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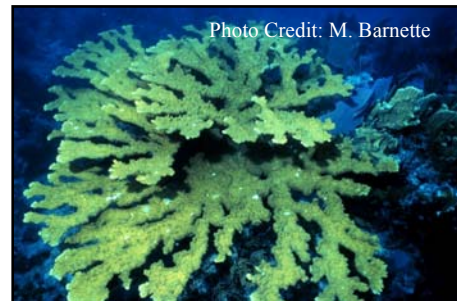
Endangered Species Act Section 4(b)(2) Report

Impacts Analysis for Critical Habitat Designation for Threatened Elkhorn & Staghorn Corals

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Staghorn Coral (*Acropora cervicornis*)



Elkhorn coral (*A. palmata*)

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EXECUTIVE SUMMARY

This report identifies and analyzes the impacts that may result from the proposed critical habitat designations for threatened elkhorn (*Acropora palmata*) and staghorn (*A. cervicornis*) corals. Section 4(b)(2) of the Endangered Species Act (ESA) requires the National Marine Fisheries Service (NMFS) to designate critical habitat for listed species based on the best scientific data available and after taking into consideration the economic, national security, and other relevant impacts of specifying any particular area as critical habitat. NMFS may exclude particular areas from a critical habitat designation, but only if the benefits of exclusion outweigh the benefits of including an area within critical habitat, and provided the exclusion will not result in the extinction of the species.

Economic impacts result through the implementation of project modifications through ESA section 7 consultation, where federal action agencies must ensure that their proposed actions are not likely to destroy or adversely modify designated critical habitat. Although we have projected the number of future section 7 consultations required by the designation, the lack of information on the specifics of future project design limits our ability to forecast the exact type and amount of project modifications required. Therefore, other than estimate maximum administrative costs, we are unable to quantify the total economic costs of project modifications. However, given the greater abundance of the PCE relative to the coral, consultation and project modifications are expected to occur as a result of this designation.

National security impacts would also result because the Department of Defense would be required to conduct ESA section 7 consultation on activities that may affect the critical habitat and, if necessary, to alter those activities to avoid adverse modification of the critical habitat. Based on our consideration of the national security impacts of the proposed critical habitat designation, we propose to exclude Naval Air Station, Key West from the designation.

Other relevant impacts include conservation benefits of the designation, both to the species and to society. Because the features that form the basis of the critical habitat designation are essential to conservation of the listed species, the protection of critical habitat from destruction or adverse modification may at minimum prevent loss of the benefits currently provided by the species and may contribute to an increase in the benefits of these species to society in the future. While we cannot quantify nor monetize the benefits, we believe they are not negligible and would be an incremental benefit of this designation.

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ACRONYMS

ATON	Aids to Navigation
BRT	Atlantic <i>Acropora</i> Biological Review Team
DOD	Department of Defense
DOI	Department of Interior
EPA	U.S. Environmental Protection Agency
EO	Executive Order
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FERC	Federal Energy Regulatory Commission
FHA	Federal Highways Administration
FWS	U.S. Fish & Wildlife Service
INRMP	Integrated Natural Resources Management Plan
NASKW	Naval Air Station Key West
NMFS	National Marine Fisheries Service
NPDES	National Pollutant Discharge Elimination System
NOAA	National Oceanic and Atmospheric Administration
NRC	Nuclear Regulatory Commission
OMB	Office of Management and Budget
PCE	Primary Constituent Elements
RFA	Regulatory Flexibility Act
RPA	Reasonable and Prudent Alternative
RPM	Reasonable and Prudent Measure
TMDL	Total Maximum Daily Load
USACE	U.S. Army Corps of Engineers
USCG	U.S. Coast Guard
USDOT	U.S. Department of Transportation
U.S.V.I.	U.S. Virgin Islands

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1 INTRODUCTION

This report contains the National Marine Fisheries Service's (NMFS), Southeast Region's analysis of impacts of designating critical habitat under section 4 of the Endangered Species Act (ESA) for elkhorn (*Acropora palmata*) and staghorn corals (*A. cervicornis*), which we listed as threatened under the ESA on May 9, 2006 (71 FR 26852). It describes the applicable laws, court rulings, executive orders and policies, the methods used and process followed, and conclusions reached for each step leading to the proposed designation.

1.1 Purpose and Structure of Report

This report documents NMFS' compliance with section 4(b)(2) of the ESA regarding impacts of proposing to designate critical habitat for elkhorn and staghorn corals. Specifically, section 4(b)(2) requires us to take into consideration the economic impact, impact on national security, and any other relevant impact, of specifying any particular area as critical habitat. Section 4(b)(2) also provides us with discretion to exclude particular areas from a designation, but only if the benefits of excluding that area outweigh the benefits of including it in the designation and exclusion will not result in extinction of the species.

In the following section we briefly describe our preliminary determination of the specific areas containing the features essential to the conservation of elkhorn and staghorn corals that meet the definition of critical habitat in section 3 of the ESA. This determination forms the basis for identifying impacts that may result from the designation. Next we summarize section 4(b)(2)'s requirements, as informed by previous designations and key court rulings, and the requirements of other laws, executive orders, and policies that are applicable to evaluating the impacts of federal regulatory actions. We then describe the regulatory and economic baselines that inform our impact analyses. We then consider the economic, national security, and other relevant impacts of the proposed critical habitat designation, followed by a synthesis of the impacts within each specific area. Last, we identify the particular areas proposed to be excluded from the designation based on the impacts identified.

1.2 Summary of Preliminary ESA Section 3 Determinations

The ESA defines critical habitat as:

“(i) the specific areas within the geographical area occupied by the species, at the time it is listed in accordance with the provisions of section 1533 of this title, on which are found those physical or biological features (I) essential to the conservation of the species and (II) which may require special management considerations or protections; and (ii) specific areas outside the geographical area occupied by the species at the time it is listed in accordance with the provisions of section 1533 of this title, upon a determination by the Secretary that such areas are essential for the conservation of the species (16 U.S.C. §1532(5)(A)).”

The application of this definition for elkhorn and staghorn corals is described in detail in the proposed rule to designate critical habitat for the two species, which is incorporated by reference and summarized here.

The geographical area occupied by these two coral species has remained unchanged from their historical ranges, and both are widely distributed throughout the Caribbean (U.S. – Florida, Puerto Rico, U.S. Virgin Islands (U.S.V.I.), Navassa; and Antigua and Barbuda, Aruba, Bahamas, Barbados, Belize, British Virgin Islands, Colombia, Costa Rica, Cuba, Dominica, Dominican Republic, Grenada, Guadeloupe, Haiti, Honduras, Jamaica, Martinique, Mexico, Netherlands Antilles, Nicaragua, Panama, St. Kitts and Nevis, St. Lucia, St. Vincent and the Grenadines, Trinidad and Tobago, and Venezuela). NMFS

regulations prohibit designating critical habitat in foreign countries or in other areas outside U.S. jurisdiction (50 CFR 424.12(h)). Thus, the geographical area occupied by these species within the jurisdiction of the United States is limited to four counties in the State of Florida (Palm Beach County, Broward County, Miami-Dade County, and Monroe County), Flower Garden Banks National Marine Sanctuary, and the U.S. territories of Puerto Rico, U.S.V.I., and Navassa Island.

Within the species' occupied geographical range, critical habitat is defined as those specific areas containing physical or biological features which are essential to the species' conservation and which may require special management considerations or protection. Conservation is defined in the ESA as meaning "to use, and the use of, all methods and procedures which are necessary to bring any endangered species or threatened species to the point at which the measures provided pursuant to this chapter are no longer necessary" (16 U.S.C. §1532(3)). Features essential to a species' conservation, then, are those features without which the process of conservation would fail, and the species would not achieve recovery for purposes of the ESA. Although features forming the basis of a critical habitat designation must be essential to the species' conservation, the features do not have to be the sole factor required to bring about recovery. Based upon the best scientific data available, we determined that a key conservation objective for these two species is a need to increase their abundance and distribution within their occupied range, by facilitating increased incidence of successful sexual and asexual reproduction. The physical feature essential to achieving this conservation objective (also referred to as a primary constituent element or PCE) is substrate of suitable quality and availability, in water depths 30 meters (98 feet) and shallower, to support successful larval settlement and recruitment, and reattachment of asexual fragments. Substrate of suitable quality and availability is defined as consolidated hardbottom or dead-in-place coral skeleton that is free from fleshy macroalgal cover and sediment cover. We determined that no other environmental features are appropriate or necessary for defining critical habitat for the two corals. Other than the substrate PCE, we cannot conclude that any other sufficiently definable feature of the environment is essential to the corals' conservation. In addition, some features of the corals' environment, such as water temperature, are more appropriately viewed as impacts or stressors that harm the corals, rather than habitat features that provide a conservation function. These stressors would therefore be analyzed as factors that may contribute to a jeopardy determination pursuant to section 7 of the ESA, rather than to a determination whether the corals' critical habitat is likely to be destroyed or adversely modified. Some environmental features are also subsumed within the definition of the substrate PCE; for instance, substrate free from macroalgal cover would encompass water quality sufficiently free of nutrients.

We identified four "specific areas" within the geographical area occupied by the species, at the time of listing, that contain the essential physical feature. These are all waters in water depths 30 meter and shallower in four specific areas: (Area 1) Palm Beach, Broward, Miami-Dade, and Monroe Counties, including the Marquesas Keys and the Dry Tortugas, Florida; (Area 2) Puerto Rico and associated islands; (Area 3) St. John/St. Thomas, U.S.V.I.; and (Area 4) St. Croix, U.S.V.I (see Appendix B). The 30-meter depth contour is the seaward boundary for all but the Florida specific area and results in three large critical habitat areas with some small adjacent, but not continuous areas less than 30 meters. However, because only specific counties in Florida are being designated, we used additional boundaries to close the polygon, including the FKNMS boundary and COLREGS line. Within these specific areas, the PCE consists of consolidated hardbottom or dead coral skeleton that are free from fleshy macroalgae cover and sediment cover. The PCE can be found unevenly dispersed throughout the identified specific areas, and we did not identify any major gaps in its distribution. The PCE is not likely to be present in natural areas of loose sediment, fleshy macroalgal covered hardbottom, or seagrasses. Additionally, existing man-made structures such as artificial reefs, boat ramps, docks, pilings, maintained channels or marinas do not provide the PCE that is essential the species' conservation. The submerged nature of the essential feature, the limits of available information on the distribution of the feature, and limits on mapping methodologies make it infeasible to define the specific areas containing the essential feature more finely than described above. Additionally, due to the population dynamics of the species and the distribution of the PCE within

the reef ecosystem, there is no basis for designating a larger number of smaller specific areas than the four we have identified.

For each of the four specific areas, we determined that the essential physical feature of suitable quality substrate may require special management considerations or protection. Suitable habitat available for larval settlement and recruitment and asexual fragment reattachment of these coral species is particularly susceptible to impacts from human activity because of the shallow water depth range (0 to 30 meters; 0 to 98 feet) in which elkhorn and staghorn corals commonly grow. The proximity of this habitat to coastal areas subject this feature to impacts from multiple activities including dredging and disposal activities, stormwater run-off, coastal and maritime construction, land development, wastewater and sewage outflow discharges, point and non-point source pollutant discharges, fishing, placement of large vessel anchorages, and installation of submerged pipelines or cables. The impacts from these activities, combined with those from natural factors (i.e., major storm events), significantly affect the quality and quantity of available substrate for these threatened species to successfully sexually and asexually reproduce.

We are not proposing to designate any areas outside the occupied geographical area as critical habitat. At the present time, the range of these species has not been constricted, and identifying areas outside this range would require speculation about possible expansion of the species beyond their historic ranges. Thus, we have not identified any areas outside the geographical area occupied by the species that are essential for their conservation (50 CFR 424.12(e)).

Finally, section 4(a)(3)(B) prohibits designating as critical habitat any lands or other geographical areas owned or controlled by the Department of Defense (DOD), or designated for its use, that are subject to an integrated natural resources management plan (INRMP), if we determine that such plans provide a benefit to the coral species (16 U.S.C. §1533(a)(3)(B)). The legislative history to this provision explains:

“The conferees would expect the [Secretary] to assess an INRMP's potential contribution to species conservation, giving due regard to those habitat protection, maintenance, and improvement projects and other related activities specified in the plan that address the particular conservation and protection needs of the species for which critical habitat would otherwise be proposed. Consistent with current practice, the Secretary would establish criteria that would be used to determine if an INRMP benefits the listed species for which critical habitat would be proposed” (Conference Committee report, 149 Cong. Rec. H. 10563 (November 6, 2003)).

No areas within the specific areas being proposed for designation are covered by relevant INRMPs. Although Naval Air Station Key West (NASKW) is within the specific areas being proposed for designation, the current INRMP was adopted in 2001 and addresses neither listed corals, nor corals in general. NASKW is in the process of updating the 2001 INRMP and has issued a draft of the document to NMFS for review. If the draft INRMP were to become final and provide a benefit to the two corals as described above, then we would not designate critical habitat within the boundaries covered by the INRMP pursuant to Section 4(a)(3)(B) of the ESA. As explained below, however, NASKW is being proposed for exclusion pursuant to Section 4(b)(2).

1.3 Section 4(b)(2) Requirements

This section describes the statutory requirements of determining the impacts of designation of critical habitat. The interpretation of the statute through previous designations and key court opinions informed our process.

The Statutory Language and Consideration of Potential Impacts of Designation

Section 4(b)(2) of the ESA states:

The Secretary shall designate critical habitat, and make revisions thereto, under subsection (a)(3) of this section on the basis of the best scientific data available and after taking into consideration the economic impact, impact on national security, and any other relevant impact, of specifying any particular area as critical habitat. The Secretary may exclude any area from critical habitat if he determines that the benefits of such exclusion outweigh the benefits of specifying such area as part of the critical habitat, unless he determines, based on the best scientific and commercial data available, that the failure to designate such area as critical habitat will result in the extinction of the species concerned (16 U.S.C. §1533(b)(2)).

Impacts may result from a critical habitat designation primarily through the operation of section 7 of the ESA (16 U.S.C. §1536). Section 7(a)(2) requires each Federal agency to consult with NMFS (or the Fish and Wildlife Service (FWS), as applicable) to insure that any action they authorize, fund or carry out will not likely jeopardize the continued existence of listed species or destroy or adversely modify the designated critical habitat of listed species. Federal agencies are required to enter into consultation whenever a proposed action “may affect” listed species or designated critical habitat. If a proposed Federal action will likely destroy or adversely modify critical habitat, the Federal agency or the project permittee or grantee may be required to implement a reasonable and prudent alternative (RPA) to the proposed action that would avoid destruction or adverse modification of critical habitat. Thus, impacts that may result from section 7 consultations include agency and project applicant administrative costs of performing the consultation, and costs of modifications to the proposed action in order to implement a RPA. In addition, because critical habitat is by definition “essential to the conservation” of the species, conservation benefits to the listed species would result when the consultation process avoids destruction or adverse modification of its critical habitat through inclusion of RPAs, or avoids lesser adverse effects to critical habitat that may not rise to the level of adverse modification through inclusion of harm avoidance measures as described in more detail in section 3.2. RPAs or harm avoidance measures to protect the listed corals may also avoid adverse impacts to other components of the ecosystem, particularly other coral species in the footprint of proposed actions. Designation and protection of critical habitat could result in or contribute to continued provision of recreational or other use values associated with the listed corals, or increases in these values if project modifications that avoid adverse modification result in increases in the species’ abundance. Similarly, project modifications that avoid adverse impacts to critical habitat and other components of the ecosystem may result in continued provision or increases in benefits to user groups and economic sectors that utilize these habitat or ecosystem components.

Commenters on previous critical habitat designations have suggested that secondary costs to regional economies can also result from project modifications prescribed through section 7 consultation. For example, concerns have been raised where critical habitat is being proposed in areas of residential development that the designation will lead to reduced revenues and employment in construction-related firms, potential lost tax revenue associated with decreased residential development, and even impairment of regional growth (See, e.g., Elliott D. Pollack and Company, 1999). In other designations, concerns have been expressed that critical habitat designation may require alteration in shipping channel dredging projects or commercial fishing activities to such an extent that it would result in regional economic impacts (See, e.g., IEc, 2003). We do not foresee that project modifications for the categories of activities we project will undergo section 7 consultation due to the proposed critical habitat designation for the two corals, described in detail in section 3.2, will result in impacts at the scale of regional economies. The PCE is located in areas that are generally located offshore some distance, within reef ecosystems, and are not practicable areas to develop. In addition, where the PCE is located within the boundaries of Federal, State or local resource protection or management areas, management regulations for protection of the reef

resources prohibit development, particularly of the scale that would impact regional economies if modification was required. In addition, the PCE does not exist in the unconsolidated sediments that typically comprise navigational channels. The only commercial fishing activity we identified that may require modification to avoid destroying or adversely modifying the PCE involves traps (e.g., stone crab and spiny lobster fisheries). The potential project modification identified for that action (i.e., fishing gear maintenance) is minor and would not have economic impacts beyond the individual fisherman required to retrieve his or her traps. Even large projects, like cable or pipeline installation, and their associated project modifications are not expected to result in secondary costs to regional economies. The potential project modifications identified for predicted future consultations are in most instances well established environmental monitoring, mitigation or harm avoidance measures; many of these are routinely required by governmental permitting agencies regulating the harmful effects of activities on marine resources, and we are not aware of any evidence that these requirements are having large-scale economic impacts. Thus, we assume that secondary costs to regional economies are not likely to result from the proposed designation, and these impacts will not be discussed further in the report.

Aside from the protections provided through section 7, the ESA imposes no other requirements or limitations on any entities or individuals as a result of critical habitat designation. Benefits to the listed species and its critical habitat may nonetheless result from a designation if state or local governments voluntarily enact protective legislation or regulations to complement the ESA protections. Similarly, a designation may raise public awareness and sensitivity to the status of listed species and the importance of designated critical habitat areas for conservation. As a result, individuals or other entities may voluntarily modify their activities to avoid harm to the species or habitat, contribute to conservation efforts, or seek to view the species in the wild.

Key Legal Interpretations

The ESA does not specify methods for identifying and considering the impacts of critical habitat designation, and previous designations have used a variety of approaches based on the differing facts and circumstances of the species and habitat involved. Several important court opinions have evaluated the legal sufficiency of these analyses, and clarified a number of important aspects of these statutory provisions. First, section 4(b)(2) consists of two steps: an initial mandatory requirement that the agency consider certain impacts of critical habitat designation, and a discretionary step wherein the agency, informed by those considerations, may propose excluding particular areas from the designation. The ESA's legislative history explains the broad latitude afforded to NMFS in its consideration of impacts:

“Economics and any other relevant impact shall be considered by the Secretary in setting the limits of critical habitat for such a species. The Secretary is not required to give economics or any other “relevant impact” predominant consideration in his specification of critical habitat...The consideration and weight given to any particular impact is completely within the Secretary's discretion” (H.R. Rep. No. 95-1625, at 16-17 (1978), 1978 U.S.C.A.N. 9453, 9466-67)¹.

NMFS may then exclude particular areas that otherwise meet the definition of critical habitat from a designation, on a determination that the benefits of exclusion outweigh the benefits of including the area(s), and exclusion will not result in the species' extinction. This step is entirely discretionary, and does not require exclusion in any circumstances.

One court has held that an agency's decision not to exercise its discretion to exclude areas is not subject to judicial review. Home Builders Association of No. Calif. et al., v. U.S. Fish and Wildlife Service, 2006 U.S. Dist. LEXIS 80255 at 45-46 (E.D. Cal., Nov. 1, 2006). The court based this conclusion on the

¹ The provisions requiring consideration of impacts were originally discussed as applicable only to critical habitat designations for invertebrate species. However, section 4(b)(2) as enacted is not limited to invertebrates, and NMFS and FWS have applied the provision to designations for vertebrate and invertebrate species.

broad latitude provided to the agency in consideration of impacts described above, the discretionary nature of the exclusion provision, and the fact that the statute provides substantive standards only for the review of actual exclusions, i.e., the Secretary must determine that the benefits of exclusion outweigh the benefits of inclusion for particular areas. In contrast, the statute includes no substantive standards for a court to review a decision not to exclude areas from a designation.

Regarding consideration of economic impacts, the Home Builders court has noted that “impacts” is not specific and can be both positive and negative (Id. at 54, citing Butte Envtl. Council v. Norton, slip op., 04-0096, at 12 (N.D. Cal. Oct. 28, 2004)); we believe this logic applies equally to national security impacts and other relevant impacts. Therefore, our analysis below begins with identification and consideration of positive and negative economic, national security, and other relevant impacts that may result from including each of the four specific areas in the proposed critical habitat designation.

1.4 Other Laws, Executive Orders, and Policies Applicable to Economic Impact Analysis

The Regulatory Flexibility Act (RFA; 5 U.S.C. §601 *et seq.*) establishes a regulatory philosophy that agencies shall endeavor, consistent with the objectives of a proposed rule and applicable statutes, to fit regulatory requirements to the scale of businesses, organizations, and governmental jurisdictions subject to regulation. The RFA does not contain decision criteria per se; rather, the purpose of the RFA is to inform the agency, as well as the public, of the expected economic impacts of a proposed action to ensure that the agency considers alternatives that minimize expected significant adverse impacts of the rule on substantial numbers of small entities, while meeting the goals and objectives of the proposed action. We conducted an Initial Regulatory Flexibility Act analysis for this proposed designation, which is presented in Appendix A.

Executive Order (EO) 12866, Regulatory Planning and Review, provides guidance to federal agencies on the development and analysis of regulatory actions. The overarching regulatory philosophy established by EO 12866 is:

Federal agencies should promulgate only such regulations as are required by law, are necessary to interpret the law, or are made necessary by compelling public need, such as material failures of private markets to protect or improve the health and safety of the public, the environment, or the well-being of the American people. In deciding whether and how to regulate, agencies should assess all costs and benefits of available regulatory alternatives, including the alternative of not regulating. Costs and benefits shall be understood to include both quantifiable measures (to the fullest extent that these can be usefully estimated) and qualitative measures of costs and benefits that are difficult to quantify, but nevertheless essential to consider. Further, in choosing among alternative regulatory approaches, agencies should select those approaches that maximize net benefits (including potential economic, environmental, public health and safety, and other advantages, distributive impacts, and equity), unless a statute requires another regulatory approach.

The EO includes a list of twelve principles for regulatory program planning and development of individual proposed rules that agencies should adhere to, to the extent permitted by law and where applicable. These principles include identification of market failures or other problems intended to be addressed by the regulation, and whether existing regulations or laws have created or contributed to the problem needing addressing. If applicable, agencies are directed to identify non-regulatory alternatives to the problem. Where regulations are necessary or required by law, agencies must design regulations in the most cost-effective manner available to achieve the regulatory objective, and that impose the least burden on society. All costs and benefits of proposed regulations must be assessed. If feasible, agencies should specify performance objectives rather than behavior or compliance requirements. Agencies are directed

to seek the views of appropriate state, local, and tribal officials if such would be significantly or uniquely affected by a proposed rule. Regulations must not be inconsistent, incompatible, or duplicative with other federal regulations, and must be simply drafted and easy to understand.

Office of Management and Budget (OMB) guidance to federal agencies on implementing EO 12866 states that good regulatory analyses include three basic elements: (1) a statement of the need for the proposed action, (2) an examination of alternative approaches, and (3) an evaluation of benefits and costs of the proposed action and the main alternatives (OMB Circular A-4, Sept. 17, 2003). Further, Circular A-4 states that proper evaluation of the benefits and costs of regulations requires:

- Explaining how the actions required by the rule are linked to the expected benefits;
- Identifying an appropriate baseline; and
- Identifying the expected undesirable side-effects and ancillary benefits of the proposed rule.

We have integrated these regulatory principles into the development of this proposed rule to the extent consistent with the mandatory duty to designate critical habitat, as defined in the ESA.

2 RELEVANT BASELINE INFORMATION

As discussed above, the impacts of proposed regulations must be evaluated in terms of the benefits and costs of the action measured against a relevant baseline. The baseline is the best assessment of the way the world looks and will look in the absence of the proposed regulations. For this proposed critical habitat designation, we have characterized the baseline using three sets of information: 1) the relevant economic baseline, 2) existing laws and regulations that may protect the proposed critical habitat feature, and 3) baseline benefits and values provided by coral reefs, and elkhorn and staghorn corals in particular.

2.1 Economic Baseline

This subsection summarizes key economic information for the areas in which activities may be affected by the proposed designation. Understanding the current types and levels of economic activity provides context for evaluating the importance of impacts resulting from the proposed action. The data available for the economic baseline cannot be easily summarized for the exact areas proposed for designation; comparative data are generally available at the state-wide or county-wide level. Therefore, data are presented for the four Florida counties that may be affected by the designation, for Puerto Rico, and for the U.S. Virgin Islands combined.

2.1.1 Florida

Florida (State) waters extend 9 nautical miles (10.36 statute miles) off the State's Gulf coast and 3 nautical miles (3.45 statute miles) off its Atlantic coast. Elkhorn and staghorn corals occur in shallow nearshore waters off four Florida Counties: Palm Beach County, Broward County, Miami-Dade County, and Monroe County.

2.1.1.1 Palm Beach County

Palm Beach County is the northernmost county of Florida where elkhorn and staghorn corals are found. It is the largest county in the state by size with a total area of 6,181 km² (2,386 square miles), with 5,113 km² being land and the remaining 1,068 km² (about 17.3 percent) being water, much of which is in the Atlantic Ocean and Lake Okeechobee (U.S. Census Bureau). It has 47 miles of coastline (Figure 2-2).

The U.S. Census Bureau estimates the population of Palm Beach County grew over 12 percent from 2000 to 2005, with approximately 1.27 million people in 2005. The County's population growth has been

dominated by in-migration from other parts of the country. From April 1, 2000, to July 1, 2006, it is estimated that there was a natural increase in the population of 6,431 (91,093 births less 88,806 deaths) and net migration of 139,754 (50,948 from net international migration plus 88,806 from net internal migration). Much of the population growth is attributable to the County being a popular destination for retirees. About 21 percent of the County's population was 65 years and over in 2005, as compared to that age group representing about 12 percent of the U.S. population and approximately 17 percent of Florida's population that year.



Figure 1. Palm Beach County. Image Source: Wikipedia.

The increases in population and employment have generated increases in demand for homes, commercial and institutional buildings, and infrastructure. Median household income in the county in 2004 was \$44,186 and 10.1 percent lived below poverty, as compared to the statewide median household income of \$40,900 and poverty rate of 11.9 percent.

