data Set Title*	*Publication Date*	*Abstract*	*Data Year(s)*	*URL*
	Team Collection		-AS Sources: U.S. Fish and Wildlife Service, National Park Service, U.S. Department of Homeland Security/U.S. Coast Guard Office of Auxiliary and Boating Safety, Professional Association of Diving Instructors, National Oceanic and Atmospheric Administration. -CNMI Sources: U.S. Fish and Wildlife Service, National Park Service, U.S. Department of Homeland Security/U.S. Coast Guard Office of Auxiliary and Boating Safety, Professional Association of Diving Instructors, Diveadvisor.com, National Oceanic and Atmospheric Administration. -FL Sources: U.S. Fish and Wildlife Service, National Park Service, U.S. Department of Homeland Security/U.S. Coast Guard Office of Auxiliary and Boating Safety, Professional Association of Diving Instructors, Diveadvisor.com, Worldwidefishing.com, Florida Fish and Wildlife Conservation Commission, Florida Department of Highway Safety and Motor Vehicles, Florida Park Service. -Guam Sources: U.S. Fish and Wildlife Service, National Park Service, U.S. Department of Homeland Security/U.S. Coast		

Source (originator)	*Data Set Title*	*Publication Date*	*Abstract*	*Data Year(s)*	*URL*
			Guard Office of Auxiliary and Boating Safety, Professional Association of Diving Instructors, Diveadvisor.com, National Oceanic and Atmospheric Administration. -HI Sources: U.S. Fish and Wildlife Service, National Park Service, U.S. Department of Homeland Security/U.S. Coast Guard Office of Auxiliary and Boating Safety, Professional Association of Diving Instructors, Diveadvisor.com, Worldwidefishing.com, Department of Land and Natural Resources, National Oceanic and Atmospheric Administration, Hawaii Tourism Authority, National Association of State Park Directors, County of Hawaii Fire Department: Ocean Safety Division. -PR Sources: U.S. Fish and Wildlife Service, National Park Service, U.S. Department of Homeland Security/U.S. Coast Guard Office of Auxiliary and Boating Safety, Professional Association of Diving Instructors, Diveadvisor.com, Worldwidefishing.com, Puerto Rico Department of Natural and Environmental Resources, U.S. Department of Agriculture. -USVI Sources: U.S. Fish and Wildlife		

Source (originator)	*Data Set Title*	*Publication Date*	*Abstract*	*Data Year(s)*	*URL*
			Service, National Park Service, U.S. Department of Homeland Security/U.S. Coast Guard Office of Auxiliary and Boating Safety, Professional Association of Diving Instructors, Diveadvisor.com, Worldwidefishing.com, National Archives and Records Administration Office of the Federal Register, Department of Planning and Natural Resources Division of Fish & Wildlife.		
Institute for Health Metrics and Evaluation (IHME)	United States Adult Life Expectancy by County 1987-2007	2011	This is a complete time series for life expectancy from 1987 to 2007 for all US counties, and released as part of IHME research published in *Population Health Metrics.*	2007	http://ghdx.healthdata.org/record/united-states-adult-life-expectancy-county-1987-2007
National Oceanic and Atmospheric Administration (NOAA), Coastal Change Analysis Program (CCAP)	National Oceanic and Atmospheric Administration, Coastal Change Analysis	2012	The Coastal Change Analysis Program (C-CAP) produces a nationally standardized database of land cover and land change information for the coastal regions of the U.S. C-CAP products are developed using multiple dates of remotely sensed imagery and consist of raster-based land cover maps for each date of analysis, as well as a file that highlights what changes have occurred between these dates and where the changes were located.	2001-2007 (various)	http://www.csc.noaa.gov/digitalcoast/data/ccapregional