Table 1 below shows that in Palm Beach County, the largest industrial sectors (by number of employees) are:

- (1) Retail Trade;
- (2) Health Care & Social Assistance;
- (3) Accommodation & Food Services;²
- (4) Administrative, Support, Waste Management, & Remediation Service;³ and
- (5) Construction.

The industrial sectors of "Retail Trade" and "Accommodation & Food Services" are principle components of tourism. According to the September 2005 City Tourism Impact Report for Palm Beach County, 7.22 million travelers visited Palm Beach County in 2004, which supported \$1.51 billion in wages and 7 percent of the jobs and generated an economic impact of \$2.83 billion.

According to Johns et al. (2003), residents and visitors spent 4.24 million person-days visiting artificial and natural reefs in Palm Beach County during the 12-month period from June 2000 to May 2001. The same study found that, over the same time period, reef-related expenditures generated \$505 million in sales, \$194 million in income, and created 6,300 jobs in the County. When asked what they were willing to pay to maintain the natural reefs in Palm Beach County in their existing condition, natural reef users

² The Accommodation and Food Services sector comprises establishments providing customers with lodging and/or preparing meals, snacks, and beverages for immediate consumption. Excluded from this sector are civic and social organizations; amusement and recreation parks; theaters; and other recreation or entertainment facilities providing food and beverage services.

³ The Administrative and Support and Waste Management and Remediation Services sector comprises establishments performing routine support activities for the day-to-day operations of other organizations. Activities performed include: office administration, hiring and placing of personnel, document preparation and similar clerical services, solicitation, collection, security and surveillance services, cleaning, and waste disposal services.

said they were willing to pay \$42 million annually (Johns et al., 2003). Furthermore, recreational fishers, divers, and snorkelers who use the reefs in the County are willing to pay \$31 million annually to maintain the reefs in their existing condition (ibid). Further, 1.76 million person-days were devoted to recreational fishing on reefs in the County from June 2000 to May 2001 (Johns et al. 2003).

Table 1. 2005 County Business Patterns and Non-employer Statistics for Palm Beach County (U.S. Census Bureau)

NAICS Code ^a	Industry Code Description	Non-Employer Firms ^b	Non-Employer Receipts (\$1,000) ^c	Employer Establishments ^d	Number of Employees	Annual Payroll (\$1,000) ^e
11	Agriculture, Forestry, Fishing and Hunting	636	27,851	78	1,398	20,666
21	Mining	18	1,971	24	234	12,828
22	Utilities	48	1,813	30	3,969	412,927
23	Construction	10,593	688,604	4,266	37,576	1,544,242
31	Manufacturing	1,221	74,104	975	15,769	753,088
42	Wholesale trade	2,793	251,624	2,436	19,902	1,052,622
44	Retail trade	7,849	453,732	5,458	73,486	1,831,500
48	Transportation & Warehousing	4,172	215,349	773	8,935	326,350
51	Information	1,577	83,540	738	15,530	770,340
52	Finance & insurance	7,523	603,238	3,175	25,748	1,934,633
53	Real estate & rental & leasing	21,153	1,774,645	2,766	14,731	636,205
54	Professional, Scientific & Technical Services	17,586	946,661	6,746	36,406	2,206,725
55	Management of Companies & Enterprises	0	0	217	16,799	1,268,578
56	Admin, support, waste mgt, remediation services	9,542	291,528	3,000	43,417	1,316,027
61	Educational services	2,106	43,080	469	9,864	301,140
62	Health care & social assistance	9,958	367,559	4,511	65,692	2,630,989
71	Arts, entertainment & recreation	4,906	189,810	796	16,627	453,617
72	Accommodation & food services	1,462	121,315	2,478	54,686	853,655
81	Other services (except public adm.)	16,293	554,540	3,625	23,587	564,578
99	Unclassified establishments	0	0	87	115	2,561
TOTAL		119,436	6,690,964	42,648	484,471	18,893,271

^a The U.S., Canada, and Mexico developed North American Industry Classification System (NAICS) is the new industry classification system, which replaces the U.S. Standard Industrial Classification (SIC) system to provide comparable statistics across the three countries.

^b A "non-employer firm" is defined as one that has no paid employees, has annual business receipts of \$1,000 or more (\$1 or more in the construction industries), and is subject to federal income taxes. Most non-employers are self-employed individuals operating very small unincorporated businesses, which may or may not be the owner's principal source of income.

^c "Receipts" (net of taxes) are defined as the revenue for goods produced, distributed, or services provided, including revenue earned from premiums, commissions and fees, rents, interest, dividends, and royalties. Receipts exclude all revenue collected for local, state, and federal taxes.

^d "Employer establishments" consist of full and part-time employees, including salaried officers and executives of corporations, who were on the payroll in the pay period including March 12. Included are employees on sick leave, holidays, and vacations; not included are proprietors and partners of unincorporated businesses.

^e "Total annual payroll" includes all forms of compensation, such as salaries, wages, commissions, bonuses, vacation allowances, sick-leave pay, and the value of payments in-kind (e.g., free meals and lodgings) paid during the year to all employees.

Coral reefs are important habitat for species targeted by commercial and recreational fishermen, and fishing is a notable industry sector contributing to tourism and to the economy of Palm Beach County. Within the “Transportation & Warehousing” industry sector, 30 business establishments in the “Charter Fishing & Party Fishing Boat” industry subsector (NAICS Code 4872102) in the County reported annual revenues totaling approximately \$6.2 million (2002 Economic Census, Transportation and Warehousing Subject Series). In 2005, commercial fishermen in Palm Beach County landed a total of 115,813 pounds of shallow water reef fish with a dockside value of \$228,584. See Table 2.

Table 1 also shows that in 2005 there were 4,266 employer establishments in the industry sector of “Construction” with 37,576 employees and an annual payroll totaling approximately \$1.54 billion (2005 County Business Patterns, U.S. Census Bureau). That same year, there were an estimated 10,593 non-employer firms in construction with total receipts of about \$689 million in the county. Employer establishments and non-employer firms involved in “Construction” represent 8.9 percent and 10 percent, respectively, of the total number of employer establishments and non-employer firms operating in Palm Beach County.

Table 2. 2005 Commercial Landings of Shallow Water Reef Fish, Palm Beach County. Source: NMFS Southeast Regional Office Logbook Data

Group/Species	Pounds	Dollars (\$)
Groupers:	19,331	58,162
Snowy grouper	6,403	18,579
Yellowedge grouper	117	343
Red grouper	960	2,498
Black grouper	996	3,030
Gag grouper	10,493	32,903
Other grouper	362	809
Hinds:	37	89
Rock hind	8	20
Red hind	29	69
Hogfish	671	1,851
Jacks:	38,734	35,077
Almaco jack	992	877
Greater amberjack	37,742	34,200
Sand perch	68	216
Banded rudderfish	7,786	4,708
Scamp	122	371
Snappers:	45,016	124,839
Dog snapper	108	258
Cubera snapper	286	377
Lane snapper	2,863	7,183
Mangrove snapper	3,899	9,147
Mutton snapper	9,545	25,435
Red snapper	105	293
Vermillion snapper	5,003	16,054
Yellowtail snapper	22,694	65,120
Mahogany snapper	2	5
Unclassified snappers	511	967
Triggerfish	4,048	3,271
Total	115,813	228,584

Table 3 shows the composition, by industry subsector, of the construction industry sector (i.e., how many establishments and firms are involved in each different type of construction). Of the businesses in the construction industry sector, the majority of employer establishments (67 percent) and non-employer firms (83 percent) are “Specialty Trade Contractors”. The remainder of employer establishments and non-employer firms in the construction industry sector are involved in the industry subsectors of “Construction of Buildings” and “Heavy & Civil Engineering Construction,” with “Construction of Buildings” being the second largest construction industry subsector. Last, 35 employer establishments and 83 non-employer firms are involved in the industry subsector of “Other Heavy & Civil Engineering Construction” (NAICS Code 237990). This subsector includes marine construction projects such as breakwater, dock, pier, jetty, seawall and harbor construction, and dredging. These establishments and non-employer firms represent approximately 0.82 percent and 0.78 percent, respectively, of the establishments and non-employer firms operating in the construction sector as a whole in the county.

Table 3. Composition, by industry subsector, of the construction industry sector (2005 County Business Patterns and Non-employer Statistics (U.S. Census Bureau).

NAICS Code	Industry Code Description	Non-Employer Firms	Non-Employer Receipts (\$1,000)	Employer Establishments	Number of Employees
23	Construction	10,593	688,604	4,266	37,576
236	Construction of buildings ^a	1,607	182,311	1,151	9,912
2361	Residential Construction	1,328	152,626	985	7,512
2362	Nonresidential Construction	279	29,685	166	2,400
237	Heavy & Civil Engineering Construction ^b	204	18,943	265	5,161
2371	Utility System Construction	25	1,857	88	2,543
2372	Land Subdivision	64	9,146	97	641
2373	Highway, Street, & Bridge Construction	32	1,227	45	1,715
2379	Other Heavy & Civil Engineering Construction	83	6,713	35	262
238	Specialty Trade Contractors ^c	8,782	487,350	2,850	22,503

^a Subsector 236, “Construction of Buildings,” comprises establishments of the general contractor type and operative builders involved in the construction of buildings.

^b Subsector 237, “Heavy and Civil Engineering Construction,” comprises establishments involved in the construction of engineering projects (e.g., highways and dams). Construction projects involving water resources (e.g., dredging and land drainage) and projects involving open space improvement (e.g., parks and trails) are included in this subsector. Specialty trade activities are classified in this subsector if the skills and equipment present are specific to heavy or civil engineering construction projects.

^c Subsector 238, “Specialty Trade Contractors,” comprises establishments engaged in specialty trade activities generally needed in the construction of all types of buildings.

2.1.1.2 Broward County

Broward County has a total area of 3,418 km² (1,320 square miles), with 3,122 km² being land and the remaining 296 km² (about 9 percent) being water (U.S. Census Bureau). Approximately 64 percent of the country’s total area lies within the Everglades conservation area, and development is restricted to 410 square miles (Broward County Planning Services Division; Figure 2).



Figure 2. Broward County. Image Source: Wikipedia

Broward County is the second most populated county in Florida and is the 15th most populous county in the nation. According to U.S. Census Bureau estimates, the population of Broward County grew 10.1 percent from April 1, 2000, to July 1, 2006, with approximately 1.79 million people in 2006. During that same period, the natural increase in population was 43,623 (142,787 births less 99,164 deaths) and net migration was 120,768 (100,986 net international migration plus 19,782 net internal migration), for a total increase of 164,391 people. The increase in population has resulted in increased demand for homes, retail and commercial buildings and infrastructure. Housing units increased from 741,043 in 2000 to 790,308 in 2005, an increase of less than 7 percent (U.S. Census Bureau). Median household income in the county in 2004 was \$43,136 and 11.6 percent of the persons in the county lived below poverty, as compared to the statewide median household income of \$40,900 and the poverty rate of 11.9 percent.

In Broward County, the largest industrial sectors (by number of employees, see Table 4) are:

- (1) Retail Trade;
- (2) Health Care & Social Assistance;
- (3) Accommodation & Food Services;
- (4) Administrative, Support, Waste Management, & Remediation Services; and
- (5) Construction.

The “Retail Trade” and “Accommodation & Food Services” industrial sectors are principle components of tourism and the contribution of tourism to Broward County’s economy is significant. In 2005, the County had a record of over 10 million visitors, a 6.3 percent increase from 2004 (Broward County Department of Urban Planning and Redevelopment, 2006). Tourism generates more than \$8.4 billion annually and employs more than 112,000 people in the County (ibid). In 2005, 22 million passengers transited through Fort Lauderdale-Hollywood International Airport, a number that broke the previous year’s record of travelers passing through the facility (Broward County Department of Urban Planning and Redevelopment, 2006).

Port Everglades infuses more than \$2.4 billion annually to the county’s economy (Broward County Department of Urban Planning and Redevelopment, 2005). It handles about 4 million cruise ship passengers and over 26 million tons of cargo annually, and nearly 6,400 cargo and cruise ships call at the port each year (ibid). According to the Broward County Department of Urban Planning and Redevelopment (2006), Port Everglades has been ranked as one of the five fastest growing container ports among the nation’s 20 largest seaports. It handles more than 22.1 percent of Florida’s waterborne imports and exports.

According to Johns et al. (2003), residents and visitors spent 9.44 million person-days visiting artificial and natural reefs in Broward County during the 12-month period from June 2000 to May 2001. The same study found that reef-related expenditures generated about \$2.1 billion in sales, over \$1 billion in income, and created 36,000 jobs in the county over the same time period. When asked what they were willing to pay to maintain the natural reefs in Broward County in their existing condition, natural reef users said they were willing to pay \$83.6 million annually (Johns et al., 2003). Furthermore, recreational fishers, divers, and snorkelers who use the reefs in the county are willing to pay \$126 million annually to maintain the reefs in their existing condition (ibid).

Coral reefs are important habitat for species targeted by commercial and recreational fishermen, and fishing is important to the Broward County economy. In 2002, within the "Transportation & Warehousing" industry sector, there were 26 business establishments in the "Charter Fishing & Party Fishing Boat" industry subsector (NAICS Code 4872102) in the County (2002 Economic Census, Transportation and Warehousing Subject Series). In 2005, commercial fishermen in Broward County landed a total of 14,830 pounds of shallow water reef fish with a dockside value of \$35,370. See Table 5.

Table 4. 2005 County Business Patterns and Non-Employer Statistics for Broward County (U.S. Census Bureau).

NAICS Code	Industry Code Description	Non-Employer Firms	Non-Employer Receipts (\$1,000)	Employer Establishments	Number of Employees	Annual Payroll (\$1,000)
11	Agriculture, Forestry, Fishing and Hunting	467	20,022	50	100 - 249	*
21	Mining	18	2,536	9	133	11,972
22	Utilities	87	4,369	26	500 - 999	*
23	Construction	15,482	824,796	4,729	45,489	1,915,366
31	Manufacturing	1,791	118,443	1,679	29,655	1,160,990
42	Wholesale trade	4,383	439,736	4,710	41,514	1,976,541
44	Retail trade	11,293	579,188	7,374	102,197	2,625,584
48	Transportation & warehousing	7,821	382,114	1,346	21,480	811,196
51	Information	2,504	106,506	1,117	19,503	1,123,875
52	Finance & insurance	7,825	487,869	3,969	40,480	2,335,984
53	Real estate & rental & leasing	25,240	1,843,848	3,670	18,422	704,456
54	Professional, scientific & technical services	22,385	1,035,758	9,187	41,852	2,212,225
55	Management of companies & enterprises	0	0	273	10,999	983,114
56	Admin, support, waste mgt, remediation services	14,601	386,155	3,869	65,367	1,833,766
61	Education services	2,782	55,593	603	15,046	450,758
62	Health care & social assistance	17,572	544,595	5,496	84,111	3,212,404
71	Arts, entertainment & recreation	6,714	222,151	960	9,728	316,824
72	Accommodation & food services	2,312	155,492	3,568	68,512	1,016,954
81	Other services (except public adm.)	27,791	808,376	4,847	30,422	753,542
99	Unclassified establishments	0	0	140	176	4,134
TOTAL		171,068	8,017,547	57,622	646,067	23,509,177

* Zero in 2005 County Business Patterns

Table 4 shows that there were an estimated 4,729 employer establishments in the construction industry, with 45,489 employees and an annual payroll totaling approximately \$1.92 billion in 2005 (2005 County Business Patterns, U.S. Census Bureau). That same year, there were an estimated 15,482 non-employer firms in construction with total receipts of about \$825 million in the county. Employer establishments and non-employer firms involved in “Construction” represent 8.2 percent and 9.1 percent, respectively, of the total number of employer establishments and non-employer firms operating in Broward County.

Table 5. 2005 Commercial Landings of Shallow Water Reef Fish in Broward County. Source: NMFS SERO Logbook Data.

Group/Species	Pounds	Dollars (\$)
Hinds:	29	54
Rock hind	27	48
Red hind	2	6
Groupers:	4,884	12,944
Snowy grouper	318	883
Red grouper	443	1,105
Black grouper	1,522	4,101
Gag grouper	2,534	6,670
Yellowfin grouper	67	185
Hogfish	556	1,435
Jacks:	937	648
Almaco jack	101	86
Greater amberjack	836	562
sand perch	11	15
Snappers:	7,366	19,156
Lane snapper	183	371
Mangrove snapper	302	742
Mutton snapper	1,177	3,068
Vermilion snapper	356	843
Yellowtail snapper	5,306	14,025
Unclassified snappers	42	107
Triggerfish	1,047	1,118
Total	14,830	35,370

Table 6 shows the composition of the construction industry sector. Of the businesses in the construction industry sector, the majority of employer establishments (69 percent) and non-employer firms (84 percent) are “Specialty Trade Contractors.” The remainder of employer establishments and non-employer firms in the construction industry sector are involved in the industry subsectors of “Construction of Buildings” and “Heavy & Civil Engineering Construction,” with “Construction of Buildings” being the second largest construction industry subsector. Last, 48 employer establishments and 107 non-employer firms are involved in the industry subsector of “Other Heavy & Civil Engineering Construction” (NAICS Code 237990). This subsector includes marine construction projects such as breakwater, dock, pier, jetty, seawall and harbor construction, and dredging. These establishments and firms represent approximately 1.02 percent and 0.69 percent, respectively, of the construction industry sector as a whole in Broward County.

Table 6. Composition of the construction industry sector and Non-employer Statistics in Broward County (2005 County Business Patterns, U.S. Census Bureau).

NAICS Code	Industry Code Description	Non-Employer Firms	Non-Employer Receipts (\$1,000)	Employer Establishments	Number of Employees
23	Construction	15,482	824,796	4,729	45,489
236	Construction of buildings ^a	2,189	160,369	1,170	10,679
2361	Residential Construction	1,678	123,699	920	6,090
2362	Nonresidential Construction	511	36,670	250	4,589
237	Heavy & Civil Engineering Construction ^b	289	27,072	275	4,276
2371	Utility System Construction	47	1,922	93	1,554
2372	Land Subdivision	104	10,604	95	407
2373	Highway, Street, & Bridge Construction	31	6,112	39	1,389
2379	Other Heavy & Civil Engineering Construction	107	8,434	48	926
238	Specialty Trade Contractors ^c	13,004	637,355	3,284	30,534

^a Subsector 236, "Construction of Buildings," comprises establishments of the general contractor type and operative builders involved in the construction of buildings.

^b Subsector 237, "Heavy and Civil Engineering Construction," comprises establishments involved in the construction of engineering projects (e.g., highways and dams). Construction projects involving water resources (e.g., dredging and land drainage) and projects involving open space improvement (e.g., parks and trails) are included in this subsector. Specialty trade activities are classified in this subsector if the skills and equipment present are specific to heavy or civil engineering construction projects.

^c Subsector 238, "Specialty Trade Contractors," comprises establishments engaged in specialty trade activities generally needed in the construction of all types of buildings.

2.1.1.3 Miami-Dade County

Miami-Dade County has a total area of 6,297 km² (2,431 square miles), with 5,040 km² being land and the remaining 1,257 km² (about 20 percent) being water (U.S. Census Bureau). Most of the area of water is Biscayne Bay, and another significant portion is the adjacent waters of the Atlantic Ocean. Among its major cities are Miami, Miami Beach, Coral Gables, and Key Biscayne. See Figure 3.

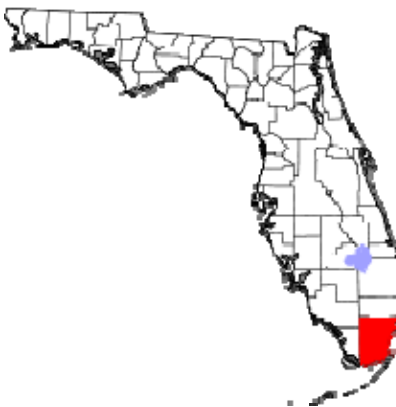


Figure 3. Miami-Dade County. Image Source: Wikipedia.

Miami-Dade County is the most populous county in Florida and the 8th most populous county in the nation. According to U.S. Census Bureau estimates, the population of the County grew 6.6 percent from April 1, 2000, to July 1, 2006, with approximately 2.4 million people in 2006. During that same period, the natural increase in population was 87,668 (204,079 births less 116,411 deaths) and net migration was 66,896 (257,492 net international migration less the 190,596 net internal out-migration). The number of housing units also increased from 852,414 in 2000 to 928,715 in 2005, an increase of about 9 percent.

Median household income in 2004 was \$34,682 and 17.1 percent of the persons in the county lived below poverty, in comparison to the statewide median household income of \$40,900 and poverty rate of 11.9 percent.

In Miami-Dade County, the largest industrial sectors (by number of employees; see Table 7) are:

- (1) Retail Trade;
- (2) Health Care & Social Assistance;
- (3) Accommodation & Food Services;
- (4) Administrative, Support, Waste Management, & Remediation Services; and
- (5) Wholesale Trade.

Table 7. 2005 County Business Patterns and Non-employer Statistics for Miami-Dade County (U.S. Census Bureau)

NAICS Code	Industry Code Description	Non-Employer Firms	Non-Employer Receipts (\$1,000)	Employer Establishments	Number of Employees	Annual Payroll (\$1,000)
11	Agriculture, Forestry, Fishing and Hunting	1,015	38,961	35	500 - 999	*
21	Mining	38	2,187	29	1,073	62,003
22	Utilities	274	3,944	29	2,500 - 4,999	*
23	Construction	30,690	1,165,256	4,618	38,417	1,482,470
31	Manufacturing	3,669	212,073	2,378	46,621	1,561,117
42	Wholesale trade	7,658	814,973	8,514	67,342	2,884,026
44	Retail trade	16,420	765,506	10,335	118,182	2,870,980
48	Transportation & warehousing	23,596	1,000,767	2,725	51,193	1,936,735
51	Information	3,457	152,330	1,444	21,956	1,283,285
52	Finance & insurance	9,005	561,580	4,728	47,057	2,889,919
53	Real estate & rental & leasing	33,897	2,666,341	4,950	23,462	1,055,582
54	Professional, scientific & tech. serv.	31,153	1,381,648	11,047	60,355	3,488,485
55	Management of companies & enterprises	*	*	291	17,005	1,311,656
56	Admin, support, waste mgt, remediation services	29,597	550,415	3,489	76,326	2,301,355
61	Educational services	3,719	63,432	727	28,162	1,019,920
62	Health care & social assistance	26,415	905,533	7,715	114,198	4,439,517
71	Arts, entertainment & recreation	8,962	280,307	971	12,553	378,867
72	Accommodation & food services	3,906	208,302	4,188	89,680	1,506,700
81	Other services (except public adm.)	62,985	1,270,636	5,895	38,989	884,694
99	Unclassified establishments	*	*	158	100 - 249	*
TOTAL		296,456	12,044,191	74,266	858,080	31,357,311

* Zero in 2005 County Business Patterns

The industrial sectors of “Retail Trade” and “Accommodation & Food Services” are principle components of tourism. Tourism is an important sector of the County’s economy and the largest sector of the City of Miami’s economy. According to the Greater Miami Convention and Visitors Bureau, in 2005, Miami-Dade County hosted 11.3 million visitors who generated over \$106 million in tourist-related sales and \$691 million in state sales tax. Overnight visitors generated an economic impact of \$13.9 billion.

The Dante B. Fascell Port of Miami-Dade ranks as the busiest cruise/passenger port in the world. In 2006, over 3.7 million cruise ship passengers passed through and over 9 million tons of cargo transited through the Port of Miami. The combination of cruise and cargo activity supports about 98,000 jobs and generates an economic impact of \$12 billion. Miami International Airport (MIA) handled 32.5 million passengers in 2006 (MIA website). Among U.S. airports, MIA ranks first in international freight, third in international passengers, and fourth in total freight.

Johns et al. (2003) estimate that residents and visitors spent 9.2 million person-days visiting artificial and natural reefs in Miami-Dade County during the 12-month period from June 2000 to May 2001. The same study found that reef-related expenditures generated about \$1.3 billion in sales, \$614 million in income, and created 19,000 jobs in the county over the same time period. When asked what they were willing to pay to maintain the natural reefs in Miami-Dade County in their existing condition, natural reef users said they were willing to pay \$47 million annually (Johns et al. 2003). Furthermore, recreational fishers, divers, and snorkelers who use the reefs in the county are willing to pay \$47 million annually to maintain the reefs in their existing condition (ibid).

Coral reefs are important habitat for species targeted by commercial and recreational fishermen, and fishing is a notable industry sector contributing to tourism and to the economy of Miami-Dade County. In 2002, within the “Transportation & Warehousing” industry sector, there were 17 business establishments in the “Charter Fishing & Party Fishing Boat” industry subsector (NAICS Code 4872102) in the County (2002 Economic Census, Transportation and Warehousing Subject Series).⁴ In 2005, commercial fishermen landed in Miami-Dade County a total of 175,511 pounds of shallow water reef fish with a dockside value of \$332,611. See Table 8.

Table 7 also shows that there were an estimated 4,618 employer establishments in the industry sector of “Construction” with 38,417 employees and an annual payroll totaling approximately \$1.48 billion in 2005 (2005 County Business Patterns, U.S. Census Bureau). That same year, there were an estimated 30,690 non-employer firms in construction with total receipts of about \$1.16 billion in the county. Employer establishments and non-employer firms involved in “Construction” represent 6.2 percent and 10.4 percent, respectively, of the total number of employer establishments and non-employer firms operating in Miami-Dade County. Table 9 shows the composition, by industry subsector, of the construction industry sector (i.e., how many establishments and firms are involved in each different type of construction).

⁴ Annual revenues for this industry subsector are withheld to avoid disclosing data of individual companies in Miami-Dade County.

Table 8. 2005 Commercial Landings of Shallow Water Reef Fish in Miami-Dade County. Source: NMFS SERO Logbook Data.