Source (originator)	*Data Set Title*	*Publication Date*	*Abstract*	*Data Year(s)*	*URL*
	Program (CCAP) Regional Land Cover Data		These data highlight the relative effects of different landscape features on water quality, such as increased polluted runoff from impervious surfaces and the mitigating impacts of forests. NOAA produces high resolution C-CAP land cover products, for select geographies. GIS and tabular data was accessed June 2012 and prepared for the project by NOAA Coastal Services Center, Charleston SC.		
National Oceanic and Atmospheric Administration (NOAA), National Marine Fisheries Service (NMFS)	Marine Recreational Information Program (MRIP)	2015	The Marine Recreational Information Program, or MRIP, is the way NOAA Fisheries counts and reports marine recreational catch and effort. Driven by data provided by anglers and captains, MRIP produces better information through better science and, equally important, increased transparency, accountability, and engagement. NOAA Fisheries is entrusted with ensuring the long-term health of ocean fisheries and other marine life in federal waters. One of our most important jobs is working with both commercial and recreational fishermen to count what species are being caught, when, where, and how. This information is used to decide how many fish can be taken recreationally and commercially without negatively affecting the sustainability of	1981-2015	http://www.st.nmfs.noaa.gov/recreational-fisheries/index

Source (originator)	*Data Set Title*	*Publication Date*	*Abstract*	*Data Year(s)*	*URL*
			individual fisheries. It also ensures appropriate measures are taken to recover fisheries in trouble.		
National Oceanic and Atmospheric Administration (NOAA), National Marine Fisheries Service (NMFS), Marine Recreational Information Program (MRIP)	Marine Recreational Fisheries Statistics Survey (MRFSS)	2015	The Marine Recreational Fisheries Statistics Program team provides essential marine recreational fisheries information to government, scientists, and the public. Since 1979, we have conducted the annual Marine Recreational Fisheries Statistics Survey (MRFSS). The purpose of this national survey is to provide a reliable database for estimating the impact of recreational fishing on marine resources. The MRFSS now encompasses nearly 30 years of continuous and standardized data, and represents the most scientifically credible and consistent picture of marine recreational catch, effort, and participation in the world.	1981-2015	http://www.st.nmfs.noaa.gov/st1/recreational/queries/
National Oceanic and Atmospheric Administration (NOAA), National Ocean Service, Office of Response and Restoration, Hazardous Materials Response Division,	Puerto Rico ESI/RSI: HYDRO (Hydrology)	2001	This data set comprises the Environmental Sensitivity Index (ESI) and Reach Sensitivity Index (RSI) data for Puerto Rico. ESI data characterize estuarine environments and wildlife by their sensitivity to spilled oil. The ESI data include information for three main components: shoreline habitats, sensitive biological resources, and human-use resources. Most rivers and streams can be readily	1998-2001	http://archive.orr.noaa.gov/topic_subtopic_entry.php?RECORD_KEY%28entry_subtopic_topic%29=entry_id,subtopic_id,topic_id&entry_id%28entry_sub

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Seattle, Washington; United States Environmental Protection Agency; United States Coast Guard; Puerto Rico Departamento de Recursos Naturales y Ambientales; and United States Department of the Interior.			subdivided into clear-cut segments, or reaches (RSI), that have very distinct and uniform characteristics within that reach of the stream. The definition of reach type is usually based on whatever the intended use of the reach classification might be. In this project, stream reaches are defined as those segments where similar spill-response modes and potential ecological and/or socioeconomic impacts from the spill are to be anticipated. However defined, the boundary of the reach is usually marked by an abrupt change in the morphology of the stream, a change commonly, but not always, brought about by an alteration in the stream's gradient. This data set contains hydrology data.		topic_topic%29=849&subtopic_id%28entry_subtopic_topic%29=8&topic_id%28entry_subtopic_topic%29=1
Puerto Rico Planning Board, Puerto Rico Electric Power Authority	Puerto Rico Economic Indicators	2014	This report contains a selection of nearly 150 key indicators in Puerto Rico's economy, and for comparison purposes present monthly data for the last ten years. Major indicators include, among others, labor, prices, manufacturing, and trade data.	2005-2014	http://www.gdb-pur.com/economy/pr-monthly-economic-indicators-time-series.html
The Henry J. Kaiser Family Foundation	State Health Facts: Infant Mortality	2013	These data represent the number of infant deaths per 1,000 live births based on linked birth and death records from the period from 2007-2009.	2007-2009	http://kff.org/other/state-indicator/infant-death-rate/