Group/Species	Pounds	Dollars (\$)
Groupers:	14,402	36,261
Snowy grouper	999	2,720
Yellowedge grouper	240	567
Red grouper	5,099	11,563
Black grouper	7,022	18,551
Gag grouper	1,029	2,827
Other grouper	13	33
Red hind	121	232
Hogfish	1,311	3,945
Jacks:	48,030	43,421
Almaco jack	3,230	3,453
greater amberjack	44,800	39,968
Sand perch	2	1
Scamp	304	774
Snappers:	110,222	246,760
Dog snapper	30	71
Cubera snapper	70	203
Lane snapper	1,522	3,216
Mangrove snapper	13,103	26,899
Mutton snapper	10,024	25,886
Red snapper	584	1,286
Vermilion snapper	2,551	6,692
Yellowtail snapper	82,291	182,456
Schoolmaster snapper	1	2
Unclassified snappers	46	49
Triggerfish	1,119	1,217
Total	175,511	332,611

Of the businesses in the construction industry sector, the majority of employer establishments (69 percent) and non-employer firms (80 percent) are “Specialty Trade Contractors”. The remainder of employer establishments and non-employer firms in the construction industry sector are involved in the industry subsectors of “Construction of Buildings” and “Heavy & Civil Engineering Construction,” with “Construction of Buildings” being the second largest construction industry subsector. Last, 28 employer establishments and 332 non-employer firms are involved in the industry subsector of “Other Heavy & Civil Engineering Construction” (NAICS Code 23799). This subsector includes marine construction projects such as breakwater, dock, pier, jetty, seawall and harbor construction, and dredging. These employer establishments and non-employer firms represent approximately 0.61 percent and 1.08 percent, respectively, of the construction industry sector as a whole within the county.

Table 9. Composition, by industry subsector, of the construction industry sector and non-employer statistics in Miami-Dade County (2005 County Business Patterns, U.S. Census Bureau).

NAICS Code	Industry Code Description	Non-Employer Firms	Non-Employer Receipts (\$1,000)	Employer Establishments	Number of Employees
23	Construction	30,690	1,165,256	4,618	38,417
236	Construction of buildings ^a	5,622	290,129	1,317	10,422
2361	Residential Construction	4,601	240,578	1,054	6,278
2362	Nonresidential Construction	1,021	49,551	263	4,124
237	Heavy & Civil Engineering Construction ^b	630	28,338	374	4,800
2371	Utility System Construction	121	3,664	65	974
2372	Land Subdivision Highway, Street, & Bridge Construction	92	9,868	223	1,017
2373	Other Heavy & Civil Engineering Construction	85	2,879	58	2,452
2379		332	11,927	28	357
238	Specialty Trade Contractors ^c	24,438	846,789	2,927	23,195

^a Subsector 236, "Construction of Buildings," comprises establishments of the general contractor type and operative builders involved in the construction of buildings.

^b Subsector 237, "Heavy and Civil Engineering Construction," comprises establishments involved in the construction of engineering projects (e.g., highways and dams). Construction projects involving water resources (e.g., dredging and land drainage) and projects involving open space improvement (e.g., parks and trails) are included in this subsector. Specialty trade activities are classified in this subsector if the skills and equipment present are specific to heavy or civil engineering construction projects.

^c Subsector 238, "Specialty Trade Contractors," comprises establishments engaged in specialty trade activities generally needed in the construction of all types of buildings.

2.1.1.4 Monroe County

Monroe County is the southernmost county in Florida and the continental United States. See Figure 4. It has a total area of 9,679 km² (3,737 square miles), with 2,582 km² being land and the remaining 7,097 km² (about 73 percent) being water (U.S. Census Bureau). The County is made up of the Florida Keys and portions of Big Cypress National Preserve and Everglades National Park. The Florida Keys are a series of islands that extend over 220 miles in length and make up the third largest barrier reef ecosystem in the world and the only one of its kind in the country. The State of Florida has designated the Florida Keys as an Area of Critical State Concern to protect the area's ecological richness, cultural significance, and environmentally sensitive nature (Florida Statute 1986; Florida Administrative Code §28-29, 1975). Over 60 percent of the Keys land mass is owned by the government and the vast majority of public land has been set aside for conservation. The County has only one highway, U.S. Highway 1. Commercial activities and residential development are mostly concentrated along that route (National Research Council, 2002). Among the County's cities are Key West, Key Largo, Big Pine Key, Marathon, and Plantation Key.

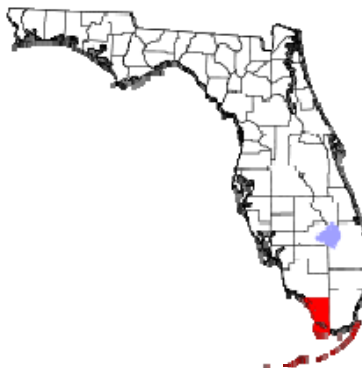


Figure 4. Monroe County. *Image Source:* Wikipedia.

More than 99.9 percent of the County's population lives on the Florida Keys. According to U.S. Census Bureau estimates, the population of the County fell 6.1 percent from April 1, 2000, to July 1, 2006, with approximately 74,737 people in 2006. During that period, there was a natural increase in population of 195 (4,642 births less 4,447 deaths) coupled with a net out-migration of 4,668 persons leaving the county (2,612 net international migration less 7,280 net internal out-migration). The number of housing units increased from 51,617 in 2000 to 52,911 in 2005, an increase of 2.5 percent. Median household income in 2004 was \$42,195 and 9.2 percent of the persons in the county lived below poverty, in comparison to the statewide median household income of \$40,900 and poverty rate of 11.9 percent.

In Monroe County, the largest industrial sectors (by number of employees; see Table 12) are:

- (1) Accommodation & Food Services;
- (2) Retail Trade;
- (3) Health Care & Social Assistance;
- (4) Construction; and
- (5) Other Services (except Public Administration).⁵

The industrial sectors of "Retail Trade" and "Accommodation & Food Services" are principle components of tourism and tourism is the major industry of Monroe County. "Tourism, directly and indirectly, contributed \$2.2 billion to Monroe County's economy in 2005. Tourism directly and indirectly created a range of from 22,395 to 23,616 jobs, or 54% of Monroe County's employment in that year" (Bennett, 2006). The Monroe County Tourist Development Council estimates more than 3.49 million people visited the County in 2003 and 3.2 million visited the Florida Keys in 2006. Of visitors surveyed from March 2005 through February 2006, 80 percent were in the Florida Keys for recreation or vacation purposes. Of those surveyed, about 84 percent reported beach activities, 75 percent viewing wildlife, 57 percent diving and snorkeling, and 30 percent fishing as activities they participated in during their visit (Monroe County Tourist Development Council, Visitor Profile Survey). See Table 10.

Table 10. Recreational activities of visitors to the Florida Keys, March 2005 – February 2006. Source: Monroe County Tourist Development Council, Visitor Profile Survey.

Recreational Activity	Frequency	Percent of Responses	Percent of Cases
Diving	548	3.2	18
Snorkeling	1,171	6.8	38.6
Fishing	913	5.3	30.1
Viewing Wildlife	2,260	13.1	74.5
Boating	1,390	8.1	45.8
Beach Activities	2,547	14.8	83.9
Dine Out/Night Life	2,879	16.7	94.9
Museums/Historic Areas	1,659	9.6	54.7
Sightseeing & Attractions	2,727	15.8	89.9
Cultural Events	1,170	6.8	38.5
Total	17,264	100	

⁵ The "Other Services (except Public Administration)" industry sector comprises establishments engaged in providing services not specifically provided for elsewhere in the classification system. Establishments in this sector are primarily engaged in activities such as equipment and machinery repairing, promoting or administering religious activities, grantmaking, advocacy, and providing drycleaning and laundry services, personal care services, death care services, pet care services, photofinishing services, temporary parking services, and dating services.

The Port of Key West is a small port; however, it serves cruise ships with itineraries in the Eastern and Western Caribbean and the Bahamas. The Key West Chamber of Commerce estimates 881,183 cruise passenger arrivals in the Port of Key West in 2006, up from 656,866 in 2000 (www.keywestchamber.org/cominfo/trends.pdf). In 2006, imports with a value of \$36,283 and exports with a value of \$11.7 million transited through the Port of Key West. There are two commercial airports in the Florida Keys: Key West International Airport and Florida Keys Marathon Airport. Key West International Airport had 276,154 arrivals in 2006, up from 275,386 in 2000 and remains the Keys primary airport for commercial activity. At present, only one commercial carrier, Delta Airlines, serves the Marathon Airport, and on July 13, 2007, the airline announced that it was suspending flights to the airport.

Leeworthy and Wiley estimate for the period of June 2000 through May 2001, the general visitor population spent over 12.1 million person days in Monroe County. According to Johns et al. (2003), residents and visitors spent 5.46 million person-days visiting artificial and natural reefs in Monroe County during the 12-month period from June 2000 to May 2001. The same study found that reef-related expenditures generated about \$504 million in sales, \$140 million in income, and created 10,000 jobs in the county over the same time period. When asked what they were willing to pay to maintain the natural reefs in Monroe County in their existing condition, natural reef users said they were willing to pay \$57.5 million annually (Johns et al. 2003).

Coral reefs are important habitat for species targeted by commercial and recreational fishermen, and fishing is a notable industry sector contributing to tourism and to the economy of Monroe County. In 2005, there were 971 non-employer firms with annual receipts of \$34.5 million in the fishing industry subsector (NAICS 1141), which represent 9.1 percent of all non-employer firms and 5.4 percent of annual receipts for all non-employer firms in the County that year. In 2002, there were 42 business establishments in the “Charter Fishing & Party Fishing Boats” industry subsector (NAICS 4872102) with total annual revenue of about \$5.5 million and 73 employees (2002 Economic Census, Transportation and Warehousing Subject Series). That same year there were 23 establishments in the “Excursion & Sightseeing Boats” industry subsector (NAICS 4872101) with total annual revenue of \$17.3 million and 224 employees. In 2005, commercial fishermen landed a total of 2,739,484 pounds of shallow water reef fish in Monroe County with a dockside value of \$5,310,600. See Table 11.

The recreational spiny lobster fishery is important to Monroe County as well. About 90 percent of Florida State’s annual commercial landings, approximately 5 million pounds, of Caribbean spiny lobster occur off the extreme southeastern portion of the state, especially the Keys. Sharp et al. (2005) estimate approximately \$24 million was spent on recreational lobster fishing in the Florida Keys from the opening of the recreational season through the first Monday in September in 2001. Fishers who resided outside the Keys accounted for about \$22 million (92 percent) of the total monies spent on recreational lobster fishing in the Keys. In addition to the regular recreational season there is the Special Two-Day Sport Season, which occurs on the last consecutive Wednesday and Thursday in July. Those two days are the busiest boating days of the year in the County. From the 1993 through 2001 Special Two-Day Sport Seasons, the average annual number of lobsters caught in Monroe County represents about 66 percent of the annual statewide total.

Table 11. 2005 Commercial Landings of Shallow Water Reef Fish, Monroe County. Source: NMFS SERO Logbook Data.

Group/Species	Pounds	Dollars (\$)
Groupers:	564,667	1,385,959
Snowy grouper	72,626	185,802
Yellowedge grouper	53,547	144,165
Red grouper	234,939	512,111
Black grouper	192,705	514,288
Gag grouper	10,390	28,588
Yellowfin grouper	228	581
Other grouper*	232	424
Hinds:	26,352	56,772
Speckled hind	25,092	54,812
Red hind	1,260	1,960
Hogfish	12,787	28,576
Jacks:	638,347	522,532
Almaco jack	16,334	13,130
Greater amberjack	612,877	504,502
Amberjack	9,136	4,900
Sand perch	226	389
Banded rudderfish	2,357	2,749
Scamp	14,303	38,330
Snappers:	1,475,745	3,269,776
Dog snapper	63	115
Blackfin snapper	934	1,849
Cubera snapper	98	115
Lane snapper	4,638	7,734
Mangrove snapper	118,613	205,556
Mutton snapper	128,076	250,699
Red snapper	5,865	14,672
Vermilion snapper	7,069	16,601
Yellowtail snapper	1,210,053	2,771,582
Unclassified snappers	333	849
Schoolmaster snapper	3	4
Triggerfish	4,690	5,491
Wenchman	10	26
Total	2,739,484	5,310,600
* Does not include Warsaw grouper		

Table 12 also shows that in Monroe County there were 359 employer establishments in the industry sector of “Construction” with 1,693 employees and an annual payroll totaling approximately \$55.7 million (2005 County Business Patterns, U.S. Census Bureau). That same year, there were 1,177 non-employer firms in construction with total receipts of about \$82 million in the county. Employer establishments and non-employer firms involved in “Construction” represent 9.6 percent and 11 percent, respectively, of the total number of employer establishments and non-employer firms operating in Monroe County. Table 12 shows the composition, by industry subsector, of the construction industry sector.

Table 12. 2005 County Business Patterns and Non-Employer Statistics for Monroe County (U.S. Census Bureau)

NAICS Code	Industry Code Description	Non-Employer Establishments	Non-Employer Receipts (\$1,000)	Employer Establishments	Number of Employees	Annual Payroll (\$1,000)
11	Agriculture, Forestry, Fishing and Hunting	992	34,476	16	20 - 99	*
21	Mining	5	160	1	0 - 19	*
22	Utilities	9	1,254	2	100 - 249	*
23	Construction	1,177	82,123	359	1,693	55,733
31	Manufacturing	107	5,337	80	338	9,652
42	Wholesale trade	136	15,495	112	480	18,964
44	Retail trade	601	44,847	723	6,422	145,298
48	Trans. & warehousing	393	19,220	141	942	25,076
51	Information	91	3,781	53	504	21,220
52	Finance & insurance	301	28,942	152	953	38,252
53	Real estate & rental & leasing	1,766	154,010	355	1,031	30,557
54	Professional, sci. & tech. services	1,219	68,691	334	1,320	51,592
55	Management of companies & enterprises	0	0	6	91	5,136
56	Admin, support, waste mgt, remediation services	895	33,503	192	796	21,627
61	Educational services	104	2,520	33	222	6,860
62	Health care & social assistance	421	21,970	214	2,373	97,625
71	Arts, entertainment & recreation	866	41,944	135	1,103	24,086
72	Accommodation & food services	255	41,226	523	10,852	210,466
81	Other services (except public adm.)	1,362	43,583	308	1,331	29,204
99	Unclassified establishments	0	0	7	0 - 19	*
TOTAL		10,700	643,082	3,746	30,631	791,348

* Zero in 2005 County Business Patterns

Of the businesses in the construction industry sector, a majority of the employer establishments (61 percent) and non-employer firms (71 percent) are “Specialty Trade Contractors.” The remainder of employer establishments and non-employer firms in the construction industry sector are involved in the industry subsectors of “Construction of Buildings” and “Heavy & Civil Engineering Construction,” with “Construction of Buildings” being the second largest construction industry subsector. Last, 6 employer establishments and 12 non-employer firms were categorized into the industry subsector of “Other Heavy & Civil Engineering Construction” (NAICS Code 2379). This subsector includes marine construction projects such as breakwater, dock, pier, jetty, seawall and harbor construction, and dredging. These establishments and firms represent approximately 1.7 percent and 1.0 percent, respectively, of the establishments and non-employer firms of the construction industry in Monroe County (see Table 13).

Table 13. Composition, by industry subsector, of the construction industry sector in Monroe County (2005 County Business Patterns, U.S. Census Bureau).

NAICS Code	Industry Code Description	Non-Employer Firms	Non-Employer Receipts (\$1,000)	Employer Establishments	Number of Employees
23	Construction	1,177	82,123	359	1,693
236	Construction of buildings ^a	333	28,020	119	678
2361	Residential Construction	301	26,966	111	632
2362	Nonresidential Construction	32	1,054	8	46
237	Heavy & Civil Engineering Construction ^b	14	1,876	20	196
2371	Utility System Construction	NR	NR	2	0 – 19
2372	Land Subdivision Highway, Street, & Bridge Construction	D	D	10	20 – 99
2373	Other Heavy & Civil Engineering Construction	NR	NR	2	20 – 99
2379		12	1,488	6	110
238	Specialty Trade Contractors ^c	830	52,227	220	819

^a Subsector 236, "Construction of Buildings," comprises establishments of the general contractor type and operative builders involved in the construction of buildings.
^b Subsector 237, "Heavy and Civil Engineering Construction," comprises establishments involved in the construction of engineering projects (e.g., highways and dams). Construction projects involving water resources (e.g., dredging and land drainage) and projects involving open space improvement (e.g., parks and trails) are included in this subsector. Specialty trade activities are classified in this subsector if the skills and equipment present are specific to heavy or civil engineering construction projects.
^c Subsector 238, "Specialty Trade Contractors," comprises establishments engaged in specialty trade activities generally needed in the construction of all types of buildings.
D Withheld to avoid disclosing data
NR Not Reported

2.1.2 Puerto Rico

Puerto Rico is an archipelago comprised of the main island (Puerto Rico) and several smaller oceanic islands: Mona, Monito, Desecheo, Caja de Muertos, Vieques, and Culebra, and still smaller islands known as the "Cordillera de Fajardo." Its waters extend 9 nautical miles (10.36 statute miles) off its shore. See Figure 5.



Figure 5. Puerto Rico. Image Source: Central Intelligence Agency.

About one-third of the population lives around the capitol city of San Juan, and over 11 percent of the population in San Juan. Other major municipalities are Bayamón, Ponce, Carolina, Arecibo, Guaynabo, and Mayaguez.

Puerto Rico has coral reef communities of limited distribution surrounding the main island’s coast, as well as the islands of Culebra, Desecheo, Mona, Monito, and Vieques (NOAA 2007). Colonies of elkhorn and staghorn coral are found in shallow waters off the main island; however, not near San Juan.

According to the U.S. Census Bureau, the population of Puerto Rico increased about 3 percent from April 1, 2000, to July 1, 2006, with approximately 3.93 million people in 2006. The increase in population has been accompanied by a larger percentage increase in housing units. Housing units increased from about 1.26 million in 2000 to approximately 1.44 million in 2005, an increase of about 14.2 percent. In 2005, median household income in Puerto Rico was \$17,184, as compared the median household income for the U.S. as a whole of \$46, 242.

In Puerto Rico, the largest industrial sectors (when sorted by sales receipts) are:

- (1) Manufacturing;
- (2) Retail Trade;
- (3) Health Care & Social Assistance;
- (4) Construction; and
- (5) Accommodation & Food Services.

Manufacturing dominates the economy of Puerto Rico. In fiscal year 2002, the Manufacturing sector accounted for approximately 42 percent of Puerto Rico's Gross Domestic Product. The value of sales, receipts or shipments from manufacturing was approximately \$58.6 billion. See Table 14. The chemical industry is the largest component of the manufacturing sector, with about a 64 percent share (Government Development Bank for Puerto Rico, 2003), and that in turn is dominated by the pharmaceutical and medicine-manufacturing sector. Food, electronics, and apparel manufacturing are other major manufacturing industries in the Territory.

The industrial sectors of "Retail Trade" and "Accommodation & Food Services" are principle components of tourism. Puerto Rico's coastline attracts tourists, and tourism (including eco-tourism) is a very important industry; it represents about 6 percent of the Territory's Gross National Product (Denton, 2006). An estimated 5 million tourists visited Puerto Rico in 2004 (CIA World Fact Book, 2007). It is anticipated that recent changes in passport law, which restrict the places where one may travel without a passport, may cause an increase in the number of U.S. citizens who visit the Territory because no U.S. passport is required to travel there (71 FR 68411).

The eastern coast of Puerto Rico, from Fajardo to Humacao and the offshore islands of Vieques and Culebra have been popular destinations for tourists who snorkel and dive. Another popular snorkeling and diving location is off La Parguera on the southwestern coast. Rincón, a municipality on the west coast, is a popular site for coastal tourism, where tourists engage in surfing, tanning, fishing, snorkeling, and SCUBA diving (Pendleton, 2002).

Coral reefs are important habitat for species targeted by commercial, recreational and subsistence fishermen, and fishing is a significant industry sector contributing to the economy of Puerto Rico. During the period from 1995 through 2002, commercial fishermen caught an average of 1.6 million tons of fish annually, with 87 percent of the fishermen targeting reef fish and invertebrates, including conch and lobster (NOAA 2007). In 2005, domestic landings of shallow water reef fish totaled 771,656 pounds (350,022 kilograms) with a value of \$1,766,337. See Table 15. These landings represent approximately 66 percent of total pounds of fish landed in Puerto Rico that year. In 2005, 173,445 pounds of spiny lobster were landed with a dockside value of \$997,005 and 195,701 pounds of conch were landed with a dockside value of \$498,094 (Fisheries of the United States 2005).

Table 14. 2002 Economic Census Summary Statistics for Puerto Rico (U.S. Census Bureau).

NAICS Code	Description	Employer Establishments	Sales, Receipts or Shipments (\$1,000)	Annual Payroll (\$1,000)	Paid Employees
21	Mining	44	107,000	18,834	949
22	Utilities	18	369,932	21,040	503
23	Construction	2,683	5,523,472*	1,009,747	67,288
31-33	Manufacturing	2,196	58,580,060	N	N
42	Wholesale trade	2,313	16,172,710	1,009,360	39,316
44-45	Retail trade	11,465	20,422,975	1,655,584	122,435
48-49	Transportation & warehousing	1,071	2,076,573	253,758	13,137
51	Information	462	3,686,792	633,161	19,696
52	Finance & insurance	1,809	10,233,015	1,152,628	36,059
53	Real estate & rental & leasing	1,783	1,698,631	148,334	8,183
54	Professional, scientific & technical services	3,965	2,836,774	701,485	26,197
55	Management of companies & enterprises	94	511,676	79,091	2,237
56	Administrative & support & waste management & remediation service	1,724	2,336,978	88,063	61,703
61	Educational services	306	242,810	74,829	4,647
62	Health care & social assistance	6,464	4,967,317	1,224,260	68,338
71	Arts, entertainment & recreation	369	278,975	45,393	3,115
72	Accommodation & food services	4,133	3,360,226	732,147	63,810
81	Other services (exceptu public administration)	3,324	1,470,563	281,805	18,417
N = Not available					
* value of construction					

Table 14 also shows in 2002 there were 2,683 employer establishments in the industry sector of “Construction” with 67,288 employees and an annual payroll totaling approximately \$1 billion (U.S. Census Bureau, 2005). Table 16 shows the composition, by industry subsector, of the construction industry sector (i.e., how many establishments and firms are involved in each different type of construction).

Of the businesses in the construction industry sector, the majority of establishments (45 percent) are involved in the “Construction of Buildings” industry subsector. The remainder of establishments in the construction industry sector are involved in the industry subsectors of “Specialty Trade Contractors” and “Heavy & Civil Engineering Construction,” with “Specialty Trade Contractors” being the second largest construction industry subsector (31 percent). Last, 12 establishments are categorized into the industry subsector of “Other Heavy & Civil Engineering Construction” (NAICS Code 2379). This subsector includes marine construction projects such as breakwater, dock, pier, jetty, seawall and harbor construction, and dredging. These establishments represent approximately 0.45 percent of the establishments in the construction industry sector of Puerto Rico.

Table 15. 2005 Shallow Water Reef Fish Commercial Landings, Puerto Rico. Source: NMFS 2005.

Group/Species	Pounds	Dollars (\$)
Goatfish	5,947	11,044
Groupers:	59,265	127,427
Red hind	29,083	59,180
Nassau	2,002	3,109
Other	28,180	65,138
Grunts:	79,795	139,973
Margate	32	64
Other	53,715	72,197
Hogfish	26,048	67,712
Jacks:	35,063	51,499
Bar jack	22,658	32,479
Horse-eye jack	8	8
Other	12,397	19,012
Parrotfish	31,157	45,474
Scup or porgy	12,092	19,275
Snappers:	439,477	1,165,816
Lane	88,274	196,985
Mutton	33,561	75,961
Yellowtail	115,013	264,379
Other	202,629	628,491
Squirrelfish	5,885	8,063
Surgeonfish	0	0
Triggerfish	32,273	48,988
Trunkfish (boxfish)	44,654	81,066
Total	771,656	1,766,337

Table 16. Composition, by industry subsector, of the construction industry sector in Puerto Rico (2002 Economic Census Summary Statistics, U.S. Census Bureau).

NAICS Code	Industry Code Description	Number of Establishments	Total Employees	Payroll (\$1,000)
23	Construction	2,683	67,288	1,009,747
236	Construction of buildings ^a	1,209	31,891	475,162
2361	Residential Construction	924	18,661	253,291
2362	Nonresidential Construction	285	13,230	221,871
237	Heavy & Civil Engineering Construction ^b	14	1,876	20
2371	Utility System Construction	NR	NR	2
2372	Land Subdivision	D	D	10
2373	Highway, Street, & Bridge Construction	NR	NR	2
2379	Other Heavy & Civil Engineering Construction	12	1,488	6
238	Specialty Trade Contractors ^c	830	52,227	220

^a Subsector 236, "Construction of Buildings," comprises establishments of the general contractor type and operative builders involved in the construction of buildings.

^b Subsector 237, "Heavy and Civil Engineering Construction," comprises establishments involved in the construction of engineering projects (e.g., highways and dams). Construction projects involving water resources (e.g., dredging and land drainage) and projects involving open space improvement (e.g., parks and trails) are included in this subsector. Specialty trade activities are classified in this subsector if the skills and equipment present are specific to heavy or civil engineering construction projects.

^c Subsector 238, "Specialty Trade Contractors," comprises establishments engaged in specialty trade activities generally needed in the construction of all types of buildings.

2.1.2.1 U.S. Virgin Islands (U.S.V.I.)

U.S.V.I. consists of the main islands of St. Croix, St. John, and St. Thomas, and 54 smaller islands and keys. Combined the U.S.V.I. has a land mass of about 134 square miles (346 square kilometers) and territorial waters that encompass approximately 972 square miles (1,564 square kilometers). U.S.V.I. waters extend 3 nautical miles (3.45 statute miles) off its shore. Elkhorn coral and staghorn coral are found in shallow waters off the three main islands. See Figure 6.



Figure 6. U.S.V.I. Image Source: Central Intelligence Agency.

According to the U.S. Census Bureau, the population of the U.S.V.I. increased from 101,809 in 1990 to 108,612 in 2000, about a seven percent increase. From 1990 to 2000, the population of St. Croix increased from 50,139 to 53,234, the population of St. John increased from 3,504 to 4,197 and the population of St. Thomas increased from 48,166 to 51,181. The population increase was accompanied by an increase in the number of housing units, which rose from 39,290 in 1990 to 50,202 in 2000, an increase of over 27 percent in ten years. Median household income of the U.S.V.I. as a whole was \$24,704 in 2000, compared to the U.S. medium of \$41,994 at that time. The World Factbook estimates the July 2007 population to be 108,448 (www.cia.gov/library/publications/the-world-factbook/geos/rq.html).

In U.S.V.I., the largest industrial sectors (by number of paid employees) are (see Table 17):

- (1) Retail Trade;
- (2) Accommodation & Food Services;
- (3) Construction;
- (4) Administrative, Support, Waste management, and Remediation Services; and
- (5) Finance & Insurance.

The industrial sectors of “Retail Trade” and “Accommodation & Food Services” are principle components of tourism. Tourism is the largest contributor to the economy of the U.S.V.I.; it accounts for 80 percent of the Territory’s Gross Domestic Product and employment (CIA World Fact Book, 2007). In 1994, the total number of visitor arrivals was approximately 1.9 million and that number increased to over 2.6 million by 2004. A survey conducted for the Virgin Islands Department of Planning and Natural Resources found that 100 percent of hotel industry participants answered that there would be a significant

impact on tourist visits to the U.S.V.I. if the coast/beaches were degraded or fisheries and/or coral reefs declined (U.S.V.I. 2003).

Table 17. 2002 Economic Census Summary Statistics for U.S.V.I. (U.S. Census Bureau).

NAICS Code	Industry Code Description	Establishments	Sales, Receipts or Shipments (\$1,000)	Annual Payroll (\$1,000)	Paid Employees
11	Agriculture, Forestry, Fishing and Hunting	N	N	N	N
21	Mining	1	D	D	0 – 19
22	Utilities	4	D	D	0 – 19
23	Construction	190	285,582*	90,662	3,050
31-33	Manufacturing	63	172,830	27,151	1,058
42	Wholesale trade	74	262,932	27,664	1,028
44-45	Retail trade	680	1,217,466	128,444	6,653
48-49	Transportation & warehousing	106	181,965	34,194	1,134
51	Information	45	183,770	30,285	845
52	Finance & insurance	96	248,229	48,040	1,416
53	Real estate & rental & leasing	192	184,904	26,224	1,152
54	Professional, scientific & technical services	228	360,192	50,235	1,238
55	Management of companies & enterprises	23	30,745	2,183	76
56	Administrative & support & waste management & remediation service	155	135,267	35,834	2,050
61	Educational services	19	5,792	1,668	97
62	Health care & social assistance	203	93,289	24,428	1,232
71	Arts, entertainment & recreation	38	110,039	14,271	662
72	Accommodation & food services	313	331,008	92,357	5,639
81	Other services (exceptu public administration)	185	153,703	34,689	1,307
99	Unclassified establishments	N	N	N	N
TOTAL		2,615	3,672,131	668,329	28,637
D = Data not disclosed N = Not available * Value of construction					

Coral reefs are important habitat for species targeted by commercial and recreational fishermen, and fishing is an important industry sector contributing to the economy of U.S.V.I. In 2005, domestic landings of shallow water reef fish totaled 1,210,788 pounds (508,253 kilograms) with a value of \$3,896,340. These landings represent approximately 83 percent of total pounds of fish landed in the U.S.V.I. that year (see Table 18). In 2005, 234,212 pounds of spiny lobster were landed with a dockside value of \$1,606,155 and 141,109 pounds of conch were landed with a dockside value of \$764,002.

Table 17 also shows that there were 190 establishments in the industry sector of “Construction” with 3,050 employees and an annual payroll totaling approximately \$90.7 million (U.S. Census Bureau, 2002). Establishments involved in “Construction” represent 7.3 percent of the total number of establishments operating in U.S.V.I. Table 19 shows the composition, by industry subsector, of the construction industry sector (i.e., how many establishments and firms are involved in each different type of construction).

Table 18. 2005 Landings of shallow water reef fish, U.S.V.I. Source: NMFS 2005.

Group/Species	Pounds	Dollars (\$)
Goatfish	4,949	16,415
Groupers:	118,478	65,138
Red hind	0	0
Nassau	0	0
Other	118,478	65,138
Grunts:	97,905	330,838
Margate	0	0
Other	97,059	326,777
Hogfish	846	4,061
Jacks:	51,586	160,464
Bar jack	0	0
Horse-eye jack	0	0
Other	51,586	160,464
Parrotfish	398,069	1,307,229
Scup or porgy	32,731	99,773
Snappers:	286,551	1,223,552
Lane	0	0
Mutton	0	0
Yellowtail	0	0
Other*	286,551	1,223,552
Squirrelfish	6,443	19,347
Surgeonfish	101,387	322,413
Triggerfish	111,843	347,110
Trunkfish (boxfish)	0	0
Total	1,210,788	3,896,340
* does not include silk snapper		

Of the businesses in the construction industry sector, a majority of establishments are involved in the “Construction of Buildings” (47.4 percent) and “Specialty Trade Contractors” (46.8 percent) industry subsectors. The remainder of establishments in the construction industry sector are involved in the industry subsector of “Heavy & Civil Engineering Construction” (12.2 percent).

Table 19. Composition, by industry subsector, of the construction industry sector in U.S.V.I. (2002 Economic Census Summary Statistics, U.S. Census Bureau)

NAICS Code	Industry Code Description	Number of Establishments	Total Employees	Payroll (\$1,000)
23	Construction	190	3,050	90,662
236	Construction of buildings ^a	90	1,205	25,412
237	Heavy & Civil Engineering Construction ^b	11	310	11,164
238	Specialty Trade Contractors ^c	89	1,535	54,086

^a Subsector 236, “Construction of Buildings,” comprises establishments of the general contractor type and operative builders involved in the construction of buildings.

^b Subsector 237, “Heavy and Civil Engineering Construction,” comprises establishments involved in the construction of engineering projects (e.g., highways and dams). Construction projects involving water resources (e.g., dredging and land drainage) and projects involving open space improvement (e.g., parks and trails) are included in this subsector. Specialty trade activities are classified in this subsector if the skills and equipment present are specific to heavy or civil engineering construction projects.

^c Subsector 238, “Specialty Trade Contractors,” comprises establishments engaged in specialty trade activities generally needed in the construction of all types of buildings.

2.2 Existing Laws and Regulations that May Protect the Proposed Critical Habitat Feature (PCE)

Numerous existing Federal, state and territorial laws and regulations directly and indirectly protect corals and coral reef ecosystems, including elkhorn and staghorn corals. These existing laws and regulations were described in detail in support of NMFS' recently proposed ESA section 4(d) rule to protect elkhorn and staghorn corals (72 FR 71102). That discussion is included in this report. Existing legal requirements are evaluated to assist in determining the incremental impact of critical habitat designation; the more overlap there is between the requirements of existing laws and the protections provided to the critical habitat feature, the less the incremental cost of the designation. As discussed below, Federal agencies implementing existing laws routinely perform, or require permittees to perform, actions to protect coral reef resources from harm, and these protective actions may also protect the proposed critical habitat feature from adverse impacts.

The physical feature (PCE) that forms the basis for our proposed critical habitat designation is substrate of suitable quality and availability to support successful elkhorn and staghorn coral larval settlement and recruitment, and reattachment of asexual fragments. We have identified three effects of human activities that could adversely impact this PCE and its ability to support conservation of the listed corals: sedimentation that covers the substrate; eutrophication that leads to algal blooms and covering of the substrate; and physical impacts that destroy or remove the substrate. As described in more detail below, the critical habitat provisions of the ESA and the essential fish habitat provisions of the Magnuson Stevens Fishery Conservation and Management Act (MSA) may directly protect coral settling and reattachment substrate from these impacts. In addition, several existing laws and regulations may indirectly protect the substrate from adverse impacts, when it is located in close association with living coral reef resources that typically receive some protection under the laws.

Notably, because the critical habitat provisions of the ESA focus on species recovery, critical habitat designation and the resulting avoidance of destruction or adverse modification will function to protect the substrate PCE to increase the abundance of elkhorn and staghorn corals. This will provide protection beyond the other laws described below and in Appendix B which generally focus on the protection of existing coral resources.

Federal

Endangered Species Act (ESA)

In the absence of critical habitat, section 7 consultations on an action's effects on corals may provide some protection to settling substrate. For example, RPAs or RPMs imposed through section 7 consultation to prevent or minimize adverse effects to the corals may indirectly protect substrate that is distributed amongst the coral in the footprint of a proposed federal action. In addition, when the impacts rise to the level of take of coral, adverse impacts to habitat features can be addressed directly through section 7 consultation. Habitat impacts constitute "harm" within the definition of "take" when the impacts are expected to result in actual injury or death to coral by, among other things, impairing essential behavioral patterns such as breeding, spawning, rearing, migrating, feeding or sheltering (50 CFR §222.102). In the absence of a critical habitat designation, habitat impacts that constitute take could only be *prevented* through section 7 consultation if the impacts would jeopardize the continued existence of the corals, by appreciably reducing their likelihood of both survival and recovery in the wild (50 CFR §402.02). Lesser impacts to habitat that constitute incidental take of a species could be minimized through reasonable and prudent measures identified in biological opinions. In contrast, habitat features identified through a critical habitat designation are protected from destruction or adverse modification through section 7 consultation, as determined based on the effects on the habitat's ability to conserve the listed species and not on impacts to both the survival and recovery of the species.

Currently, critical habitat designations for other species under NMFS' jurisdiction do not overlap with the areas being proposed for designation for the two corals. In addition, few of the listed species under NMFS' jurisdiction are heavily associated or reliant upon coral reef habitats. Thus, these other listings and designations do not provide significant baseline protections under the ESA for the proposed coral critical habitat.

Magnuson-Stevens Fishery Management and Conservation Act: Essential Fish Habitat

Every fishery management plan developed under the MSA is required to describe and identify essential fish habitat (EFH) for the covered fishery, and to minimize to the extent practicable adverse effects on such habitat caused by fishing (16 U.S.C. §1853(a)(7)). The MSA defines essential fish habitat as "those waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity" (16 U.S.C. §1802(10)). Elkhorn and staghorn corals are "fish" for purposes of the Act. NMFS has designated coral reef and certain hard bottom habitat areas as essential fish habitat for corals, including elkhorn and staghorn corals, as well as for the numerous fish species that utilize these habitats. The South Atlantic Fishery Management Council, which recommends management measures for corals to NMFS, has defined essential fish habitat for stony corals such as elkhorn and staghorn corals as including:

"...rough, hard, exposed, stable substrate from Palm Beach County south through the Florida reef tract in subtidal to 30 m depth, sufficiently low enough to provide algal symbionts adequate sunlight penetration for photosynthesis" (South Atlantic Fishery Management Council, 1998).

The Magnuson Stevens Act requires all federal agencies to consult with NMFS regarding actions they authorize, fund, or undertake, or propose to authorize, fund or undertake, that may adversely affect EFH. NMFS recommends measures the agency can take to conserve the EFH at issue, and the federal agency must respond in writing describing measures the agency proposes to avoid, mitigate or offset the adverse impacts on EFH, or explain its reasons for proposing to proceed inconsistently with NMFS' recommendations (16 U.S.C. §1855(b)).

Clean Water Act

The Clean Water Act establishes a comprehensive federal framework for improving and maintaining surface water quality by regulating discharges of pollutants into the waters of the United States, including the territorial sea. The Clean Water Act includes several provisions that can directly address two of the three impacts to the PCE that can interfere with coral conservation – sedimentation and nutrification.

Section 303 of the Act requires states and tribes to develop and adopt water quality standards that meet the broad goals of the CWA for individual water bodies. EPA must approve state or tribal water quality standards, or promulgate substitute standards. Water quality standards protect designated uses of water bodies, such as drinking water supply, recreational use, or aquatic life. Water quality criteria may also be established, which are pollutant-specific limits, or descriptions of conditions of a water body, necessary to achieve or maintain designated uses. EPA publishes recommended water quality criteria for specific designated uses; states and tribes must adopt corresponding criteria that are at least as protective as EPA's recommendations. States and tribes are required to monitor and report on the conditions of their water bodies; those not meeting established water quality standards due to pollutants are termed "impaired waters."

Sediments, including clean sediments, and nutrients are considered "pollutants" under the Clean Water Act, and according to EPA are the most common causes of impaired waters. States are required to develop strategies to meet established water quality standards for their impaired waters by, among other things, developing Total Maximum Daily Loads for pollutants that EPA must approve or substitute. Florida has identified recreation, propagation, and maintenance of a healthy, well-balanced population of

fish and wildlife in marine waters as the designated use of Florida Keys waters. Florida Keys waters are listed as an impaired waterbody due, in part, to excessive nutrients. EPA has developed a comprehensive framework to address nutrient water quality standards and has published guidance for states and tribes for development of nutrient TDMLs, and Ecoregional Nutrient Criteria to help address nutrification.

National Pollution Discharge Elimination System permits (NPDES) issued under section 402 of the Act are required for all discharges to surface waters of the United States from point sources such as industrial facilities or municipal wastewater plants. NPDES permits contain numeric limits on specific pollutants and are an integral part of states' strategies to achieving water quality standards for waterbodies. EPA authorizes states to implement NPDES permitting programs based on specific criteria. EPA retains oversight of state permitting activities, including the ability to object to issuance of particular permits and issuance of substitute permits. EPA acts as the NPDES permitting authority for point sources in states that do not have approved programs. Florida has a fully-approved NPDES permitting program. The U.S. Virgin Islands has a partially-approved program, and can issue permits for individual dischargers not including federal facilities. Puerto Rico does not have an approved NPDES permitting program.

Dredge and fill activities are regulated under section 404 of the Act; EPA administers the program and USACE issues the permits. EPA and the USACE have extensive regulations and guidance documents for permitting dredge and fill activities in the marine environment (*See, e.g.*, 40 CFR Part 230). Discharge of dredged or fill material to waters of the United States is not authorized if there is a practicable alternative to the proposed discharge that would have less adverse impact on aquatic ecosystems, so long as the alternative does not have other significant adverse environmental impacts. Significantly respecting coral reefs and coral reef ecosystems, discharge of dredged or fill material will not be permitted in the following circumstances: the discharge would cause or contribute to violation of applicable state water quality standards; the discharge would jeopardize the continued existence of ESA-listed species or destroy or adversely modify critical habitat; or violate requirements imposed by NOAA to protect National Marine Sanctuaries (40 CFR §230.10(b)). Effects of proposed discharge of dredged or fill material on aquatic substrates, and on aquatic organisms that utilize particular substrates, must be evaluated in applications for such discharges (*See, e.g.*, 40 CFR §230.20).

The Clean Water Act does not establish direct federal regulatory authority over nonpoint sources of pollution, though nonpoint source discharges are the most significant sources of pollution overall in the United States. Nonpoint sources can include atmospheric deposition of pollutants into water bodies, and commonly includes sediments and nutrients. Under section 319 of the Act, EPA can provide federal grants to states with EPA-approved nonpoint source pollution management programs.

Finally, section 401 of the Act requires that federal agencies issuing permits or licenses under certain provisions of the Act obtain state certification that the activity will not cause or contribute to violation of the relevant state water quality standards for the waterbody at issue. Section 401 applies to NPDES permits issued by EPA, and to section 404 permits issued by the USACE.

Rivers and Harbors Act

This Act provides some protection against physical destruction of the substrate proposed to be designated as critical habitat. In issuing permits for construction of structures in or affecting navigable waters of the United States, the U.S. Army Corps of Engineers (USACE) generally considers adverse impacts to coral reefs and coral reef systems as detrimental to the public interest and requires permit applicants to avoid or minimize these impacts. In addition, under the Act the U.S. Coast Guard establishes and operates aids to maritime navigation, including aids to assist vessels from running aground on coral reefs. Several such aids to prevent ship groundings have been installed in the Florida Keys reef tract system.

National Marine Sanctuary, and National Parks, Monuments and Wildlife Refuges

Several federal resource management areas have been established that include or specifically protect coral reef resources. These areas include: the Florida Keys National Marine Sanctuary (FKNMS), Dry Tortugas National Park, Biscayne Bay National Park, Everglades National Park, Buck Island Reef National Monument, Virgin Islands Coral Reef National Monument, and Virgin Islands National Park. Management plans and regulations for some or all of these areas may protect coral settling and reattachment substrate from physical destruction by regulating vessel anchoring and through installation of mooring buoys and navigational aids, and by regulating or prohibiting activities such as mining, drilling, and construction of structures on the seabed. The management plans and regulations may also protect the substrate from the impacts of sedimentation and nutrification through the regulation of dredging and filling, and discharging material into the boundaries of the protected areas.

State and Territorial Laws

Florida, Puerto Rico, and the U.S.V.I. have adopted laws and regulations to protect coral reef resources in general, or in special resource management areas established to protect coral reef resources. Several laws prohibit or limit some activities that would adversely affect the proposed PCE. For example, in Florida, Biscayne Bay Aquatic Preserve and John Pennekamp Coral Reef State Park prohibit dredge and fill activities that would harm coral reef resources and prohibit destroying or removing hard substrate. Similarly, U.S.V.I. has established the St. Croix East End Marine Park. Park management laws prohibit taking or damaging living coral as well as dead coral formations; drilling, dredging or otherwise altering the seabed; and discharging any material into the Park.

Florida law also requires that conduits for telecommunication lines be directionally drilled under nearshore benthic resources, including near shore reefs.

2.3 Baseline Benefits and Values of Coral Reefs, Including the Listed Species

The baseline benefits and values of coral reefs are important to describe given the focus of critical habitat designation on the avoidance of adverse modification of coral habitat and the recovery of threatened elkhorn and staghorn corals. The *Acropora* BRT (2005) provided a summary of some of the ecosystem or ecological benefits elkhorn and staghorn corals provide.

“Coral reefs serve a number of functional roles in subtropical and tropical environments of the wider Caribbean, including, but not limited to primary production, recycling of nutrients in relatively oligotrophic seas, calcium carbonate deposition yielding reef construction, refuge and foraging base for other organisms, and modification of near-field or local water circulation patterns (De Freese 1991). Coral reefs also protect shorelines, serving to buffer inshore subtidal (e.g., seagrass) and intertidal (e.g., mangroves) communities, [and human communities] from otherwise high wave energy conditions in certain localities. Coral reefs are host to a multitude of species of algae, invertebrates, and fishes. Reef environments are characterized by an incredible diversity of species packed into a relatively small spatial dimension (m² to km²) defined by high benthic diversity (Connell 1978, Richards and Lindeman 1987). Organisms essential in the construction of tropical reefs are hermatypic (reef-building) corals and coralline algae. Through reef construction, these organisms provide habitat for sedentary and mobile species (Lewis 1981).”

Elkhorn and staghorn corals are two of the major reef-building corals in the Caribbean. Over the last 5,000 years, they have made a major contribution to the structure that make up the Caribbean reef system. As summarized in Bruckner (2002), the structural and ecological roles of Atlantic *Acropora* spp. in the Caribbean are unique and cannot be filled by other reef-building corals in terms of accretion rates and the

formation of structurally complex reefs. At current levels of acroporid abundance this ecosystem function is significantly reduced. Due to elkhorn and staghorn corals' extremely reduced abundance, it is likely that Caribbean reefs are in an erosional, rather than accretional, state.

In addition to the important functions of reef building and reef maintenance provided by elkhorn and staghorn corals, these species themselves serve as fish habitat (Ogden and Ehrlich 1977, Appeldoorn et al. 1996), including essential fish habitat (CFMC 1998), for species of economic and ecologic importance. Specifically, Lirman (1999) reported significantly higher abundances of grunts (*Haemulidae*), snappers (*Lutjanidae*), and sweepers (*Pempheridae*) in areas dominated by elkhorn coral compared to other coral sites suggesting that fish schools use elkhorn colonies preferentially. Additionally, Hill (2001) found staghorn coral in a Puerto Rican back-reef lagoon was the preferred settlement habitat for the white grunt (*Haemulon plumieri*).

Numerous reef studies have described the relationship between increased habitat complexity and increased species richness, abundance, and diversity of fishes. Due to their branching morphologies, elkhorn and staghorn corals provide complexity to the coral reef habitat that other common species with mounding or plate morphologies do not provide.

Other benefits of elkhorn and staghorn corals are provided in the forms of shoreline protection and contribution to tourism and recreation. Again, due to their function as major reef building species, elkhorn and staghorn corals provide shoreline protection by dissipating the force of waves that is a major source of erosion and loss of land. In 2005, the coast of Mexico north of Cancun was impacted by Hurricane Wilma. Wave height was recorded just offshore of the barrier reef at 11 m; wave height at the coast was observed to be 3 m (B. van Tussenbroek pers. comm.). There would have been significantly greater damage to coastal structures had the 11 m waves not been dissipated by the reef.

Lastly, as described in the economic baseline, numerous studies have identified the economic value of coral reefs to tourism and recreation (e.g., Johns et al., 2003). Elkhorn and staghorn corals have iconic status within the coral reef ecosystem as evidenced by entire reef zones bearing their names. Similarly, the species are often depicted on tourism brochures as the icon of the Caribbean reef system. The importance of the benefits elkhorn and staghorn corals provide is evidenced by the designation of marine protected areas specifically for the protection of these species (e.g., Tres Palmas Reserve, Puerto Rico).

3 ECONOMIC IMPACTS

The following section identifies economic impacts that may result from including the four specific areas in the proposed critical habitat designation. As discussed above, economic impacts result through implementation of section 7 of the ESA, in consultations with federal agencies to ensure that their proposed actions are not likely to destroy or adversely modify designated critical habitat, and these impacts are the focus of this section. We discuss economic benefits of the designation that are expected to result from conservation of the two corals in other sections of the report.

The analysis of impacts below begins with a comprehensive approach to the first, mandatory step of section 4(b)(2), by identifying economic (Section 3), national security (Section 4), and other relevant impacts (Section 5) that may result from including each of the four specific areas in a proposed critical habitat designation. Both positive and negative impacts are identified (these terms are used interchangeably with benefits and costs, respectively). Impacts are evaluated in quantitative terms where feasible, but qualitative appraisals are used where that is more appropriate to particular impacts.

The ESA does not define what "particular areas" means in the context of section 4(b)(2), or the relationship of particular areas to "specific areas" that meet the statute's definition of critical habitat. As there was no biological basis to subdivide the four specific critical habitat areas into smaller units, we treated these areas as the "particular areas" for our initial consideration of impacts of designation.

We begin with a brief overview of important court rulings and other important guidance regarding methods for economic impact analyses.

3.1 Economic Impact Analysis

Co-Extensive and Incremental (Baseline) Methods

Several courts have reviewed analyses of economic impacts of critical habitat designation, and most of these cases have addressed whether the traditional economic methodology of baseline or incremental impacts analysis may be used. In New Mexico Cattle Growers Assoc. et al. v. USFWS, 248 F.3d 1277 (10th Cir. 2001), the court ruled that given FWS' underlying assumption that critical habitat did not add any protection beyond what listing of the species already provided, the baseline economic impacts analysis was not consistent with the ESA. The court required FWS to analyze all economic impacts of critical habitat designation even if those impacts are attributable co-extensively to other causes such as listing of the species (*Id.* at 1285). In Cape Hatteras Access Preservation Alliance et al. v. U.S. Dept. of the Interior, 344 F. Supp. 2d 108 (D.D.C. 2004), the district court agreed with previous courts and found that the basis of FWS' belief that impacts of critical habitat designation were wholly co-extensive with impacts of listing was the conflated regulatory definitions of "destruction or adverse modification" and "to jeopardize" a listed species (*Id.* at 128-29). However, recognizing that the definitional issue was not before the Tenth Circuit, and given the distinction between adverse modification of critical habitat and jeopardy, the Cape Hatteras court disagreed with the Tenth Circuit and ruled that the baseline approach is a reasonable method for assessing the actual costs of a particular critical habitat designation (*Id.* at 130). Another court, reviewing the Cape Hatteras and New Mexico Cattle Growers cases, ruled that co-extensive costs could not be the basis for excluding areas from a designation. Cntr. for Biological Diversity v. Bureau of Land Management, 422 F. Supp. 2d 1155, 1153 (N.D. Cal. 2006).

NMFS has followed the Tenth Circuit's "total costs" approach, including identification of co-extensive costs and benefits, in circumstances where data have not allowed making a credible distinction between the impacts of consultations that would result from critical habitat designation, in addition or compared to the impacts that would result from species listing alone. (See, e.g., Proposed Rule Designating Critical Habitat for Southern Resident Killer Whales, 71 FR 34571 at 34577, June 15, 2006). At least one court has ruled that continued use of the total impacts approach and inclusion of co-extensive impacts can be appropriate so long as impacts of designating critical habitat are not presumed to be wholly co-extensive with the impacts of listing the species. Home Builders Association of Northern California et al. v. U.S. FWS, 2007 U.S. Dist. LEXIS 5208 (E.D. Cal. Jan. 24, 2007). This opinion indicates that a valid total impacts analysis, one that meaningfully analyzes impacts above and beyond listing, must at minimum give proper consideration to the recovery benefits resulting from a critical habitat designation (*Id.* at 19-21).

Additional Guidance

Other cases and federal government guidance are relevant to the analysis of economic impacts resulting from critical habitat designations. For example, as discussed more fully above, the Statement of Regulatory Philosophy and Principles in EO 12866, Regulatory Planning and Review, states in part:

"In deciding whether and how to regulate, agencies should assess all costs and benefits of available regulatory alternatives, including the alternative of not regulating. Costs and benefits shall be understood to include both quantifiable measures (to the fullest extent that these can be usefully estimated) and qualitative measures of costs and benefits that are difficult to quantify, but nevertheless essential to consider."

OMB Circular A-4 (2003) provides additional explanation:

“Benefit-cost analysis is a primary tool used for regulatory analysis. Where all benefits and costs can be quantified and expressed in monetary units, benefit-cost analysis provides decision makers with a clear indication of the most efficient alternative, that is, the alternative that generates the largest net benefits to society...”

“It will not always be possible to express in monetary units all of the important benefits and costs. When it is not, the most efficient alternative will not necessarily be the one with the largest quantified and monetized net-benefit estimate. In such cases, you should exercise professional judgment in determining how important the non-quantified benefits or costs may be in the context of the overall analysis.”

“A complete regulatory analysis includes a discussion of non-quantified as well as quantified benefits and costs...When there are important non-monetary values at stake, you should also identify them in your analysis so policymakers can compare them with the monetary benefits and costs.”

Cases reviewing critical habitat impacts analyses have applied principles similar to those of the OMB guidance, for example: all important costs and benefits should be included in an impacts analysis (See, e.g., Center for Biological Diversity v. Bureau of Land Management, 422 F. Supp. 2d 1155, 1153 (N.D. Cal. 2006) (FWS’ impacts analysis was improperly unbalanced in ignoring available data in the record regarding economic benefits of designation)); and important impacts that can only be evaluated in non-monetary metrics can be included in the analysis (See, e.g., Home Builders Association of Northern California, 2006 U.S. Dist. LEXIS 80255 (E.D. Cal., Nov. 1, 2006) (FWS properly determined that monetizing the benefits of designation was infeasible and that benefits were best expressed in biological terms)).