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	Rate (Deaths per 1,000 Live Births)				
The Henry J. Kaiser Family Foundation	State Health Facts: Number of Cancer Deaths per 100,000 Population	2013	These data represent age-adjusted rates per 100,000 U.S. standard population. Rates for the United States and each state are based on populations enumerated in the 2010 census as of April 1. Rates for Puerto Rico, Virgin Islands, Guam, American Samoa, and Northern Marianas are based on the 2010 census, estimated as of July 1, 2010. Since death rates are affected by the population composition of a given area, age-adjusted death rates should be used for comparisons between areas because they control for differences in population composition.	2010	http://kff.org/other/state-indicator/cancer-death-rate-per-100000/
The World Bank	World Bank – Annual Visitor Arrivals	2014	The World Bank is a vital source of financial and technical assistance to developing countries around the world. We are not a bank in the ordinary sense but a unique partnership to reduce poverty and support development. The World Bank Group comprises five institutions managed by their member countries. Annual visitor arrivals is an international tourism indicator based on the	1995-2014	http://data.worldbank.org/indicator/ST.INT.ARVL

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			number of tourists who travel to a country other than that in which they usually reside, and outside their usual environment, for a period not exceeding 12 months and whose main purpose in visiting is other than an activity remunerated from within the country visited. When data on number of tourists are not available, the number of visitors, which include tourists, same-day visitors, cruise passengers, and crew members, is shown instead.		
The World Bank	World Bank – Fish/Mammal species threatened	2010, 2011	The World Bank is a vital source of financial and technical assistance to developing countries around the world. We are not a bank in the ordinary sense but a unique partnership to reduce poverty and support development. The World Bank Group comprises five institutions managed by their member countries. Fish species are based on Froese, R. and Pauly, D. (eds). 2008. Threatened species are the number of species classified by the IUCN as endangered, vulnerable, rare, indeterminate, out of danger, or insufficiently known. Mammal species are mammals excluding whales and porpoises. Threatened species are the number of species classified by the IUCN	2010, 2011	http://data.worldbank.org/indicator/EN.FSH.THRD.NO http://data.worldbank.org/indicator/EN.MAM.THRD.NO

Source (originator)	*Data Set Title*	*Publication Date*	*Abstract*	*Data Year(s)*	*URL*
			as endangered, vulnerable, rare, indeterminate, out of danger, or insufficiently known.		
The World Bank	World Bank - Population, Total	2014	The World Bank is a vital source of financial and technical assistance to developing countries around the world. We are not a bank in the ordinary sense but a unique partnership to reduce poverty and support development. The World Bank Group comprises five institutions managed by their member countries. Total population is based on the de facto definition of population, which counts all residents regardless of legal status or citizenship--except for refugees not permanently settled in the country of asylum, who are generally considered part of the population of their country of origin. The values shown are midyear estimates.	2012-2013	http://data.worldbank.org/indicator/SP.POP.TOTL
The World Bank	World Bank – Climate Change Knowledge Portal	2012	The World Bank is a vital source of financial and technical assistance to developing countries around the world. We are not a bank in the ordinary sense but a unique partnership to reduce poverty and support development. The World Bank Group comprises five institutions managed by their member countries. The World Bank Climate Change Knowledge Portal reports monthly data since 1900 on	1900-2012	http://sdwebx.worldbank.org/climateportal/index.cfm?page=downscaled_data_download&menu=historical

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			temperature and precipitation for each world nation		
The World Bank	World Bank - GDP (current US$)	2014	The World Bank is a vital source of financial and technical assistance to developing countries around the world. We are not a bank in the ordinary sense but a unique partnership to reduce poverty and support development. The World Bank Group comprises five institutions managed by their member countries. GDP at purchaser's prices is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources. Data are in current U.S. dollars. Dollar figures for GDP are converted from domestic currencies using single year official exchange rates.	2005-2013	http://data.worldbank.org/indicator/NY.GDP.MKTP.CD/countries/PR?display=graph
U.S. Army Corps of Engineers	National Inventory of Dams	2016	The NID consists of dams meeting at least one of the following criteria; 1) High hazard classification - loss of one human life is likely if the dam fails, 2) Significant hazard classification - possible loss of human life and likely significant property or environmental destruction, 3) Equal or exceed 25 feet in	2015-2016	http://nid.usace.army.mil/cm_apex/f?p=838:1:0::NO::APP_ORGANIZATION_TYPE,P12_ORGANIZATION:8,