3.2 Section 7 Impacts

As stated above, the only requirements that result from designating critical habitat are that federal agencies must consult with NMFS on proposed actions that may affect designated critical habitat and must modify their actions as necessary to avoid destroying or adversely modifying critical habitat. As discussed above, consultations may result in economic impacts on federal agencies and proponents of proposed actions. These impacts and costs may not constitute incremental impacts of critical habitat designation if a proposed project would trigger consultation due to its effects on listed species. If a consultation is required due to the expected effects of a proposed action on both the listed species and on the designated critical habitat, and the same project modification would address both types of adverse effects, the impacts are co-extensive.

Overview of Section 7 Process

Section 7(a)(2) of the ESA requires Federal agencies (action agencies) to consult with NMFS whenever activities they fund, authorize, or carry out may affect a listed species or designated critical habitat. In some cases, consultations will involve NMFS and another Federal agency only, such as USACE. Often they will also include a third party involved in projects with a Federal nexus, such as private applicants conducting activities that require a Federal permit, or public or private entities receiving Federal funding.

During a consultation, NMFS, the action agency, and, if applicable the private permittee or grantee, communicate in an effort to minimize potential adverse effects on the species and/or critical habitat. The duration and complexity of these interactions depends on the number of variables, including the type of consultation, the species, the activity of concern, the potential effects to the species and designated critical habitat associated with the proposed activity, and the parties involved. *Informal consultation* is designed to identify and avoid potential adverse impacts at an early stage in the planning process. If during informal consultation it is determined by the Federal agency, with the written concurrence of NMFS, that

the action is not likely to adversely affect listed species or critical habitat, the consultation process is terminated, and no further action is necessary (50 CFR §402.13). By contrast, a *formal consultation* is required if the action agency determines that the proposed action may adversely affect a listed species or designated critical habitat in ways that cannot be resolved through informal consultation. Regardless of the type of consultation or proposed project, section 7 consultations can require substantial administrative effort on the part of all participants. The costs of these efforts are an important component of the economic impacts assessment.

The section 7 consultation process may result in modifications to a proposed project. Projects may be modified in response to conservation measures agreed upon by NMFS and the action agency during the informal consultation process in order to avoid adverse impacts on a species and/or its designated critical habitat (harm avoidance), thereby removing the need for formal consultation. Alternatively, formal consultations may involve modifications that are agreed upon by the action agency and the applicant and included in the project descriptions as harm avoidance measures; or the modifications may be included in NMFS' biological opinion on the proposed action as RPMs to reduce the impact of take of the species. NMFS' consultation regulations specify that RPMs along with terms and conditions that implement them cannot alter the basic design, location, scope, duration and timing of the action and may only involve minor changes (50 CFR § 402.14(i)(2)). In some cases, NMFS may determine that a project is likely to jeopardize the continued existence of the species and/or destroy or adversely modify its designated critical habitat. In these cases, NMFS will include RPAs to the proposed project that must avoid jeopardy or destruction or adverse modification. By definition, RPAs must be consistent with the intended purpose of the action and capable of being implemented consistent with the action agency's legal authority and jurisdiction, and be economically and technologically feasible (50 CFR §402.02). All of these project modifications have the potential to represent some direct cost to the action agency and/or the applicant.

Incremental or Co-Extensive Consultation Impacts for the Listed Corals and the Proposed PCE

As discussed below, all broad categories of future actions that may trigger consultation because they have the potential to adversely affect the PCE, also have the potential to adversely affect the corals themselves if they are present in the footprint of the action area. Where possible, in the descriptions of future actions requiring consultation below, we will describe whether the activity is more likely to adversely affect the corals or the PCE. If we cannot reasonably predict the relative numbers of consultations for the PCE alone, versus for the PCE and the corals co-extensively, then we consider the administrative costs of the consultations to be fully co-extensive.

Further, as demonstrated below, it is not possible to quantify all of the section 7 impacts due to the sparse distribution of the corals and unevenly disperse distribution of the PCE, the uncertain scope and location of projected future federal actions, and the uncertain nature of potential project modifications that could be required to avoid adverse effects to the corals or the PCE. The data available on the distribution of the PCE and the corals show that the PCE occupies a far greater surface area than the corals themselves. Additionally, the PCE is not concentrated within particular locations; it is distributed throughout the reef ecosystem. Consequently, precise mapping of neither the PCE nor the corals is available. Pre-consultation underwater surveys may be necessary to determine the amount of PCE or corals within the project action area. These surveys will assist in determining whether consultation is required and whether potential project modifications may be necessary.

In addition, for all categories of future actions that may affect both the corals and the PCE, it is too speculative for us to predict whether those adverse effects will rise to the level of take, jeopardy, and/or destruction or adverse modification – that will depend on such factors as the size and specific location of the project. Thus, we cannot at this time state whether project modifications associated with predicted adverse effects would constitute RPAs, RPMs, or harm avoidance measures. To be conservative in estimating impacts, we will assume that project modifications will always be required to address the adverse effects on the PCE predicted from the expected future agency actions triggering consultation.

Activities that May Trigger Consultation

A query of NMFS' Public Consultation Tracking System (PCTS) was conducted to identify past activities that required ESA section 7 consultations that, if proposed in the future would trigger consultation because they "may affect" elkhorn or staghorn corals or their proposed critical habitat. This technique has been used consistently in evaluating the section 7 impacts of critical habitat designations. The corals have only been listed for a little over a year, thus the database documents consultations required primarily for effects on other listed species (e.g., sea turtles, smalltooth sawfish, Johnson's seagrass). Nonetheless, we believe this approach produced a reasonable estimation of future federal actions that may occur in the range of the corals and the PCE because many past actions were routine and implemented repeatedly. We request federal action agencies to provide us with information on future consultations if our assumptions omitted any future actions likely to affect the proposed critical habitat. The PCTS database contains information dating from 1997, providing a consultation history spanning 10 years. Similar to previous designations, we limit our predictions of impacts below to a 10-year time horizon due to the difficulty in estimating activities and costs beyond that timeframe. Our database extrapolation was limited to the proposed critical habitat areas (i.e., Palm Beach, Broward, Miami-Dade, and Monroe Counties, Puerto Rico, and the U.S.V.I).

US Army Corps of Engineers

The US Army Corps of Engineers (USACE) is responsible for carrying out and permitting the majority of actions with the potential to affect the areas in which the corals and their proposed critical habitat occur. The USACE was the action agency for 402 of the 548 consultations we reviewed. USACE civil works districts undertake projects to maintain navigation channels and water infrastructure, conduct environmental restoration, and maintain flood control. USACE regulatory districts grant permits for private activities in navigable waterways under section 404 of the CWA and section 10 of the RHA.

Dredging and Disposal

Dredging is the removal of material from the bottoms of water bodies, and is most often done to deepen, widen or maintain navigation corridors, anchorages, or berthing areas. It is also done to mine sand to use as fill for land reclamation and other construction projects. Dredging for navigation purposes may also involve disposal of dredge spoil material within the marine environment. There are four basic types of dredge equipment typically used in the range of the two corals and affected area: hopper dredges, hydraulic cutterhead dredges, hydraulic suction dredges, and bucket/clamshell dredges. Direct impacts from dredging and disposal, regardless of the method used, include loss of critical habitat through direct dredging of the hardbottom or permanent placement of sediment. The secondary impacts from vessels, anchors, and pipelines are not likely to affect the proposed PCE, unless there are dead-in-place elkhorn or staghorn skeletons present. Dredging and disposal, regardless of the method used, produces mechanical, turbidity, and sedimentation impacts. These impacts can result in direct removal, sedimentation that can cover the PCE rendering it unavailable for larval recruitment or fragment reattachment.

Twenty-three dredging and disposal projects are projected to be implemented by the USACE over the next ten years. Because the PCE occurs in greater abundances than the corals, it is likely that dredge and disposal projects will have a higher probability of affecting the PCE. However, nothing about the nature of dredging and disposal make either the PCE or the corals more susceptible to adverse effects.

Maintenance Dredging and Disposal

Maintenance dredging is the same as discussed above, only the purpose is to maintain existing channels, ports, and marinas for safe navigation, rather than creating new ones. Typically, neither the PCE nor the species will be present in the footprint of the dredging, because the substrate is composed of unconsolidated sediment. However, the sedimentation effects on the PCE from dredging and disposal would be the same as discussed above.

We project that USACE will be involved in six maintenance dredging and disposal projects over the next ten years. Two recent projects in Monroe and Palm Beach counties involved the dredging and disposal of 97,000 cubic yards and 80,000 cubic yards respectively. As stated above, because the PCE occurs in greater abundances than the corals, it is likely that dredge and disposal projects will have a higher probability of affecting the PCE. However, nothing about the nature of dredging and disposal make either the PCE or the corals more susceptible to adverse effects.

Beach Nourishment/Bank Stabilization

Beach nourishment and bank stabilization include placement of sandy material on a beach through overland hauling or dredging of offshore sand deposits. In either case, there is the potential for sediment to become suspended in the water column, which could be carried offshore and be deposited on coral habitat. If the corals were present within the area impacted by the project, they could be adversely affected. Sediments can cover substrate and render it unavailable for coral settling or reattachment, and smother corals and reduce water clarity, which deprives corals' zooxanthellae of the light they require for photosynthesis.

We have projected that USACE will be involved in 27 beach nourishment/bank stabilization projects over the next ten years. Two recent projects in Palm Beach and Broward counties placed 920,000 cubic yards of sand along a half mile, and 1.54 million cubic yards of sand along 6.82 miles of beach, respectively. Because the PCE occurs in greater abundances than the corals, it is likely that beach renourishment projects will have a higher probability of affecting the PCE. However, nothing about the nature of beach renourishment make either the PCE or the corals more susceptible to adverse effects.

Construction (USACE permitted activities - docks, piers, private dredging, private disposal, private shoreline stabilization, aquaculture, oil and gas pipelines, cables)

Generally, the USACE permits any construction in the waters of the U.S. Docks and piers provide permanent and/or temporary mooring locations for vessels. This category includes single-family home docks and large vessel berthing. Piles driven into the substrate support the framework and the decking. They can be fixed above the water or can be floating and are typically made of concrete or treated wood. Private dredging and disposal is the same as discussed above, only the responsible entity is not the USACE, it is a third party who receives a permit from the USACE. Similarly, private shoreline stabilization is the same as discussed above for beach renourishment/bank stabilization, with a third party applicant. Oil and gas pipelines and cables are placed on the seafloor. The pipe or cable is fed from a lay vessel and allowed to drop to the seafloor. The cable or pipe can be secured to the seafloor or covered with boulders or concrete mats to prevent movement and for protection of the cable or pipe.

All of the above mentioned activities can impact the PCE or the corals present in the footprint of the project. In addition to direct removal, sedimentation and turbidity can be caused by the activities and have the adverse effects discussed above. Additionally, structures could be constructed directly over the proposed PCE, thus destroying it.

Based on the past consultation history, we project that USACE will permit 333 marine construction projects over the next ten years. Although exact numbers cannot be obtained from the PCTS database due to reporting impreciseness, of the ones we could identify, 134 (likely more) of the 333 past projects were for single-family and small docks. It is unlikely, due to their construction along mostly artificial

shorelines (e.g., seawalls), that docks would impact the PCE or corals. However, because the specifics of future projects are unknown, a survey would need to be conducted to identify if either the PCE or species will be present in future action areas.

Maintenance Construction (USACE permitted activities - docks, piers, private dredging, private disposal, private shoreline stabilization, aquaculture, oil and gas pipelines, cable)

Maintenance construction involves all of the activities discussed above, only the activity is undertaken to maintain an existing structure. The effects on the species and proposed critical habitat will be the same as above. We project 13 USACE-permitted maintenance construction projects over the next ten years, of which none were previously identified as dock construction.

Department of Defense (DOD)

Military Installations

DOD operates several military installations in and near areas of coral reef ecosystems, such as Key West, Puerto Rico, and the U.S.V.I. Homestead Air Force (Reserve) Base is located about ten miles from Biscayne National Park and Naval Air Station, Key West is located on Boca Chica Key, which is 5 miles from Key West. The development and maintenance of military installations adjacent to and in coastal waters involves many of the construction activities already discussed. The DOD may need to build and maintain navigation channels, marinas, and ports. They may need to construct docks or stabilize their shoreline. DOD also regulates discharges to surface waters from their installations. The effects to the PCE and the corals are discussed above and below in the dredge and disposal, USACE permitted activities, and discharges to navigable waters sections.

The military also conducts ship, vessel, and aircraft operations in and over the coastal waters of the U.S. DOD maintains areas of water to conduct training exercises. According to the DOD Coral Reef Protection Implementation Plan, it is “DOD policy to avoid, where possible, adversely impacting coral reefs during training exercises and routine operations. Consistent with essential national security and mission requirements, DOD carefully plans maritime exercises and routine operations so as to avoid physical damage to coral reefs from ships and landing craft, and biological impairment from oil and fuel spillage, chemical/ hazardous waste releases, and excessive noise.” As previously discussed, ships and vessels may ground or drag their anchor, and crush the PCE or corals that lie in their path. Lastly, the DOD conducts target training exercises using both vessels and aircraft. A potential impact would be the ammunition landing on or near the PCE or the corals and damaging or destroying them.

We have projected a combined total of 28 DOD consultations over the next ten years, of which most are training exercises. Due to their location in shallow water, it is unlikely that corals or the PCE would be impacted by normal training exercises; however, the other activities identified above have the potential to affect the corals or PCE.

Environmental Protection Agency

The EPA is responsible for promulgating water quality criteria, reviewing state water quality standards, listing impaired water bodies, issuing or delegating authority to the states for NPDES permits, and identifying TMDLs for waterbodies resulting from point and non-point source pollution. Sewage, cruise ship and industrial effluent, storm water and agricultural runoff, river discharge, and groundwater are sources of nutrients, sediments, turbidity, and contaminants that may adversely affect the PCE and the corals. Two components of discharges from land are nitrogen and phosphorus (nutrients). Nutrifaction (excess nutrients) from ocean outfall discharges contribute to algal and bacteria blooms that smother or shade the PCE and the species.

We have projected 29 consultations with EPA over the next ten years regarding their implementation of the Clean Water Act. The nature of identifying water quality standards means that large water bodies are

affected. Therefore, we are unable to predict whether the PCE or corals will be more or less affected by these consultations. However, as previously discussed, the same pollutants affect the corals and the PCE.

National Oceanic and Atmospheric Administration/Department of Interior

Resource Management

NOAA and DOI are responsible for managing designated lands and aquatic areas specifically for wildlife and natural resources use and conservation. Specifically, they are responsible for National Marine Sanctuaries, National Estuarine Research Reserves, National Parks, National Monuments, and National Wildlife Refuges. The development of management plans, and often implementing regulations, is required for each of these protected areas. Protected area resource management plans are diverse in the activities that they regulate for the protection of marine and other natural resources. Overall, impacts would arise from the direct human use of the protected area, such as boating, fishing, SCUBA diving and snorkeling, and construction. Additionally, in some cases water quality is regulated specifically for the protected area. Impacts from water quality regulation would be the same as those discussed above. Indirect impacts could arise from the boats the divers/snorkelers use to access the reefs.

We project 18 potential consultations with NOAA or DOI over the next ten years respecting development or revision of management plans or associated regulations, or actions implementing plans.

National Marine Fisheries Service

NMFS approves and implements Fisheries Management Plans (FMPs), which contain conservation and management measures designed to prevent overfishing and rebuild overfished stock, and to protect, restore, and promote the long-term health and stability of each fishery. Different fisheries use different gear types, which are authorized by regulations implementing the FMPs, of which only trap fisheries are likely to impact the PCE (dead-in-place coral skeletons). We project 3 potential consultations with NMFS over the next ten years on fishery management of trap fisheries (e.g., stony crab, spiny lobster).

US Coast Guard (USCG)

Response to Oil Spills and Vessel Groundings

The USCG is responsible for implementing the Oil Pollution Act through responding to oil spills and vessel groundings, which present the risk of an oil spill. Additionally, they can recover the costs incurred through the removal of discharges of oil, including costs of prevention, minimization or mitigation of substantial threats of discharges. Although the species or critical habitat may be impacted by the actual oil spill or vessel grounding, because they are not activities conducted or authorized by a federal agency, no consultation would occur. However, the USCG's response to the incident could impact the PCE or the species. The method of removal of the oil could be more or less detrimental depending on the properties of the oil and the hydrodynamics of the system. The removal of a grounded vessel in a reef environment could impact the PCE or the species if care is not taken to identify an egress path to avoid additional damage. In either case, the USCG typically conducts an emergency consultation with NMFS to reduce impacts to listed species. NMFS would consider the specifics of the situation and recommend that impact to the species be avoided or minimized, while still meeting the public safety mission of the USCG.

Aids To Navigation (ATONs)

The USCG is responsible for maintaining safe navigation in the waters of the U.S. To accomplish this goal, they install and maintain ATONs including channel lights, buoys, and permanent pilings. The potential impact of these activities to the species or proposed critical habitat would be from direct placement of the ATON or damage from an anchor chain sweep.

Anchorage

The query of the database did not yield any previous consultations on the USCG designation of special anchorages. However, section 4 (a) and (b) of the Ports and Waterways Safety Act authorizes the USCG to direct the anchoring of vessels through the designation of special anchorage areas. Anchorages have the potential to impact the PCE or the species if the anchorage is located in or near the reef habitat. Anchorages that are located near the species habitat have the potential for adverse impacts if anchored vessels become free from anchor and ground on the reef.

We have only projected one consultation with the USCG in the next ten years regarding their activities that have the potential to adversely affect the proposed critical habitat.

Summary: Projected Type and Number of Future Consultations

Whether past consultations were formal or informal was based on the species or critical habitat affected at the time of consultation and not whether they would have been formal or informal due to the corals' listing or proposed critical habitat. However, because we have identified all of the above categories of activities as having the potential to adversely affect both the corals and their proposed critical habitat, and to be conservative (to avoid underestimating impacts), we assume that all of the projected future actions within these categories will require formal consultations for estimation of both administrative and project modification costs. Therefore, we combined the numbers of past formal and informal consultations to estimate the total number of future consultations and their associated costs.

Table 20 summarizes the types of activities that may affect elkhorn or staghorn corals and their proposed critical habitat. The first column is the category of activity. The second column is the federal action agency and the fourth column indicates if the affected party is the federal agency or a third party either authorized or funded by a federal agency. The next three columns indicate whether the consultation would be triggered by the listing of the corals, the proposed critical habitat designation, or by both. This information is included to assist in the attribution of costs to the critical habitat rule versus the baseline (i.e., co-extensive or incremental costs).

As Table 20 illustrates, there will be categories of federal actions that trigger consultations solely because of the listing of the species that will not also trigger consultation for the proposed critical habitat (e.g., fishery management, research). The impacts of these consultations are not an impact of the critical habitat designation. Specifically, 548 consultations are projected to occur in the next 10 years for effects on the species, whereas only 470 of those consultations are projected to involve effects on the PCE. There are no *categories* of activities that would trigger consultation on the basis of the proposed critical habitat designation alone. However, it is feasible that ultimately a *specific* project would have impacts on critical habitat but not on the species, because the corals are not present within the action area. This can be determined with a survey of the actual proposed action area before consultation is initiated. Because the total surface area covered by the proposed PCE (although unquantified) is far larger than the total surface area on which the corals (again unquantified) currently occur, it is likely there will be more consultations with impacts on critical habitat than on the species. Nonetheless, it is impossible to determine how many of those projects there may be at this time.

Although we have made the assumptions discussed above to be conservative, it is likely that this is an overestimation of the number of future formal consultations. This is due mostly to the low abundance of the species making it unlikely that the corals will be present in all future action areas. Similarly, although the PCE (consolidated hardbottom free from sediment or macro-algal cover) is much more abundant than the species, it is not likely that it will occur in all future action areas. It is impossible to predict the precise locations of the action areas for future consultations, thus the assumption that the corals or the PCE will be adversely affected by every future federal action identified likely results in an overestimate of section 7 impacts.

Table 20. Numbers of future consultations by action category and action agency that may affect elkhorn or staghorn corals, their proposed critical habitat, or a combination of the two over the next ten years as extrapolated from the last ten year consultation history. Also indicated is whether the activity is carried out by the federal action agency or a third party permittee or grantee.

Category	Agency	Total # of Consults	Fed/ NonFed	Listing	CH	Both
Beach Nourishment/Bank Stabilization	USACE	27	Both	X	X	X
Construction (docks, piers, private dredging, private disposal, shoreline stabilization, aquaculture, oil and gas lines, cables)		333	NonFed	X	X	X
Dredging and Disposal		23	Fed	X	X	X
Maintenance Construction (docks, piers, private dredging, private disposal, shoreline stabilization, aquaculture, oil and gas lines, cables)		13	NonFed	X	X	X
Maintenance Dredging and Disposal		6	Fed	X	X	X
Military	DOD	20	Fed	X	X	X
Discharges to navigable waters	EPA	28	NonFed	X	X	X
Water quality standards, NPDES, TMDLs		1	Both	X	X	X
Airport Repair/Construction	FAA	0	NonFed	X	X	X
Power Plant Operations	FERC/NRC	2	NonFed	X		
Bridge Repair	FHA/USDOT	19	Fed	X		
Fishery management	NMFS	23 ⁶	Fed	X	X	X
Research	NOAA/DOI	1	Both	X		
Resource Management		17	Fed	X	X	X
Anchorage	USCG	0	Fed	X	X	X
ATONs		1	Fed	X	X	X
Ship/Vessel/Aircraft Operations		34	Both	X		
TOTAL		548		548	473	

⁶ Of these 23 past consultations on fishery management activities, only 3 were likely to affect the proposed critical habitat and thus, only 3 fishery management consultations are included in our analysis for critical habitat.

3.3 Potential Project Modifications

This section provides a description of the project modifications that NMFS may require to reduce impacts to the PCE through section 7 consultation. Although we have made the assumption that project modifications would be required by NMFS for all of the projected future consultations (i.e., RPAs), not all of the project modifications identified for a specific category of activity would be necessary for an individual project within that category. For example, if a beach renourishment project were altered to include sand bypassing, it would not be necessary to relocate the project; however, it may be necessary to conduct conditions monitoring to insure the project does not have adverse effects. To illustrate the potential project modifications due to the critical habitat designation, we present a matrix of Category of Activity versus Project Modification (Table 21).

As stated above, no category of activity would trigger consultation on the basis of the proposed critical habitat designation alone. Similarly, no category of project modifications was identified that would be required to reduce the impact of a project only on the PCE. NMFS would require or recommend the same types of project modifications to avoid or minimize adverse modification of the critical habitat as we would to avoid or minimize adverse impacts to the listed corals. Thus, if a project required consultation due to adverse effects on both the corals and the PCE, and the same project modification would address both types of adverse effects, the costs of would be co-extensive. Given that the coral is less abundant than the substrate PCE, for any specific project some modifications would be required only to avoid impacts to critical habitat, but that potential is undeterminable at this time. Consequently, we are unable to project definitively whether the costs associated with these project modifications will be wholly or partially co-extensive, or incremental.

Table 21. Matrix of Category of Activity versus potential project modifications required through section 7 consultation for proposed critical habitat. A ○ indicates the cost of project modification would be partially co-extensive with the listing of the two species, a ● indicates the cost of the project modification would be fully co-extensive with the listing of the two species, and a shaded block indicates the project modification is currently required under another regulatory authority.

		Project Modification													
		Action Agency	Project Relocation	Conditions Monitoring	GPS and DPV protocol	Diver Assisted Anchoring/Mooring Buoy Use	Pipe Collars/Cable Anchoring	Sand Bypassing	Shoreline Protection Measures	Upland or Artificial Sources of Sand	HDD/Tunneling	Water Quality Standard Modification	Sediment and Turbidity Control Measures	Fishing Gear Maintenance	Diver Education
Category of Activity	Beach Nourishment/Bank Stabilization	USACE	○	●	○	●	●	○	○	○			●		
	Construction		○	●	○	●	●		○	○	○		●		
	Dredging and Disposal		○	●	○	●	●						●		
	Maintenance Construction		○	●	○	●	●		○	○	○		●		
	Maintenance Dredging and Disposal		○	●	○	●	●						●		
	Military Installations	DOD	○	●	○	●	●		○	○	○	○	●		
	Discharges to navigable waters	EPA	○	●								○	●		
	Water quality standards, NPDES, TMDLs		○									○			
	Airport Repair/Construction	FAA		●									●		
	Resource Management	NOAA/DOI				●						○	●		●
	Fishery Management	NMFS												●	
	ATONs	USCG	○												
Anchorage	○														

Project Relocation

In many cases a proposed project will have direct impacts on the PCE because it occurs in the footprint of the project. For example, the PCE may occur in the area identified for a proposed dredge project or in the direct path of a proposed stormwater outfall. In such circumstances, NMFS may suggest project relocation. The goal would be to completely avoid all impacts to the PCE. Project relocation may not always be feasible and as such might not meet the definition of an RPM or an RPA; therefore it would not automatically be a requirement if the PCE were to be impacted by a proposed federal action. Similarly, project relocation is a potential project modification to avoid impacts to the corals. Project relocation is not specifically required by any other regulatory agency to avoid impacts to coral reef resources. Project relocation is likely a modification only required in a jeopardy or destruction or adverse modification determination where no other modification can be identified. The cost of project relocation would be dependent on the specific project and the circumstances of the new project location. Therefore, an estimate of the average relocation cost or range of costs cannot be reasonably made at this time.

Conditions Monitoring

Many projects may have indirect effects on the PCE. For example, though not in the direct footprint of a dredging project, the PCE may be affected by a sediment or turbidity plume carried downstream. To insure that the PCE is not adversely affected by projects such as these, the PCE and environmental conditions should be monitored. The specific parameters monitored will depend on the specifics of the project. Environmental parameters could include turbidity, sediment load and rate, and nutrients. We have required this modification for projects that impact the listed corals; many regulatory authorities also require various monitoring programs if coral reef resources are in the footprint of proposed actions. The approximate cost to conduct this project modification for a beach nourishment or offshore coral relocation project would be approximately \$3.5-6K per day for personnel, boats, gas, and equipment (D. Gilliam and T. Moore, pers comms.). A recent beach renourishment project had approximately 400 days of monitoring associated with it. Costs will vary with project size, location, duration, and distance from shore. For example, a project located adjacent to the shoreline (like a dock construction) would not incur the same costs as a larger offshore project, since a boat might not be necessary to access the dock site.

GPS and DPV protocol

Various projects involve the use of vessels to conduct their operations (e.g., various coastal construction projects). To reduce the secondary impacts from these projects (i.e., anchor damaging or groundings), NMFS would recommend the use of Global Positioning System (GPS) and Dynamically Positioned Vessels (DPVs). DPVs use GPS coupled with thrusters located at different points around the vessels to continuously update and maintain position. This capability, known as “station keeping,” ensures the proper location of the vessels without the need for anchors. Station keeping has been used in deep water applications (e.g., oil and gas operations), but the cost associated with this project modification is unknown for shallow water applications. This modification might be a requirement for the listed corals when there are colonies in the project area that would likely be impacted. Additionally, station keeping is not currently required by any other regulatory agency to avoid adverse impacts to coral reefs or any other resources.

Diver Assisted Anchoring/Mooring Buoy Use

As stated above, impacts to the PCE and the two coral species can occur from vessel operation (e.g., anchor damage or groundings). Where mooring a vessel is necessary, NMFS may require the use of existing mooring buoys or the use of a diver to assist placement of the anchor on the seafloor. The cost associated with this project modification would be the addition of a diver (typically \$300-1000 per day) to the vessel crew, if a mooring buoy was not available.

Pipe Collars/Cable Anchoring

Several projects use pipelines or cables (i.e., oil and gas, telecommunications, dredge and disposal). If the path of the pipe or cable cannot be relocated to completely avoid reef habitat or to use existing gaps in reefs, they should be anchored to the substrate to avoid secondary impacts from the pipe or cable dragging during storm events. NMFS has required this project modification for projects that impact listed corals, and it is currently required by the USACE and state agencies to avoid adverse impacts to coral reef resources. Collars cost approximately \$1,200 and are typically placed every 20 meters, so the range of potential costs are \$15,600 to \$3,033,600, based on the minimum and maximum paths through the proposed critical habitat.

Sand Bypassing/Backpassing

The conventional means for handling sand accretions at inlets or to provide sand to upstream depleted beaches is to periodically dredge large volumes of sand and then place it in bulk on the beach. As an alternative to conventional beach renourishment events, sand bypassing plants use hydraulic or mechanical means to move the sand across the inlet in smaller quantities over longer periods of time from an accreting area updrift to the eroded downdrift area. The material is placed on the beach immediately downdrift from the obstruction. This mechanical means serves to replace the natural littoral movement of sand. The beach that receives the sand then serves as a feeder beach and delivers sand to downdrift beaches (NOAA Coastal Services Center 2006). As with bypassing, sand backpassing is the mechanical transport of sand from an accreted stable beach to an eroded beach, but instead the sand is moved from a down current beach to an up current beach against the natural littoral movement of sand. Either of these methods of beach nourishment could be used to reduce the potential impacts to the PCE from conventional beach renourishment events. Whether these project modifications would be required is a function of the details of the proposed project; NMFS has not required this project modification for projects that impact the two listed corals. Similarly, sand bypassing/backpassing is not currently required by other regulatory agencies. According to the Report from the Southeast Florida Coral Reef Initiative Maritime Industry and Coastal Construction Impacts Workshop (TetraTech 2007), “sand bypassing costs estimated for several different alternatives at Port Everglades in Broward County range from around \$10 to \$16 per cubic yard, excluding the cost of construction. According to a California Beach Restoration Study drafted in 2002, backpassing costs typically run \$1.50 per cubic yard.” Examples of sand bypassing projects near the proposed critical habitat are Jupiter Inlet, which bypasses 75,000 cubic yards of sand per year, and Canaveral Channel, which bypasses 512,000 cubic yards per year. Using these examples, the range of costs is \$413,000 to \$8,100,000 per year per project.

Shoreline Protection Measures to Reduce Frequency of Beach Nourishment Events

In addition to the project modifications identified above, other recommendations would be the use of techniques to reduce the frequency of nourishment events. Many erosion control programs now incorporate innovative shoreline protection measures (dune restoration, artificial reef-like breakwaters, etc.). Whether these project modifications would be required is a function of the details of the proposed project; NMFS has not required such measures for projects that impacts the listed corals. Similarly, these measures are not currently required by other regulatory agencies. The potential costs of these projects are varied due to the specifics of structure to be constructed (i.e., breakwater, submerged fencing, groin field, dune stabilization). It is feasible that ultimately the construction of these structures could provide long-term cost savings over traditional methods by not having to renourish beaches and other shoreline as often.

Upland or Artificial Sources of Sand

To reduce the impact from dredging sand from offshore as the source for beach renourishment, we may recommend the use of upland or artificial sources (i.e., recycled glass). Whether these project modifications would be required is a function of the details of the proposed project; NMFS has not

required this modification for projects that impact the listed corals. Similarly, these modifications are not currently required by other regulatory agencies. The costs associated with this project modification are varied due to location of the sand source.

HDD/Tunneling

In cases where pipeline or cables can not be relocated to utilize existing gaps on the reef, we would recommend the use of Horizontal Directional Drilling (HDD) or tunneling. These techniques are trenchless construction methods that allow cables and pipelines to be installed underground resulting in no, or minimal, surface disturbance. NMFS has not required this modification for projects that impact the listed corals. However, the state of Florida currently requires the use of directional drilling in the southeast Florida reef tract and telecommunication cables are prohibited in Biscayne Aquatic Preserve, Biscayne National Park, and Monroe County, Florida (F.A.C. 18-21). The cost associated with these techniques is approximately \$1.39-\$2.44 million per mile (TetraTech 2007).

Water Quality Standard Modification

Existing discharges to the corals' habitat result in adverse effects on the PCE, which decreases recruitment. Whether these discharges are currently in compliance with existing water quality standards is unknown. However, presuming that the current discharges are in compliance and to reduce the impact of discharges on the PCE, the water quality standards may need to be revised. Specifically, standards for nutrients and sediments may need to be addressed. This project modification would be a result of a consultation on EPA water quality standards. Costs associated with this project modification are unknown due to the unknown scope and extent to which the standards might need to be modified.

Sediment and Turbidity Control Measures

Projects which involve any sedimentation or turbidity (e.g., dredging and disposal, shoreline stabilization) would be required to use sediment and turbidity control measures. Typically these consist of silt curtains to contain the sediment or turbidity plume. NMFS has required this modification for projects that impact listed corals and the modification is currently required by regulatory agencies to avoid adverse impacts to coral reef resources (i.e., USACE, state of Florida). One example of costs associated with implementing this project modification is \$43K per mile (Broward County Beach Renourishment Segment II project). Small dock construction would typically require approximately 100 yds of silt curtain. A recent large beach renourishment project was approximately 7 miles long; however, the entire project area is not typically curtained at the same time as renourishment proceeds in phases down the length of the beach. Nonetheless, the costs will vary depending on location and material being dredged.

Fishing Gear Maintenance

The legal placement of traps typically does not cause damage to the PCE (dead-in-place coral skeletons); however, if traps are not properly maintained, they can become mobile and damage the skeletons. NMFS would likely require that the trap fishermen ensure that gear does not become derelict, either from abandonment or storm mobilization. This can be accomplished through collection of traps prior to major storms. Although NMFS understands that this cannot always be accomplished due to the unpredictability of storm timing and tracks, a good-faith effort must be made. This project modification is also in the interest of the trap fishery because it prevents the loss of gear and the necessity for replacement. This project modification is not currently required by any regulatory authority. The costs associated with this project modification are a function of the fisherman's time and gas required for the collection of the traps. However, it is possible that the costs would be offset by the reduction of lost traps.

Diver Education

Various resource management agencies have the authority to manage diving activities within their jurisdictions as a function of their resource management plans. To reduce the effect of diver impacts on the PCE, specifically dead-in-place skeletons, NMFS may require that the agencies implement or modify

diver education programs on the sensitivity of this portion of the PCE (as well as the listed corals) to diver impacts. This project modification would be required by NMFS for both the critical habitat and listed corals, though it is not currently required by any other regulatory authority. The costs associated with this project modification would be the administrative cost of agency personnel creating the program, and individual costs of taking the training.

3.4 Estimated Section 7 Costs

As previously stated, ESA section 7 consultation costs of the proposed critical habitat designation result from administrative effort to conduct the consultation and the addition of project modifications (i.e., RPAs). In this section, we first estimate the administrative costs of consultation that may result from the proposed rule. Next, we summarize the potential costs of project modifications to the extent practicable, given the current lack of information regarding the scope and precise location of future projects.

Certain assumptions were made in considering the economic impact of section 7 consultation and project modification implementation. Table 22 presents a summary of key assumptions applied to this analysis.

Table 22. Key assumptions applied to the estimation of costs of the proposed critical habitat rule.

Key Assumptions Applied to the Section 7 Impacts Consideration	
Key Assumption	Effect on Cost
The presence of other listed species or designated critical habitat has no influence on consultation.	+
Past 10 year consultation history is indicative of next 10 year consultation projection.	?
All future consultations are expected to be formal.	+
All project modifications are required.	+
-: This assumption may result in underestimate of real costs. +: This assumption may result in an overestimate of real costs. ?: This assumption has an unknown effect on real costs.	

3.4.1 Administrative Costs

Estimates of the costs of federal agencies and third parties such as permittees or grantees participating in the consultation process were developed from a review and analysis of the PCTS database, as discussed above (Table 20) and from the estimated section 7 costs identified in the *Economic Analysis of Critical Habitat Designation for the Gulf Sturgeon* (IEc, 2003) inflated to 2006 dollars (the 2007 inflation coefficient was not known at the time of drafting). Cost figures are based on an average level of effort for consultations of low or high complexity (based on NMFS and other Federal agency information), multiplied by the appropriate labor rates for NMFS and other Federal agency staff. Additionally, included in the estimates are the cost to conduct surveys of the project area to determine the presence and amount of the PCE. Although the PCE occurs in greater abundance than the corals and thus the probability that a consultation would be required because of the critical habitat designation is higher than for the corals, we are unable to estimate how many consultations would be required on the basis of critical habitat alone. Therefore, we present the estimated maximum incremental administrative costs.

Table 23. Estimated Administrative Costs of Section 7 Consultation for Acropora Critical Habitat (Per Effort). Source: IEC, 2003 inflated to 2006 dollars using CPI index.

	NMFS	Action Agency	Third Party	Total Cost
Formal Consultation				
Low	\$3,475	\$10,762	\$3,251	\$17,489
High	\$6,839	\$20,600	\$4,596	\$34,529

Notes: Low and high estimates primarily reflect variations in staff wages and time involvement by staff. Third parties are defined as state agencies, local municipalities, and private parties. Action agency costs include the cost of conducting a biological assessment. Programmatic consultations are assumed to be formal. Costs are presented in 2006 dollars.

3.4.2 Project Modification Costs

Given the uncertainties in predicting the precise scope and location of future federal actions that will require consultation, and the resultant uncertainty in predicting future project modification costs, it is not possible for NMFS to estimate the total section 7 costs of the proposed critical habitat designation with any certainty. As noted above, there are two overarching determinants of whether future section 7 impacts will be incremental impacts of the designation, or co-extensive with the listing or another legal authority. The first is the far greater abundance of the PCE compared to the listed corals, or all coral resources combined. On this basis alone one could expect the majority of future consultation costs to be incremental. However, given that all categories of future actions that may adversely impact the PCE also have the potential to adversely impact the listed corals, and the fact that the same project modifications would address adverse impacts to both the PCE and the corals, if the listed corals are present in the action area of a proposed project along with the PCE, the section 7 costs will be co-extensive.

Table 24 summarizes the project modifications discussed above and identifies costs and scope when the information was available. Although we have a projection of the number of future formal consultations (albeit an overestimation), the lack of information on the specifics of project design limits our ability to forecast the exact type and amount of modifications required. For example, NMFS will likely require conditions monitoring for future projects that affect the PCE. However, we do not know if the PCE will be present in proposed future action areas because we do not know the location of future action areas, and the PCE has not been mapped precisely at this time. This can easily be determined with a survey of the actual proposed action area prior to initiating section 7 consultation. Without this information it is impossible to estimate specifically which project modification(s) may be required, and the scope of such modification(s), for any potential action area (in our example, the effort necessary to monitor conditions). In addition, the estimation of future consultations (Table 20) indicates that the majority of consultations are likely to be USACE-permitted or conducted actions (402 of 470 critical habitat consultations). As discussed above, a large portion of these future consultations are likely to be dock construction, and it is highly unlikely that every one of these projects would adversely affect the PCE or corals.

We used two characterizations of project modification costs that may result from this proposed rule: fully co-extensive and partially co-extensive. Certain costs were characterized as fully co-extensive with the listing of the species because the nature of the actions that would require these modifications typically involve a large action area likely to include both the PCE and either the listed corals or other coral reef resources. An example is water quality standard modification, where due to the size of the action area, the corals will be present and therefore the cost of changing the standard is co-extensive. Costs are also more likely to be co-extensive if another regulatory authority currently requires the modification. An example is conditions monitoring, which is currently required by federal, state, and local jurisdictions. A cost was characterized as partially co-extensive if the project modification was identified as an RPM (i.e., to offset the impact of take on the species) for the listing, but due to our lack of knowledge whether the

PCE or species will be present, we are unable to determine if the costs would be attributed to the species or PCE. Therefore, the costs associated with those project modifications would be a co-extensive cost and not an incremental cost of this rule if the PCE and coral species are both in the action area of a proposed project.

Table 24. Summary of costs associated with specific project modifications. Where information was available, ranges of scopes are included.

Project Modification	Cost	Unit	Range	Approx. Totals per Project
Fully Co-extensive				
Conditions Monitoring	\$3.5-6K	per day	1-400 days	\$3.5K - 2.4M
Diver Education	Administrative cost	n/a	n/a	n/a
HDD/Tunneling	\$1.39 -2.44M	per mile	0.2 - 31.5 miles	\$278K -76.9M
Fishing Gear Maintenance	Cost of gas and time to retrieve traps. Ultimately a potential cost savings of reduction in lost traps.	n/a	n/a	n/a
Pipe Collars/Cable Anchoring	\$1,200	per anchor	13 – 2,529 anchors	\$15.6K – 3M
Sediment and Turbidity Control Measures	~\$43K	per mile	0.05 – 7 miles	\$2-301K
Water Quality Standard Modification	Undeterminable	n/a	n/a	n/a
Partially Co-extensive				
Project Relocation	Undeterminable	n/a	n/a	n/a
Diver Assisted Anchoring /Mooring Buoy Use	\$300-1000	per day	n/a	n/a
GPS and DPV protocol	Undeterminable	n/a	n/a	n/a
Sand Bypassing/Backpassing	\$1.5-16K	per cu yd	75-512K cu yds	\$113K-8.1M
Shoreline Protection Measures to Reduce Frequency of Beach Nourishment Events	Undeterminable but ultimately a potential cost savings	n/a	n/a	n/a
Upland or Artificial Sources of Sand	Undeterminable	n/a	n/a	n/a

4 NATIONAL SECURITY IMPACTS

Previous critical habitat designations have recognized that impacts to national security result if a designation would trigger future section 7 consultations because a proposed military activity “may affect” the physical or biological feature(s) essential to the listed species’ conservation that form the basis for including areas in a critical habitat designation. Potential project modifications may also impact national security. Anticipated interference with mission-essential training or testing or unit readiness, either through delays caused by the consultation process or through expected requirements to modify the action to prevent adverse modification of critical habitat, has been identified as a negative impact of critical habitat designations. (See, e.g., *Proposed Designation of Critical Habitat for the Pacific Coast Population of the Western Snowy Plover*, 71 FR 34571, June 15, 2006, 34583; and *Proposed Designation of Critical Habitat for Southern Resident Killer Whales*; 69 FR 75608, Dec. 17, 2004, 75633)

Past designations also recognized that whether national security impacts result from the designation depends on whether future consultations would be required under the jeopardy standard regardless of the critical habitat designation, and whether the designation would add new burdens beyond those related to the jeopardy consultation.

As discussed above, based on the past ten year consultation history, it is likely that consultations with respect to activities on DOD facilities will be triggered as a result of the proposed critical habitat designation. Further, it is possible that some consultations for a specific action will be due to the presence of the PCE alone, and that adverse modification of the PCE could result, thus requiring an RPA to the proposed DOD activity.

On May 22, 2007, we sent a letter to DOD requesting information on national security impacts of the proposed critical habitat designation. We received a response only from the Department of the Navy (Navy). Further discussions and correspondence identified Naval Air Station Key West (NASKW) as the only installation potentially affected by the critical habitat designation. NASKW resides solely within the Florida specific area of the proposed critical habitat (Area 1); no other DOD installations were identified as likely to be impacted by this proposed designation

The Navy identified several particular areas that would involve impacts to national security if consultation and project modifications were required to avoid impacts to critical habitat (Figure 7). The Navy considers nearshore areas to be under its control pursuant to its navigable servitude for purposes of national defense under the Submerged Lands Act (43 U.S.C. §1314). Additionally, the Navy states that NASKW and associated annexes (including bombing and strafing areas) provide training necessary to national security and identified the types of military activities that take place in the areas. The Navy concluded that critical habitat designation at NASKW would likely impact national security by diminishing military readiness through the requirement to consult on their activities within critical habitat beyond the requirement to consult on the two listed corals. Because the total surface area covered by the proposed PCE (although unquantified) is far larger than the total surface area on which the corals (again unquantified) currently occur, it is likely there will be more consultations with impacts on critical habitat than on the species. Specifically, they identified impacts on several activities including military training and readiness, access to, management of, and maintenance of piers, harbors, waterfront instrumentation, and support for refueling or docking of federal vessels.

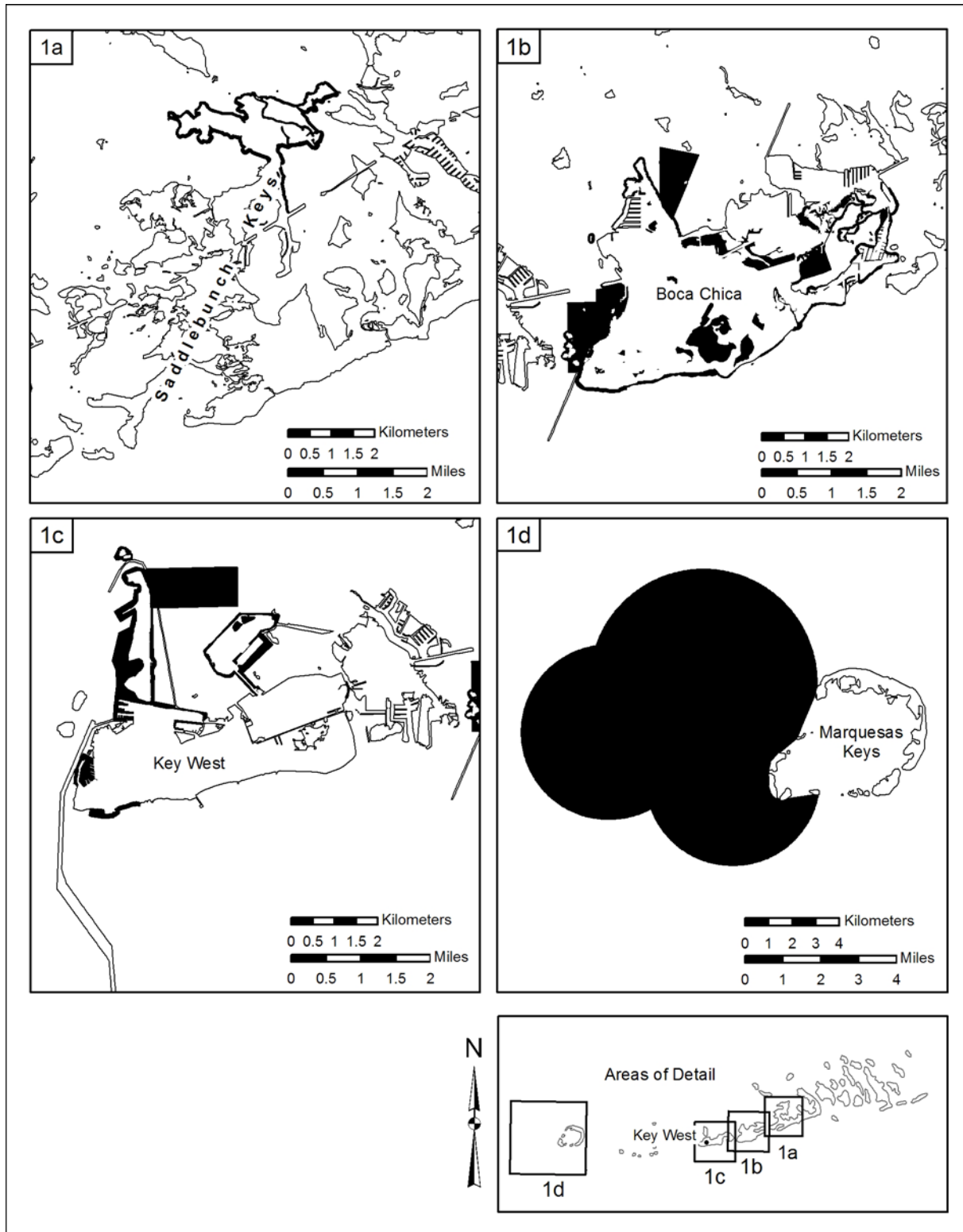


Figure 7. Waters under the control of Naval Air Station, Key West that overlap with the proposed critical habitat for elkhorn and staghorn corals.

5 OTHER RELEVANT IMPACTS

Past critical habitat designations have identified two broad categories of other relevant impacts: conservation benefits, both to the species and to society, and impacts on governmental or private entities that are implementing existing management plans that provide benefits to the listed species.

As we discuss below, elkhorn and staghorn corals currently provide a range of important uses and services to society as reflected in the economic valuation literature review. As these benefits currently exist, we do not interpret them as resulting from the critical habitat designation per se. However, because the features that form the basis of the critical habitat designation are essential to conservation of the listed species, the protection of critical habitat from destruction or adverse modification may at minimum prevent loss of the benefits currently provided by the species and may contribute to an increase in the benefits of these species to society in the future. Therefore, critical habitat alone will not bring about coral recovery, and the benefits of conserving elkhorn and staghorn coral are and will continue to be the result of several laws and regulations. We determined that there are benefits resulting from this designation.

Where possible, the benefits of critical habitat designation should be described on an area-by-area basis in order to provide the best available information to finalize critical habitat designations. As noted below, data are not available to quantify or monetize the benefits on an area-by-area basis.

5.1 Education, Awareness, and Other General Benefits of Coral Reefs that May Result from the Designation

There is the potential for education and awareness benefits arising from the proposed critical habitat designation. This potential stems from two sources: (1) entities that engage in section 7 consultation and (2) members of the general public interested in coral conservation. The former potential exists from parties that voluntarily alter their activities to benefit the species or PCE because they were made aware of the critical habitat designation through the section 7 consultation process. The latter may engage in the same voluntary efforts because they learned of the critical habitat designation through outreach materials. For example, we have been contacted by that diver groups in the Florida Keys who are specifically seeking elkhorn and staghorn corals on dives and reporting locations to NMFS, which will be of assistance to us in planning and implementing coral conservation and management activities.

In our experience, designation raises the public's awareness that there are special considerations to be taken within the area. Similarly, state and local governments may be prompted to enact laws or rules to compliment the proposed critical habitat designation and benefit the listed corals. Those laws would likely result in additional impacts of the designation. However, it is impossible to quantify the beneficial effects of the awareness gained through or the secondary impacts from state and local regulations resulting from the proposed critical habitat designation.

Finally, elkhorn and staghorn corals are an integral part of the ecosystems in which they live. Avoiding destruction or adverse modification of the PCE for listed corals, which will involve in many instances preventing deterioration of water quality, will benefit other organisms that coinhabit these areas. Specifically, the PCE is not only essential to the conservation of elkhorn and staghorn corals, it is also the habitat necessary for the recruitment of other coral and invertebrate species that are important components of a reef ecosystem.

5.2 Conservation Benefits

As mentioned above, by definition the proposed PCE is "essential to the conservation" of the species; in other words, conservation of the species as defined in the ESA is not possible without the feature. Hence, the designation of critical habitat is focused on recovery of the listed coral species. The PCE identified

for the elkhorn and staghorn coral critical habitat designation is especially tied to the recovery of these species, because it provides the appropriate habitat necessary for increasing the species' abundances, density, and genetic diversity through sexual and asexual recruitment. Thus, preventing adverse modification of critical habitat provides the potential for conservation of the corals to be successful, and the benefits of the species and their habitat can be expected at minimum to persist (not to diminish), as the corals begin to increase in abundance. Benefits of the corals may also be expected to increase as a result of conservation, given the reasonable assumption that local abundance and density of these iconic species on reefs leads to increased visitation, user enjoyment, and populations of target fish species.

The benefits described below are partially co-extensive benefits because they will result from both listing and critical habitat designation, as well as a variety of existing laws and regulations. The PCE is essential to the species' conservation, but the feature alone will not bring about the species' recovery. However, because the PCE is essential to the conservation of the species, protecting the PCE from destruction or adverse modification is expected to maintain and potentially increase the benefits these species provide. Actions resulting from listing that are expected to contribute to the species' conservation include recovery plan development and implementation, implementation of the recently proposed 4(d) rule, and potential future rules to protect the species.

5.2.1 Benefits of Designation to the Corals

As mentioned above, we have determined that elkhorn and staghorn corals cannot be recovered without the PCE we have identified in our proposed rulemaking. The PCE identified for the elkhorn and staghorn coral critical habitat designation is especially tied to the recovery of these species, because it provides the appropriate habitat necessary for increasing the species' abundances, density, and genetic diversity through sexual and asexual recruitment.

In the status review conducted for our determination to list the species, we determined there is no difference in the importance of any populations throughout the ranges of either species to their status and recovery potential. Genetic analyses reviewed during that process indicate that both species exhibit limited ability for successful sexual reproduction over large distances, so the availability of suitable settling substrate in close proximity to existing coral colonies is extremely important and underscores the importance of each of the specific critical habitat areas to conservation of the corals in those locales. Our inability to designate critical habitat in areas outside of U.S. jurisdiction limits the total area containing the substrate PCE that we can protect from destruction or adverse modification through a designation to a small percentage (estimated at 5 to 10%) of the ranges of these species.