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			height and exceed 15 acre-feet in storage, 4) Equal or exceed 50 acre-feet storage and exceed 6 feet in height. The goal of the NID is to include all dams in the United States that meet these criteria, yet in reality, is limited to information that can be gathered and properly interpreted with the given funding. The NID initially consisted of approximately 45,000 dams, which were gathered from extensive record searches and some feature extraction from aerial imagery. Since continued and methodical updates have been conducted, data collection has been focused on the most reliable data sources, which are the many federal and state government dam construction and regulation offices. In most cases, dams within the NID criteria are regulated (construction permit, inspection, and/or enforcement) by federal or state agencies, who have basic information on the dams within their jurisdiction. Therein lies the biggest challenge, and most of the effort to maintain the NID; periodic collection of dam characteristics from 49 states (Alabama currently has no dam safety legislation or formal dam safety program), Puerto Rico, and 18 federal offices. The Corps resolves duplicative and conflicting data from the 68 data sources, which helps obtain the more		

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			complete, accurate, and updated NID. The NID is published every two years.		
U.S. Department of Commerce Bureau of Economic Analysis	Advance 2013 and Revised 1997-2012 Statistics of GDP by State	2014	These statistics reflect the results of the comprehensive revision of gross domestic product (GDP) by state for 1997–2012. This revision not only incorporates new and revised source data, but it also includes significant improvements in classification and statistical methods to more accurately portray the state economies. Significant changes introduced with this revision include: updated industry definitions consistent with the 2007 North American Industry Classification System (NAICS), results of the 2013 comprehensive revision of state personal income, results of the 2013 comprehensive revision of the national income and product accounts and the 2014 comprehensive revision of the annual industry accounts, which included the recognition of research and development (R&D) expenditures as capital, the capitalization of entertainment, literary, and other artistic originals, the expansion of the capitalization of the ownership transfer costs of residential fixed assets, the use of an improved accrual accounting treatment of transactions for defined benefit pension plans, and improved	1997-2013	https://www.bea.gov/newsreleases/regional/gdp_state/gsp_newsrelease.htm

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			methods for computing financial services provided by commercial banks		
U.S. Department of Health and Human Services	National Vital Statistics Reports: Deaths: Preliminary Data for 2011	2012	These are preliminary U.S. data on deaths, death rates, life expectancy, leading causes of death, and infant mortality for 2011 by selected characteristics such as age, sex, race, and Hispanic origin. Preliminary data in this report are based on records of deaths that occurred in calendar year 2011, which were received from state vital statistics offices and processed by the Centers for Disease Control and Prevention's National Center for Health Statistics (NCHS) as of June 12, 2012.	2011	http://www.cdc.gov/nchs/data/nvsr/nvsr61/nvsr61_06.pdf
U.S. Department of Health and Human Services	National Vital Statistics Reports: Deaths: Final Data for 2010	2013	These data represent final 2010 data on U.S. deaths, death rates, life expectancy, infant mortality, and trends by selected characteristics such as age, sex, Hispanic origin, race, state of residence, and cause of death.	2010	http://www.cdc.gov/nchs/data/nvsr/nvsr61/nvsr61_04.pdf
U.S. Energy Information Administration	EIA State Electricity Profiles	1991-2014	The State Electricity Profiles presents a summary of key State statistics for 2000, and 2004 through 2010. The tables present summary statistics; ten largest plants by generating capacity; top five entities ranked by retail sales; electric power industry generating capacity by primary energy source; electric	1990-2014	http://www.eia.gov/electricity/state/

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			power industry generation of electricity by primary energy source; utility delivered fuel prices for coal, petroleum, and natural gas; electric power emissions estimates; retail sales, revenue, and average revenue per kilowatthour by sector; and utility retail sales statistics. Data published in the State Electricity Profiles are compiled from five forms filed annually by electric utilities and other electric power producers.		
United States Census Bureau	Census 2000	2002	Summary File 3 contains population and housing data based on Census 2000 questions asked on the long form of a one-in-six sample of the population. Population items include marital status, disability, educational attainment, occupation, income, ancestry, veteran status, and many other characteristics. Housing items include tenure (whether the unit is owner- or renter-occupied), occupancy status, housing value, mortgage status, price asked, and more. In addition to the 50 states and District of Columbia, the U.S. Census Bureau also conducts censuses and surveys in the the United States' Island Areas. Census and survey operations are conducted in cooperation with the governments of the the Island Areas and frequently include	2000	http://www.census.gov/main/www/cen2000.html