5.2.2 Economic Benefits Associated with Recovery of the Listed Corals

Past critical habitat designations have described the benefits of designation in terms of biological or ecological metrics, and qualitative descriptions of societal use values, due to limited reliable information on the monetary value of these benefits. For coral reef resources, and elkhorn and staghorn corals in particular, we have reliable information to characterize both ecological and reliable economic estimates of conservation benefits that may result from conservation of the two corals that is expected from the proposed critical habitat designation. Though economic benefits of the designation could be discussed above in the economic impacts section, we discuss those potential benefits here because they flow from the conservation of the two corals. As indicated above, the economic values presented in the remainder of this section are measures of *existing* benefits provided by coral reefs in the areas covered by the proposed designation, derived from a number of studies and databases. We present these data as context for our conclusion that non-negligible economic benefits will result from the proposed designation, because the protection of their critical habitat from destruction or adverse modification is expected at minimum to prevent loss of existing benefits the corals provide to society, and may contribute to an increase in such benefits in the future.

The listing of and critical habitat designation for elkhorn and staghorn corals is focused on their recovery so that the protections of the ESA are no longer necessary. These corals have intrinsic values that will be enhanced by their recovery. Existence value reflects the utility the public derives from the knowledge that species continue to exist. Additionally, the habitat provided by threatened corals, and the organisms supported by that habitat have an intrinsic value, adding to the total value of threatened corals. Further adding to that value is the intrinsic value of the entire coral reef ecosystem in which threatened corals are found.

There are several sources of data on the monetary values associated with coral reefs, including the reefs formed and inhabited by elkhorn and staghorn coral. Though we have arranged the next several subsections to display different economic attributes of the corals, there is some overlap between the values discussed. For example, in this subsection we discuss a total valuation study of coral reefs off of southern Florida to users visiting the reefs by boat, which would include some of the value to fishing economies discussed below.

Johns et al. (2003) estimated the value of natural coral reefs to residents and tourists utilizing the reefs through boat visits in the four Florida counties included in the proposed critical habitat designation: Palm Beach, Broward, Miami-Dade, and Monroe counties. Through extensive direct surveys of actual expenditures by boaters, and contingent valuation surveys of the willingness of reef users to pay to maintain natural reefs in their existing conditions, these authors estimated both the value of natural reefs to reef users, and the economic contribution of natural reefs to the counties' economies. Table 25 and Table 26 summarize some of the findings of the Johns et al. (2003) study. The authors point out that the results likely underestimate total societal value for natural reefs because non-reef users and their values for reefs were not included in the study.

Table 25. Economic Contribution of Natural Reef-Related Expenditures to Each County, June 2000 to May 2001 – Residents and Visitors. Recreated from Johns et al. (2003).

Type of Economic Contribution	County			
	Palm Beach	Broward	Miami-Dade	Monroe
Sales (in millions of 2000 dollars)	\$357	\$1,108	\$878	\$363
Income (in millions of 2000 dollars)	\$142	\$547	\$419	\$106
Employment – (number of full- and part-time jobs)	4,500	19,000	13,000	8,000

Table 26. Annual Use Value From June 2000 to May 2001 and Capitalized Value associated With Natural Reef Use in Southeast Florida – Residents and Visitors. Recreated from Johns et al. (2003).

Item	Palm Beach County	Broward County	Miami-Dade County	Monroe County	Total ^a
Person-Days of Reef Use (in millions of 2000 dollars)	2.83	5.47	6.22	3.64	18.15
Use Value Per Person-Day	\$14.86	\$15.16	\$7.54	\$16.34	\$12.74
Annual Use Value (in millions of 2000 dollars)	\$42.12	\$83.60	\$46.71	\$55.22	\$227.65
Capitalized Value at 3 percent discount rate (in billions of 2000 dollars)	\$1.4	\$2.8	\$1.6	\$1.8	\$7.6

^a Use Value per Person per Day is the average among the counties.
Note: Use value per person-day is a day or portion of a day of reef use.

We did not find comparable studies of use or total values, or economic contributions of coral reefs off of Puerto Rico and the U.S. Virgin Islands. To provide a frame of reference for the Johns et al. study, and its potential representativeness of economic benefits of conserving the reefs off these islands, we have summarized a variety of valuation studies of reef resources in Table 27.

Across studies, some estimated values are similar in magnitude. For example, Cesar et al. (2002) provides a per trip willingness to pay over and above the \$3 admission fee at Hanauma Bay, Hawaii to protect coral reefs of between \$0.44 and \$2.86, while Spurgeon et al. (2004) estimate that the public is willing to pay between \$2.13 and \$8.50 per trip to protect coral reefs in America Samoa. In general, however, there is a great deal of variation, as discussed in the meta-analysis of coral reef valuation studies by Brander et al. (2007). This variation arises largely from differences in (1) the good being valued (e.g., coral reef recreation, protection of coastal resources, reduction of water pollution affecting coral reefs); (2) survey methods (e.g., interview, self-administered questionnaire, etc.); and (3) the mechanism through which the respondent would actually pay the bid amount (e.g., increase in annual taxes, one-time access fee, etc.), as well as other factors.

The majority of studies in Table 27 attempt to estimate the total value of coral reefs (i.e., including existence value), rather than the benefits associated with improved species recovery (i.e., protections afforded threatened corals under ESA section 7). For these reasons, this analysis does not specifically monetize the benefits associated with ESA section 7 protection for threatened corals. Nonetheless, taken as a whole, the studies summarized above support the concept that conservation of coral reefs and their habitats and related ecosystems is likely to generate sizable benefits to the public.

Table 27. Summary of Economic Valuation Literature Related to Coral Reefs.

Author	Geographic Area	Key Issues Addressed in Survey	Survey Administration	Range of Values
Brander, Van Beukering, and Cesar (2007)	Worldwide	The authors collected 166 coral reef valuation studies, 52 of which provided sufficient information for a statistical meta-analysis, yielding 100 separate value observations in total. Focusing on recreational values, the authors use US\$ per visit as the dependent variable in our meta-analysis. Different valuation methods are shown to produce widely different values, with the contingent valuation method producing significantly lower value estimates.	<p><i>Sample Frame:</i> Various</p> <p><i>Number of Survey Participants:</i> Various</p> <p><i>Survey Mode:</i> Various</p>	<p>US\$184 per visit</p> <p>Mean value of coral reef recreation</p> <p>US\$17 per visit</p> <p>Median value of coral reef recreation</p> <p>Note: The mean and median values of coral reef associated recreation vary considerably by location, recreational activity, and valuation method used.</p>
Spash et al. (2000)	Curaçao and Jamaica	Two separate contingent valuation method surveys were designed – one survey for Jamaica and one for Curaçao. The aim was to find a realistic scenario in which to describe a reason why the general public might need to pay for biodiversity improvement.	<p><i>Sample Frame:</i> Residents and tourists of Curaçao and Jamaica</p> <p><i>Number of Survey Participants:</i> 1,152 for Curaçao 1,058 for Jamaica</p> <p><i>Survey Mode:</i> Surveys</p>	<p>US\$2.08</p> <p>Estimated willingness to pay by Curaçao residents for environmental improvement</p> <p>US\$3.24</p> <p>Estimated willingness to pay by Jamaica residents for environmental improvement</p> <p>US\$2.46</p> <p>Estimated willingness to pay by Curaçao tourists for environmental improvement</p> <p>US\$2.73</p> <p>Estimated willingness to pay by Jamaica tourists for environmental improvement</p>

Author	Geographic Area	Key Issues Addressed in Survey	Survey Administration	Range of Values
Spurgeon et al. (2004)	America Samoa	The overall aim of the study was to undertake an economic valuation of coral reefs and adjacent habitats in American Samoa, focusing on current and potential values for corals and mangroves. In addition, it was agreed that an attempt should be made to estimate potential nonuse values. Three main data collection components were undertaken: Information review, village discussion meetings, and general public questionnaire survey.	<p><i>Sample Frame:</i> America Samoa residents (adults over the age of 16)</p> <p><i>Number of Survey Participants:</i> 300</p> <p><i>Survey Mode:</i> General public questionnaire survey</p>	<p>\$105 per year</p> <p>Estimated willingness to pay of residents for the protection of coastal resources (2004 dollars)</p> <p>\$8.50 per visit</p> <p>Estimated willingness to pay for coral reefs of tourists and cruise passengers (16,000 people)</p> <p>\$2.13 per visit</p> <p>Estimated willingness to pay for coral reefs of business visitors and those visiting relatives (38,000 people).</p>
Van Beukering et al. (2006)	Saipan, Commonwealth of the Northern Marianas Islands	The main objective of the study was to carry out an economic valuation of the coral reefs and associated resources on Saipan. The results of the study were derived through five major research methodologies: 1) Household survey; 2) Discrete choice experiment; 3) Total Economic Value Calculation; 4) Spatial analysis; 5) Sustainable financing	<p><i>Sample Frame:</i> Saipan residents</p> <p><i>Number of Survey Participants:</i> 375</p> <p><i>Survey Mode:</i> Discrete Choice Experiment (DCE) Surveys</p>	<p>\$1.86 for each percent increase in reef recreation</p> <p>Estimated willingness to pay of residents for increase in reef recreation</p> <p>\$5.99 for each percent decrease in water pollution</p> <p>Estimated willingness to pay of residents for reduction of reef pollution.</p>

Author	Geographic Area	Key Issues Addressed in Survey	Survey Administration	Range of Values
Cesar et al. (2002)	Hanauma Bay, Hawaii	The main purpose of the survey was to determine the average profile of each user group in terms of (i) actual expenditure directly attributable to the diving or snorkeling trip, (ii) the consumer surplus for this experience and (iii) the willingness to pay for a healthier marine environment.	<p><i>Sample Frame:</i> The active user group of coral reefs in Hawaii</p> <p><i>Number of Survey Participants:</i> 50 divers, 260 snorkelers, and 150 non-coral reef users</p> <p><i>Survey Mode:</i> Interview surveys</p>	<p>\$2.86 per trip</p> <p>Estimated willingness to pay of residents to protect the marine environment.</p> <p>\$2.69 per snorkeling trip</p> <p>Estimated willingness to pay of snorkelers to protect the marine environment.</p> <p>\$0.44 per dive</p> <p>Estimated willingness to pay of divers to protect the marine environment.</p> <p>NOTE: These dollar values are the amount reef users are willing to pay over and above the cost of admission to Hanauma Bay.</p>
Van Beukering et al (2007)	Guam	The objective of this study was to carry out a comprehensive economic valuation of the coral reefs and associated resources in Guam. The focus was on valuing the five main uses of coral reefs in Guam. Some of these are extractive uses, such as fisheries (i); others are non-extractive, such as recreation/tourism (ii), cultural/traditional uses (iii), and education and research (iv). Finally, some are indirect uses, such as shoreline and infrastructure protection (v).	<p><i>Sample Frame:</i> Guam residents</p> <p><i>Number of Survey Participants:</i> 400</p> <p><i>Survey Mode:</i> Discrete Choice Experiment (DCE) Surveys</p>	<p>\$2.23 for each percent increase in reef recreation</p> <p>Estimated willingness to pay of residents for increase in reef recreation</p> <p>\$10.40 for each percent decrease in water pollution</p> <p>Estimated willingness to pay of residents for reduction of reef pollution.</p>

5.2.3 Benefits to Fisheries

As discussed in section 2.3 above, due to their branching morphology and the habitat complexity they provide, elkhorn and staghorn corals are particularly important habitat for fish species, including species of economic and ecological importance. Reef fish are popular on tourist menus and support a valuable export industry (Burke and Maidens 2004). In addition, reef fisheries are a primary source for protein and employment for local human populations. The productivity of reef fisheries is dependent on the health of the reef ecosystem. Thus, the critical habitat designation, which focuses on the recovery of elkhorn and staghorn corals, once the most abundant and most important species on Caribbean coral reefs in terms of accretion of reef structure, could contribute to increased economic benefits in the form of increased allowable harvest of shallow reef fish. These benefits might include an increase in fishery and related jobs and expenditures within the U.S. Caribbean regional economy, or if considered within the welfare economics context, an increase in the producer and consumer surplus.

The Caribbean coral reef ecosystems formed and inhabited by elkhorn and staghorn corals support a wide variety of fish species at various points in their life cycle including jacks, triggerfish, scamp, hind, and several species of the snapper-grouper complex (see Table 28). In 2005, landings of shallow water reef fish totaled 3,045,638 pounds, 771,656 pounds, and 1,210,788 pounds in each of the proposed critical habitat areas – Florida, Puerto Rico, and U.S.V.I.⁷, respectively (see Table 28). The total value of these landings in Florida, Puerto Rico, and U.S.V.I. was \$5,907,165, \$1,766,337, and \$3,896,340, respectively.

Designation of critical habitat, with its focus on recovery of elkhorn and staghorn corals, therefore, presents the potential to provide increased economic benefits to the U.S. Southeast and Caribbean regions by providing habitat for valuable reef fish species.

Table 28. 2005 Landings of Shallow Water Reef Fish for Critical Habitat Specific Areas (Source: NMFS SERO Logbook Data; see Tables 5, 8, 11 and 15).

Critical Habitat Area	Area Location	Dollars (2005)	Total Pounds Landed
Area 1	Florida (Palm Beach, Broward, Miami-Dade, and Monroe Counties)	\$5,907,165	3,045,638
Area 2	Puerto Rico	\$1,766,337	771,656
Areas 3 and 4	U.S.V.I.	\$3,896,340	1,210,788

5.2.4 Benefits to Tourism and Recreation Economies

Tourism is a principle component of each of the proposed critical habitat area economies. As indicated in the discussion of the Johns et al. (2003) study, U.S. coral reefs are a major destination for snorkelers, SCUBA divers, recreational fishers, boaters, and sun seekers. Diving tours, fishing trips, hotels, restaurants, and other businesses based near reef systems provide millions of jobs and contribute billions of dollars in tourism-dependent revenue annually. For example, overall for southeast Florida's reefs (i.e., Palm Beach, Broward, Miami-Dade, and Monroe Counties), 18 million people participated in reef-related activities during 2001, and these reefs are estimated to have an asset value of \$7.6 billion (Johns et al. 2003).

Additionally, tourism is the largest contributor to the economy of the U.S.V.I.; it accounts for 80 percent of the Territory's Gross Domestic Product and employment (CIA World Fact Book 2007). A survey

⁷ When referring to "U.S.V.I." in this section, this includes both U.S.V.I. proposed critical habitat areas: (1) St. Croix; and (2) St. Thomas/St. John.

conducted for the Virgin Islands Department of Planning and Natural Resources found that 100 percent of hotel industry participants answered that there would be a significant impact on tourist visits to the U.S.V.I. if the coast/beaches were degraded or fisheries and/or coral reefs declined (U.S.V.I. 2003).

Last, it is estimated that the net revenues from dive tourism throughout the Caribbean could decrease by 2 to 5 percent (i.e. losses of \$100 million to \$300 million) by the year 2015, if coral reef degradation continues (Burke and Maidens 2004). On the other hand, under a “no degradation” scenario, net revenues from dive tourism throughout the Caribbean might grow to nearly \$6 billion (ibid). Net annual revenues of dive tourism in the Caribbean in 2000 were estimated at \$2.1 billion (ibid).

Designation of critical habitat, with its focus on recovery of elkhorn and staghorn corals may increase the value of coral reefs to both SCUBA divers and other tourists as a result of increased structural and species diversity of coral reefs (which provides more interesting diving and snorkeling), increased sport fishing, and shore stabilization (i.e. less erosion of beaches).

5.2.5 Benefits of Shoreline Protection

Coral reefs buffer adjacent shorelines from wave action and prevent erosion of beaches, property damage, and loss of life. Reefs also protect highly productive mangrove fisheries and wetlands along the coast as well as ports and harbors and the economies they support. It is difficult to quantify these services that coral reefs provide; however, the value of shoreline protection can be approximated by estimating the cost of replacing these services through artificial means (e.g., beach renourishment, breakwaters, etc.) (Burke and Maidens 2004). It is estimated that the annual economic value of shoreline protection services provided by healthy coral reefs ranged from \$2,000 per kilometer (km) of coastline (for protection of less-developed shorelines) to \$1,000,000 per km of coastline (for highly developed shorelines) (ibid).

Degraded reefs do not provide the same level of shoreline protection as healthy reefs. Therefore, critical habitat designation, with its focus on recovery of elkhorn and staghorn corals may contribute to preservation of the economic value of the shoreline protection services provided by coral reefs.

5.3 Impact on Natural Resource Agencies with Existing Management Plans Benefiting the Proposed PCE

Many previous designations have evaluated the impacts of designation on relationships with, or the efforts of, private and public entities that are involved in management or conservation efforts benefiting listed species. These designations found that the additional regulatory layer of a designation would negatively impact the conservation benefits provided to the listed species by existing or proposed management or conservation plans. For example, NMFS has previously considered the impacts of designation on Indian tribal sovereignty and participation in conservation activities (69 FR 74572, 74622 (Dec. 14, 2004), Proposed Designation of Critical Habitat for 13 Evolutionarily Significant Units of Pacific Salmon (*Oncorhynchus* spp.) and Steelhead (*O. mykiss*) in Washington, Oregon, and Idaho). The U.S. FWS has considered the impacts of designation on private entities that have entered into Habitat Conservation Plan agreements under the ESA, and Federal, state or local conservation plans implemented under a variety of legal authorities (See, e.g., 72 FR 33808 (June 19, 2007), Proposed Revised Critical Habitat for the San Bernardino Kangaroo Rat (*Dipodomys merriami parvus*); 72 FR 30279 (May 31, 2007), Clarification of the Economic and Non-Economic Exclusions for the Final Designation of Critical Habitat for Four Vernal Pool Crustaceans and Eleven Vernal Pool Plants in California and Southern Oregon.). One court held that this type of impact is a permissible interpretation of “other relevant impacts” under section 4(b)(2) (Center for Biological Diversity et al., v. Dept of the Interior, 240 F. Supp. 2d 1090, 1105 (D. Ariz. 2003) (“It is certainly reasonable to consider a positive working relationship relevant, particularly when that relationship results in the implementation of beneficial natural resource programs, including species preservation.”)).

Similar to national security impacts, impacts on entities responsible for natural resource management or conservation plans that benefit listed species, or on the functioning of those plans, depend on the type and number of section 7 consultations that may result from the proposed critical habitat designation in the areas covered by the plans.

Table 29 summarizes the existing resource management areas that will likely require section 7 consultation in the future, when the responsible federal agencies revise their management plans or associated regulations, or implement management actions. Negative impacts to these entities could result if the designation interferes with these agencies' ability to provide for the conservation of the species, or otherwise hampers management of these areas. Table 29 also identifies some existing prohibitions in these areas that may protect the proposed critical habitat PCE. As discussed above, existing management plans and associated regulations protect existing coral reef resources, and do not specifically protect the substrate PCE for purposes of increasing elkhorn and staghorn coral abundance and eventual recovery. Thus, the critical habitat designation will provide unique benefits for these corals, beyond the benefits provided by existing management plans.

The identified areas not only contain the PCE, but also the two listed corals. Hence, any section 7 impacts will not be solely the result of critical habitat designation, but will be co-extensive with the listing. Because we identified that resource management was a category of activities that may affect both the species and the critical habitat and that the project modifications required through section 7 consultation would be the same for the species and the PCE, the impacts are considered to be co-extensive. In addition, we found no evidence that relationships would be negatively affected or that negative impacts to other agencies' ability to provide for the conservation of the listed coral species would result from designation.

Table 29. Major federal resource management areas that overlap with the proposed critical habitat designation for elkhorn and staghorn corals.

Management Area	Notes
Florida Keys National Marine Sanctuary, NOAA NOS	Prohibited: Moving, removing, taking, harvesting, damaging, disturbing, breaking, cutting, or otherwise injuring, or possessing (regardless of where taken from) any living or dead coral or coral formation, or attempting any of these activities, except as permitted; Drilling into, dredging, or otherwise altering the seabed of the Sanctuary
Dry Tortugas National Park (includes Dry Tortugas Research Natural Area), DOI NPS	Prohibits extractive activities in the RNA, including fishing; Commercial fishing within Dry Tortugas National Park is prohibited; fish traps in the Tortugas region are prohibited; boats may only anchor on sand within one nautical mile of the Fort Jefferson Harbor Light; vessel discharges prohibited
Dry Tortugas Ecological Reserve, DOI NPS – NOAA NOS	Commercial fishing in the TER is prohibited; fish traps in the Tortugas region are prohibited; boats may only anchor on sand within one nautical mile of the Fort Jefferson Harbor Light; vessel discharges prohibited
Biscayne Bay National Park, DOI NPS	Several areas are closed year-round to public entry to protect sensitive resources and wildlife. Beaching or anchoring of vessels is prohibited in several areas of the Park
Buck Island Reef National Monument, DOI NPS	Prohibited: dredging and filling; boat operation that damages underwater features; anchoring other than in deep sand bottom areas
Virgin Islands National Park, DOI NPS	Prohibited: dredging and filling; boat operation that damages underwater features; anchoring except in emergency situations
Virgin Islands Coral Reef National Monument, DOI NPS	Prohibited: Collecting coral, dead or alive; dredging, excavating, or filling operations; and anchoring is restricted

6 SYNTHESIS: IMPACTS OF INCLUDING EACH OF THE FOUR SPECIFIC AREAS IN THE PROPOSED CRITICAL HABITAT DESIGNATION FOR ELKHORN AND STAGHORN CORALS

As discussed above, the ESA requires that in proposing to designate critical habitat we take into consideration the economic, national security, and other relevant impacts of designating any particular area as critical habitat. Because the ESA does not specify methods or criteria for the consideration of impacts, the agency has considerable discretion in evaluating the various impacts and determining how the impacts will be used in deciding whether to propose any particular area for exclusion. In the following subsections we summarize and discuss the impacts of designation identified above, including the limitations of available information and the assumptions used, patterns or unusual distributions in impacts, and information about the importance of various impacts. Though above we discussed economic benefits of conservation of the corals in the other relevant impacts section to provide a comprehensive discussion of the benefits of conservation, in this synthesis of area-by-area impacts we include those benefits in the consideration of economic impacts.

6.1 Impacts in Area 1: Southern Florida

6.1.1 Economic Impacts within Area 1

As discussed above, no categories of federal actions would require consultation in the future solely due to the critical habitat designation; all projected categories of future actions have the potential to adversely affect both the PCE and the listed corals. In addition, past actions triggered consultation due to effects on one or more other listed species within the areas covered by the proposed designation (e.g., sea turtles, smalltooth sawfish, Johnson's seagrass) but for purposes of the analysis above we assumed these other species consultations would not be co-extensive with consultations for the corals or the PCE.

The proposed Florida specific area of critical habitat (Area 1) will have the greatest number of section 7 consultations resulting from the proposed critical habitat designation over the next 10 years, 314 consultations or on average 31 per year. The number of future consultations is proportional to the length of coastline in each of the four specific areas along which the consultations will occur. Area 1 is projected to experience 66% of total consultations and it contains 65% of critical habitat coastline. As in the other specific areas, USACE-permitted marine construction activities comprise the largest number of projected future actions in Area 1. (The percentages are similar across the areas – 75 percent in Area 1; 65 % in Area 2; and 61% in Areas 3 and 4). We detected no patterns or clumping in the geographic distribution of projected future actions and future consultations and project modifications within Area 1 that would suggest an economic basis for focusing our evaluation of impacts on smaller areas within Area 1. In other words, no particular areas within Area 1 are expected to incur an inordinate or disproportionate share of the costs of designation.

Table 30 summarizes the number of formal consultations projected over the next ten years for Area 1, the federal action agency, and whether the entity conducting the activity will be a federal agency or third party. As discussed above, whether these future consultations are incremental impacts of the critical habitat designation or are co-extensive impacts of the listing or other legal authorities, depends on whether the listed corals or other coral species happen to be in the action area of future projects. Based purely on the relative abundance of the PCE and the listed corals, or all corals combined, there seems to be a higher likelihood that a future project could impact the PCE alone and thus be an incremental impact of designation. On the other hand, projects with larger or diffuse action areas may have a greater likelihood of impacting both the PCE and the corals, and the same modifications would alleviate both types of impacts, so the costs of these projects would be co-extensive either with the listing or existing authorities focused on protecting coral reef resources.

As mentioned above, the majority of projected consultations in Area 1 will be USACE-authorized marine construction activities (235 of 314 projects), and all of these could involve third-party permittees. Although we have assumed that all of these projects will require formal consultation due to effects on the PCE and the corals to avoid underestimating section 7 impacts, as discussed in Section 3 above, it is unlikely that *all* of these projects will trigger consultation for either the PCE or the corals, or that they would require modification to avoid adverse impacts. Though our database on past consultations is not complete, the data indicate that the majority of the projects in this category were residential dock construction, and as such would have been located in protected shorelines such as manmade canals where the PCE and the corals are not routinely found. Even when these projects trigger consultation in the future, the project modifications that may be required as a result of the proposed critical habitat rule may also be required by an existing regulatory authority, including the ESA listing of the two corals. Thus, if both the PCE and corals are present, or if another regulatory authority would also require the project modification, the costs associated with these project modifications will be co-extensive.

Many of the other categories of activities projected to occur in Area 1 have the potential to have effects over larger, more diffuse action areas, and thus are more likely to be coextensive costs because of the increased potential for affecting the coral as well as the substrate PCE (e.g., dredging projects, water discharge and water quality regulatory projects).

We can identify the maximum incremental economic impact of the critical habitat due to the administrative costs of conducting section 7 consultation. Multiplying the total number of consultations by the low and high estimates of cost yields \$5,543,946 to \$10,945,740 (in 2006 dollars) as the range of total administrative cost of the critical habitat rule over the next ten years. However, because we cannot determine which consultations will affect the PCE only, and for the other limitations discussed above, no total cost of project modifications can be identified for this specific area of critical habitat. Nevertheless, our analysis indicates that consultations in Area 1 will be required due to their adverse impacts on the PCE, and project modifications will be implemented to avoid destruction or adverse modification of the PCE. Preventing these impacts will contribute to the economic and other conservation benefits described below.

Positive economic impacts are also expected to result from the proposed critical habitat designation in Area 1, that flow from the conservation benefits the rule will provide to elkhorn and staghorn corals, and in turn the services these corals provide to society. As discussed in sections 5.21 and 5.2, the designation of critical habitat is expected to contribute to the retention of existing economic benefits that corals provide and potential increases in these benefits as conservation progresses and the corals increase in abundance. In Area 1, the natural reefs formed and inhabited by elkhorn and staghorn corals provide over \$225 million in average annual use value (2003 dollars) and a capitalized value of over \$7 billion to the four Florida counties covered by Area 1. Natural reef-related industries provided over 40,000 jobs in Area 1 in 2003, generating over \$1 billion in income. Area 1 experienced almost \$6 million in value of commercial reef-dependent fish landings in 2005. Available information also demonstrates the direct link between healthy coral reef ecosystems and the value of dive tourism throughout the Caribbean, including Florida, with estimated losses in the hundreds of millions of dollars region-wide per year if reef degradation continues. Assisting elkhorn and staghorn coral in their recovery, and resumption of their reef-building functions, can prevent the loss, and may contribute to the increase, of these economic benefits.