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			modifications to the questionnaires to help the local and federal governments better understand the populations being counted.		
United States Census Bureau	2010 Census	2011	Summary File 1 shows detailed tables on age, sex, households, families, relationship to householder, housing units, detailed race and Hispanic or Latino origin groups, and group quarters.	2010	http://www.census.gov/2010census/data/
United States Census Bureau	2008-2012 ACS 5-Year Estimates	2013	The ACS provides information on more than 40 topics, including education, language ability, the foreign-born, marital status, migration and many more. Each year the survey randomly samples around 3.5 million addresses and produces statistics that cover 1-year, 3-year, and 5-year periods for geographic areas in the United States and Puerto Rico.	2012	http://www2.census.gov/acs2012_5yr/summaryfile/
United States Census Bureau	2013 Population Estimates: Annual Estimates of the Resident Population: April 1, 2010 to	2014	The estimates are based on the 2010 Census and reflect changes to the April 1, 2010 population due to the Count Question Resolution program and geographic program revisions. The resident population for each year is estimated since the most recent decennial census by using measures of population change. The resident population includes all people currently residing in the United States.	2010-2013	http://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=PEP_2013_PEPANNRES&prodType=table

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	July 1, 2013				
United States Census Bureau	2009-2013 ACS 5-Year Estimates	2014	The ACS provides information on more than 40 topics, including education, language ability, the foreign-born, marital status, migration and many more. Each year the survey randomly samples around 3.5 million addresses and produces statistics that cover 1-year, 3-year, and 5-year periods for geographic areas in the United States and Puerto Rico.	2013	http://www2.census.gov/acs2013_5yr/summaryfile/
United States Census Bureau	Building Permits Survey	2015	Data collected include number of buildings, number of housing units, and permit valuation by size of structure. This survey covers all places issuing building permits for privately-owned residential structures. Over 98 percent of all privately-owned residential buildings constructed are in permit-issuing places.	2004-2014	http://www.census.gov/construction/bps/stateannual.html
United States Census Bureau	County Business Patterns	2014	County Business Patterns (CBP) is an annual series that provides subnational economic data by industry. This series includes the number of establishments, employment during the week of March 12, first quarter payroll, and annual payroll.	1998-2012	http://www.census.gov/econ/cbp/
United States Department of	Supplemental Nutrition	2015	SNAP offers nutrition assistance to millions of eligible, low-income individuals and families and provides economic benefits to	2010-2014	http://www.fns.usda.gov/pd/supplemental-nutrition-

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Agriculture Food and Nutrition Service	Assistance Program: Average Monthly Participation (Persons)		communities. The number of persons participating is reported monthly. Annual averages are the sums divided by twelve.		assistance-program-snap
US Geological Survey; Water Use in the United States	Estimated Use of Water in the United States: County-Level Data	2010	These data files present water-use estimates by county for the United States, the District of Columbia, Puerto Rico, and the U.S. Virgin Islands which support the State-level water-use estimates published in USGS Circular 1405, Estimated Use of Water in the United States in 2010. All States provided estimates for public supply, domestic, irrigation, livestock, aquaculture, industrial, mining, and thermoelectric power water use. All States also provided estimates of public supply deliveries for domestic use. All States have estimates of the total population served by public supply and how many people consume each type of water (groundwater, surface water, self-serviced). States optionally may have estimated public supply population served by groundwater and surface water. All States will have estimates of total irrigation. States optionally may have estimated subtotals for	2010	http://water.usgs.gov/watuse/data/2010/index.html

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			crop irrigation and golf-course irrigation. No consumptive-use data were collected nationally for any of the categories for 2010. No commercial water-use data were collected nationally for 2010. No wastewater release data were collected nationally for 2010. No hydroelectric power instream use data were collected nationally for 2010. Public-supply deliveries for commercial, industrial, and thermoelectric power were not collected nationally for 2010.		