Based on the above consideration of the positive and negative economic impacts of including Area 1 in the proposed critical habitat designation, we do not exercise our discretion to propose for exclusion all or any part of Area 1 from the designation on the basis of these impacts.

Table 30. Projected future section 7 consultations within Area 1 (Florida). The number of formal consultations are indicated, as well as whether the entity conducting the action will be the federal action agency or a third party.

Category of Activity	Action Agency	Fed/ NonFed	# of Consultations
Beach Nourishment/Bank Stabilization		Both	26
Construction (docks, piers, private dredging, private disposal, shoreline stabilization, aquaculture, oil and gas lines, cables)		NonFed	235
Dredging and Disposal	USACE	Fed	15
Maintenance Construction (docks, piers, private dredging, private disposal, shoreline stabilization, aquaculture, oil and gas lines, cables)		NonFed	7
Maintenance Dredging and Disposal		Fed	2
Military	DOD	Fed	5
Discharges to navigable waters		NonFed	14
Water quality standards, NPDES, TMDLs	EPA	Both	0
Airport Repair/Construction	FAA	NonFed	0
Resource Management	NOAA/DOI	Fed	10
Fishery Management	NMFS	Fed	3
Total			317

6.1.2 National Security Impacts in Area 1

As discussed above, impacts to national security as a result of the proposed critical habitat designation are expected to occur in Area 1, specifically on 47.3 sq miles (123 sq km) of NASKW. Based on information

provided to us by the Navy, national security interests will be negatively impacted by the designation, because the potential additional consultations and project modifications to avoid adversely modifying the PCE will interfere with military training and readiness required to maintain national security. Based on these considerations, we propose exclusion of the particular areas identified by the Navy from the critical habitat designation. Our exclusion analysis is presented in section 7 of this report.

6.1.3 Other Relevant Impacts in Area 1

We identified several types of positive conservation benefits expected to result from the designation, including in Area 1. As we have documented, recovery of elkhorn and staghorn corals cannot succeed without protection of the substrate PCE from destruction or adverse modification. No existing laws or regulations protect the PCE specifically for increasing coral abundance and eventual recovery. Given the extremely low current abundance of the corals and characteristics of their sexual reproduction, protecting the PCE throughout the corals' range and throughout each of the four specific areas is extremely important for conservation of these species.

The economic benefits to society from conservation of these corals are discussed in the economic impacts section above. There are also potential educational and awareness benefits that may result from the designation. In Florida, we are already being contacted by recreational dive organizations that focus their dive trips on discovering elkhorn and staghorn corals. The designation may increase this activity, specifically by focusing trips within the boundaries of critical habitat. This information will assist us in planning for conservation and management of elkhorn and staghorn corals. Additionally, the FKNMS, Biscayne and Dry Tortugas National Parks may benefit from that added awareness of the threatened corals within their boundaries, as well as support their conservation goals with the protection critical habitat affords. Finally, we documented the tangible, and economic, benefit that coral reefs provide in terms of protecting shorelines from storm and wave action and erosion. Given elkhorn and staghorn corals' function as reef-building species throughout their ranges, these benefits seem clearly linked to the population status of these species.

We identified no other relevant impacts that are negative and expected to result from including Area 1 in the designation.

Based on the above consideration of the positive and negative other relevant impacts of including Area 1 in the proposed critical habitat designation, we do not exercise our discretion to propose for exclusion all or any part of Area 1 from the designation on the basis of these impacts.

6.2 Impacts in Area 2: Puerto Rico

6.2.1 Economic Impacts within the Puerto Rico Critical Habitat Area

Many of the economic impact considerations for Area 1 are the same or similar for Area 2. The proposed Puerto Rico specific area of critical habitat will have the second largest number of section 7 consultations resulting from the proposed critical habitat designation over the next 10 years - 115 or on average 11-12 per year, and that number is proportional to the length of coastline along which the consultations will occur (25% of total consultations; 26% of critical habitat coastline). No categories of federal actions are expected to require consultation in the future solely due to the critical habitat designation; projected categories of future actions may also adversely affect the listed corals. Further, consultations for the PCE may be co-extensive with other listed species in Area 2, such as sea turtles, though we assumed there would be no overlap for purposes of identifying the maximum number of future consultations above. Similar to Area 1, we detected no patterns or clumping in the geographic distribution of projected future actions and future consultations and project modifications within Area 2 that would suggest an economic basis for focusing our evaluation of impacts on smaller areas that might experience inordinate or disproportionate future costs.

Table 31 summarizes the number of formal consultations projected over the next ten years for Area 2, the federal action agency, and whether the entity conducting the activity will be a federal agency or third party. Whether these future consultations are incremental impacts of the critical habitat designation or are co-extensive impacts of the listing or other legal authorities, depends on whether the listed corals or other coral species occur in the action area of future projects. Based purely on the relative abundance of the PCE and the listed corals, or all corals combined, there seems to be a higher likelihood that a future project could impact the PCE alone and thus be an incremental impact of designation. On the other hand, projects with larger or diffuse action areas may have a greater likelihood of impacting both the PCE and the corals, and the same modifications would alleviate both types of impacts, thus the costs of these projects would be co-extensive either with the listing or existing authorities focused on protecting coral reef resources.

As mentioned above, similar to Area 1 the majority of projected consultations in Area 2 will be USACE-authorized marine construction activities, and all of these could involve third-party permittees. These actions are projected to make up about 65% of future consultations, compared to comprising 75% of future consultations in Area 1. As is true for Area 1, it is highly unlikely that all of these projects will trigger consultation for either the PCE or the corals, or that they would require modification to avoid adverse impacts. Though our database on past consultations is not complete, the data indicate that the majority of the projects in this category were residential dock construction, and as such would have been located in protected shoreline areas such as manmade canals where the PCE and the corals are not routinely found. Even when these projects trigger consultation in the future, the project modifications that may be required as a result of the proposed critical habitat rule may also be required by an existing regulatory authority, including the ESA listing of the two corals. Thus, if both the PCE and corals are present, or if another regulatory authority would also require the project modification, the costs associated with these project modifications will be co-extensive.

A number of activities, such as dredging and water discharge projects that have the potential to have effects over larger, more diffuse action areas, are expected to occur in Area 2. Project modification costs for such activities are more likely to be coextensive costs because of the increased potential for affecting the coral as well as the substrate PCE.

We can identify the maximum incremental economic impact of the critical habitat due to the administrative costs of conducting section 7 consultation. Multiplying the total number of consultations by the low and high estimates of cost yields \$2,011,211 to \$3,970,852 (in 2006 dollars) as the range of total administrative cost of the critical habitat designation over the next ten years. For the same reasons discussed regarding Area 1, we cannot quantify a total cost of project modifications for this specific area of critical habitat. As in Area 1, however, our analysis indicates that consultations in Area 2 will be required due to their adverse impacts on the PCE, and project modifications will be implemented to avoid destruction or adverse modification of the PCE. Preventing these impacts will contribute to the economic and other conservation benefits described in this report.

There are also positive economic impacts expected to result from the proposed critical habitat designation in Area 2, that flow from the conservation benefits the rule will provide to elkhorn and staghorn corals, and the services these corals provide to society. As discussed in sections 5.1 and 5.2, the designation of critical habitat is expected to contribute to the retention of existing economic benefits that corals provide and potential increases in these benefits as conservation progresses and the corals increase in abundance. We did not locate studies of the total value of natural coral reefs to residents or visitors to Puerto Rico, but given the data on reef-related values from diverse areas around the world described above, we expect that Puerto Rico's coral reefs, formed and inhabited by elkhorn and staghorn corals, are an important component of the economy. Coral reefs provided over 87% of average annual commercial fish and invertebrate landings in Puerto Rico from 1995 to 2002. In 2005, domestic landings of shallow water reef fish comprised about 66 percent of all fish landed in Puerto Rico that year, and were valued at over \$1.7 million. Tourism is not as important component of Puerto Rico's overall economy as it is in Areas 1 and

3-4, but it may be much more significant for the shoreside communities from which dive and other reef-related tourism embarks.

Table 31. Projected future section 7 consultations within Area 2 (Puerto Rico). The number of formal consultations is indicated, as well as whether the entity conducting the action will be the federal action agency or a third party.

Category of Activity	Action Agency	Fed/ NonFed	# of Consultations
Beach Nourishment/Bank Stabilization		Both	1
Construction (docks, piers, private dredging, private disposal, shoreline stabilization, aquaculture, oil and gas lines, cables)		NonFed	75
Dredging and Disposal Maintenance	USACE	Fed	5
Construction (docks, piers, private dredging, private disposal, shoreline stabilization, aquaculture, oil and gas lines, cables)		NonFed	3
Maintenance Dredging and Disposal		Fed	4
Military	DOD	Fed	15
Discharges to navigable waters	EPA	NonFed	8
Water quality standards, NPDES, TMDLs		Both	0
Airport Repair/Construction	FAA	NonFed	0
Resource Management	NOAA/DOI	Fed	4
Total			115

Based on the above consideration of the positive and negative economic impacts of including Area 2 in the proposed critical habitat designation, we do not exercise our discretion to propose for exclusion all or any part of Area 2 from the designation on the basis of these impacts.

6.2.2 National Security Impacts in Area 2

No impacts to national security are expected to occur in Area 2 as a result of the proposed critical habitat designation.

6.2.3 Other Relevant Impacts in Area 2

We identified several types of positive conservation benefits expected to result from the designation, including in Area 2. As we have documented, recovery of elkhorn and staghorn corals cannot succeed without protection of the substrate PCE from destruction or adverse modification. No existing laws or regulations protect the PCE specifically for increasing coral abundance and eventual recovery. Given the extremely low current abundance of the corals and characteristics of their sexual reproduction, protecting the PCE throughout the corals' range and throughout each of the four specific areas is extremely important for conservation of these species.

The economic benefits to society from conservation of these corals are discussed in the economic impacts section above. The potential educational and awareness benefits that may result from the designation may arise in Puerto Rico similar to such benefits that exist in Florida and may be enhanced by the designation of critical habitat there. Additionally, existing marine reserves may benefit from the awareness that critical habitat rises. Specifically, Tres Palmas Reserve may benefit from that added awareness of the threatened corals within their boundaries, as well as support their conservation goals with the protection critical habitat affords. Finally, we documented the tangible, and economic, benefit that coral reefs provide in terms of protecting shorelines from storm and wave action and erosion. Given elkhorn and staghorn corals' function as reef-building species throughout their ranges, these benefits seem clearly linked to the population status of these species.

We identified no other relevant impacts that are negative and expected to result from including Area 2 in the designation.

Based on the above consideration of the positive and negative other relevant impacts of including Area 2 in the proposed critical habitat designation, we do not exercise our discretion to propose for exclusion all or any part of Area 2 from the designation on the basis of these impacts.

6.3 Impacts in Areas 3 and 4: U.S.V.I.

6.3.1 Economic Impacts within the U.S.V.I. Critical Habitat Areas

The economic data sources and consultation database do not allow for extracting data specific to Areas 3 and 4 separately; therefore the data presented are applied to these specific areas combined. The economic considerations for these Areas are the same or similar as those above for Areas 1 and 2. The proposed U.S.V.I. specific area of critical habitat will have the fewest section 7 consultations resulting from the proposed critical habitat designation over the next 10 years, 41 or on average 4 per year, and that number is proportional to the length of coastline along which the consultations will occur (9% of total consultations; 8% of critical habitat coastline). As with the other Areas, no categories of federal actions are expected to require consultation in the future solely due to the critical habitat designation; projected future categories of actions may also adversely affect the listed corals. Further, consultations for the PCE may be co-extensive with other listed species in Areas 3 and 4, such as sea turtles, though we assumed there would be no overlap for purposes of identifying the maximum number of future consultations above. Similar to Areas 1 and 2, we detected no patterns or clumping in the geographic distribution of projected future actions and consultations within Areas 3 and 4. Thus, we detected no economic basis for focusing our consideration on smaller portions of Areas 3 and 4.

Table 32 summarizes the number of formal consultations projected over the next ten years for Areas 3 and 4, the federal action agency, and whether the entity conducting the activity will be a federal agency or

third party. As with the other Areas, whether these future consultations in Areas 3 and 4 are incremental impacts of the critical habitat designation or are co-extensive impacts of the listing or other legal authorities, depends on whether the listed corals or other coral species occur in the action area of future projects. Based purely on the relative abundance of the PCE and the listed corals, or all corals combined, there seems to be a higher likelihood that a future project could impact the PCE alone and thus be an incremental impact of designation, and that holds true for Areas 3 and 4. On the other hand, projects with larger or diffuse action areas may have a greater likelihood of impacting both the PCE and the corals, and the same modifications would alleviate both types of impacts, thus the costs of these projects would be co-extensive either with the listing or existing authorities focused on protecting coral reef resources.

Similar to the other areas, the majority of projected consultations in Areas 3 and 4 will be USACE-authorized marine construction activities, and all of these could involve third-party permittees. These actions are projected to make up 61% of the consultations (25 of 41 projects). As with the other Areas, these consultations in the past comprised residential dock construction unlikely to adversely impact the PCE or the corals, at least not in every instance. Most of the project modifications that may be required as a result of the proposed critical habitat rule may be required by an existing regulatory authority, including the ESA listing of the two corals. Thus, if both the PCE and corals are present, or if another regulatory authority requires the project modification, the costs associated with these project modifications will be co-extensive. Areas 3 and 4 are also expected see a number of activities, such as dredging and water discharge projects, that have the potential to have effects over larger, more diffuse action areas and thus have a higher likelihood of being coextensive costs.

We can identify the maximum incremental economic impact of the critical habitat due to the administrative costs of conducting section 7 consultation. Multiplying the total number of consultations by the low and high estimates of cost yields \$717,040 to \$1,415,695 (in 2006 dollars) as the range of total administrative cost of the critical habitat designation over the next ten years. For the same reasons applicable to Areas 1 and 2, we cannot quantify a total cost of project modifications for this specific area of critical habitat. Similar to the other areas, however, our analysis indicates that consultations will be required in Areas 3 and 4 in the future due to adverse impacts on the PCE, and project modifications will be implemented to avoid these impacts, so that the economic and other conservation benefits described in this report will result at least in part due to these consultations.

Positive economic impacts are also expected to result from the proposed critical habitat designation in Areas 3 and 4, that flow from the conservation benefits the rule will provide to elkhorn and staghorn corals. As discussed in sections 5.2 and 5.2, the designation of critical habitat will contribute to the retention of existing economic benefits that corals provide and potential increases in these benefits as conservation progresses and the corals increase in abundance. We did not locate studies of the total value of natural coral reefs to residents or visitors to the U.S.V.I, but given the value of the tourism to the Territory's overall economy, we expect that the total value of reefs in U.S.V.I. is high. As discussed above, tourism accounts for 80 percent of the Territory's Gross Domestic Product and employment. One survey documented that 100 percent of hotel industry respondents stated they believed there would be a significant impact on tourist visits if the coast and beaches were degraded, or fisheries or coral reefs declined. In 2005, domestic landings of shallow water reef fish comprised about 83 percent of all fish landed in the U.S.V.I. that year, and were valued at over \$3.8 million.

Based on the above consideration of the positive and negative economic impacts of including Areas 3 and 4 in the proposed critical habitat designation, we do not exercise our discretion to propose for exclusion all or any part of Areas 3 and 4 from the designation on the basis of these impacts.

Table 32. Projected future section 7 consultations within Areas 3 and 4 (U.S.V.I.). The number of formal consultations are indicated, as well as whether the entity conducting the action will be the federal action agency or a third party.

Category of Activity	Action Agency	Fed/ NonFed	# of Consultations
Beach Nourishment/Bank Stabilization		Both	0
Construction (docks, piers, private dredging, private disposal, shoreline stabilization, aquaculture, oil and gas lines, cables)		NonFed	25
Dredging and Disposal Maintenance	USACE	Fed	3
Construction (docks, piers, private dredging, private disposal, shoreline stabilization, aquaculture, oil and gas lines, cables)		NonFed	3
Maintenance Dredging and Disposal		Fed	0
Military	DOD	Fed	0
Discharges to navigable waters	EPA	NonFed	6
Water quality standards, NPDES, TMDLs		Both	1
Airport Repair/Construction	FAA	NonFed	0
Resource Management	NOAA/DOI	Fed	3
Total			41

6.3.2 National Security Impacts in Areas 3 and 4

No impacts to national security are expected to occur in areas 3 and 4 as a result of the proposed critical habitat designation.

6.3.3 Other Relevant Impacts in Areas 3 and 4

We identified several types of positive conservation benefits expected to result from the designation, including in Areas 3 and 4. As we have documented, recovery of elkhorn and staghorn corals cannot succeed without protection of the substrate PCE from destruction or adverse modification. No existing laws or regulations protect the PCE specifically for increasing coral abundance and eventual recovery. Given the extremely low current abundance of the corals and characteristics of their sexual reproduction, protecting the PCE throughout the corals' range is extremely important to maintaining coral populations throughout their ranges.

The economic benefits to society from conservation of these corals are discussed in the economic impacts section above. The potential educational and awareness benefits that may result from the designation may arise in Puerto Rico similar to such benefits that seem to be arising in Florida due to the listing of the corals. Additionally, the Virgin Islands National Park and Virgin Islands Coral Reef National Monument may benefit from that added awareness of the threatened corals within their boundaries, as well as support their conservation goals with the protection critical habitat affords. Finally, we documented the tangible, and economic, benefit that coral reefs provide in terms of protecting shorelines from storm and wave action and erosion. Given elkhorn and staghorn corals' function as reef-building species throughout their ranges, these benefits seem clearly linked to the population status of these species.

We identified no other relevant impacts that are negative and expected to result from including Areas 3 and 4 in the designation.

Based on the above consideration of the positive and negative other relevant impacts of including Areas 3 and 4 in the proposed critical habitat designation, we do not exercise our discretion to propose for exclusion all or any part of Areas 3 and 4 from the designation on the basis of these impacts.

7 EXCLUSION ANALYSIS

Based on our consideration of impacts above, we are not proposing to exclude any particular areas from the proposed critical habitat designation based on economic or other relevant impacts. However, we have determined that expected national security impacts from the designation of critical habitat for elkhorn and staghorn corals at NASKW and associated annexes warrant exercise of our discretion to propose excluding these areas from the designation. Below we determine whether exclusion is appropriate.

7.1 Comparison of the Benefits of Exclusion to the Benefits of Including the Particular Areas of NASKW in the Critical Habitat Designation

Section 4(b)(2) of the ESA allows excluding areas from a proposed designation of critical habitat only if the benefits of excluding a particular area outweigh the benefits of including the area, and only if exclusion of the area will not result in extinction of the listed species.

The benefit of excluding the NASKW particular areas (see Figure 7 above) is that the Navy would only be required to comply with the jeopardy prohibition of section 7(a)(2) and not the adverse modification prohibition. The Navy maintains that the additional commitment of resources in completing an adverse modification analysis, and any change in its activities to avoid adverse modification of critical habitat would likely reduce its readiness capability. Given that the Navy is currently actively engaged in training, maintaining, and deploying forces in the current war effort, this reduction in readiness could reduce the ability of the military to ensure national security.

The best data available indicate that the PCE is rare within the exclusion area (Figure 7). Further, the excluded area is extremely small in comparison to the size of Area 1 (47.3 of 4,250 sq miles or 1.1%). The corals themselves, and their undesignated habitat, will still be protected through section 7

consultations that prohibit jeopardizing the species' continued existence and require RPMs to minimize the impacts of incidental take. Further, there are no other federal activities that might adversely impact the proposed critical habitat that would be exempted from future consultation requirements due to this exclusion, since these areas are under the exclusive control of the Navy. Therefore, in our judgment, the benefit of including the particular area is outweighed by the national security benefit the Navy will gain by not consulting on critical habitat.

Finally, Section 4(b)(2) does not allow NMFS to exclude areas if exclusion will result in extinction of the species. We are recommending exclusion of only 1.1% of the proposed critical habitat because of impacts to national security. Given this small percentage, we conclude that the exclusion of these areas will not result in extinction of either elkhorn or staghorn corals.

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APPENDIX A

Initial Regulatory Flexibility Analysis For the Proposed Designation of Critical Habitat For Elkhorn and Staghorn Corals

INITIAL REGULATORY FLEXIBILITY ANALYSIS

INTRODUCTION

The purpose of the Regulatory Flexibility Act (RFA) is to establish a principle of regulatory issuance that agencies shall endeavor, consistent with the objectives of the rule and applicable statutes, to fit regulatory and informational requirements to the scale of businesses, organizations, and governmental jurisdictions subject to regulation. To achieve this principle, agencies are required to solicit and consider flexible regulatory proposals and to explain the rationale for their actions to assure that such proposals are given serious consideration. The RFA does not contain any decision criteria; instead, the purpose of the RFA is to inform the agency, as well as the public, of the expected economic impacts of alternatives to the proposed action and to ensure that the agency considers alternatives that minimize the expected impacts while meeting the goals and objectives of the proposed action and applicable statutes.

The following Initial Regulatory Flexibility Analysis (IRFA) has been prepared pursuant to section 603 of the RFA to provide information to the public about the impacts of the proposed action and significant alternatives to the proposed action. According to the RFA, an IRFA must contain the following information: (1) a description of the reasons why action by the agency is being considered; (2) a succinct statement of the objectives of, and legal basis for, the proposed rule; (3) a description, and where feasible, an estimate of the number of small entities affected by the proposed rule; (4) a description of the projected reporting, record-keeping, and other compliance requirements of the final rule, including an estimate of the classes of small entities which will be subject to the requirements of the report or record; and (5) identification, to the extent practicable, of all relevant Federal rules which may duplicate, overlap, or conflict with the proposed rule. An IRFA must also describe significant alternatives to the proposed rule which accomplish the stated objectives of applicable statutes and which minimize any significant economic impact of the proposed rule on small entities. Analysis of these factors is based on the impacts analysis developed in the ESA 4(b)(2) Report.

Reasons why action by the agency is being considered

The purpose and need, issues, problems, and objectives of the proposed ESA critical habitat designation for threatened corals are discussed in the *Impacts Analysis for Critical Habitat Designation for Threatened Elkhorn & Staghorn Corals* prepared pursuant to ESA section 4(b)(2) and are incorporated herein by reference. In summary, the purpose of the proposed critical habitat designation is to designate to the maximum extent prudent and determinable geographical areas that contain the physical and biological features essential to the conservation of the species, which require special management. For elkhorn and staghorn corals, we have determined this feature to be substrate of suitable quality and availability, in water depths 30 meters (0 to 98 feet) and shallower, to support successful larval settlement and recruitment, and reattachment of asexual fragments. The critical habitat provisions of the ESA are intended to promote species recovery by prohibiting federal agency actions from destroying or adversely modifying PCEs that are essential to a species' conservation. Protection of the listed corals' substrate PCE from destruction or adverse modification through critical habitat designation is expected to assist in increasing the abundance of elkhorn and staghorn corals to the point at which the protections of the ESA are no longer necessary. This will provide protection beyond other laws and regulations, which generally focus on the protection of existing coral reef resources.

Objectives and legal basis for proposed rule

Under ESA section 4(a)(3), the Secretary of Commerce is required, to the maximum extent prudent and determinable, to designate critical habitat for threatened and endangered species. The Secretary may exclude areas from the designation upon a determination that the benefits of exclusion outweigh the benefits of including particular areas in the designation, so long as exclusion will not result in the extinction of the species. The proposed critical habitat represents that designation for elkhorn and staghorn corals. The proposed critical habitat rule identifies those specific areas within the geographical area occupied by the species at the time of listing on which are located a physical feature determined to be essential to the conservation of the species, and which requires special management considerations or protections. The proposed designation also identifies proposed exclusions resulting from consideration of the economic, national security, and other relevant impacts of the designation.

Description and estimate of the number of small entities to which the proposed rule may apply

This rule may affect small businesses, small nonprofit organizations, and small governmental jurisdictions that engage in activities that would affect the essential feature identified in this proposed designation, if they receive funding or authorization for such activity from a Federal agency. Such activities would trigger ESA section 7 consultation requirements, and potential requirements to modify proposed activities to avoid destroying or adversely modifying the critical habitat. The consultation record from which we have projected likely actions occurring over the next ten years indicates that applicants for federal permits or funds have included small entities. For example, marine contractors have been the recipients of USACE permits for dock construction; some of these contractors may be small entities. According to the Small Business Administration, businesses in the Heavy and Civil Engineering Construction subsector (NAICS Code 237990), which includes firms involved in marine construction projects such as breakwater, dock, pier, jetty, seawall and harbor construction, must have average annual receipts of no more than \$31 million to qualify as a small business (dredging contractors that perform at least 40% of the volume dredged with their own equipment, or equipment owned by another small concern are considered small businesses if their average annual receipts are less than or equal to \$18.5 million). Our consultation database does not track the identity of past permit recipients or whether the recipients were small entities, so we have no basis to determine the percentage of grantees or permittees that may be small businesses in the future. We do know from the more recent consultation history that small governmental jurisdictions (population less than or equal to 50,000) have received USACE permits for beach renourishment. Small businesses in the tourist and commercial fishing industries may benefit from the rule, as conservation of elkhorn and staghorn corals is expected to result in increased direct and indirect use of, and values derived from, coral reefs. We encourage small businesses, small governmental jurisdictions, and other small entities to provide comment on whether they may be affected by this rulemaking to help us provide an accurate estimate of the number of small entities to which the proposed rule will apply.

A review of historical ESA section 7 consultations involving projects where these corals are found is described in Section 3.2 of the Draft Section 4(b)(2) Report prepared for this rulemaking. We projected that, on average, approximately 39 Federal projects with non-federal grantees or permittees will be affected by implementation of the proposed critical habitat designation, annually, across all four areas proposed for inclusion in the critical habitat designation. Some of these grantees or permittees could be small entities, or could hire small entities to assist in project implementation. Historically, these projects have involved pipeline installation and maintenance, mooring construction and maintenance, dock/pier construction and repair, marina construction,

bridge repair and construction, new dredging, maintenance dredging, NPDES/water quality standards, cable installation, beach nourishment, shoreline stabilization, reef ball construction and installation, and port construction. Potential project modifications we have identified that may be required to prevent these types of projects from adversely modifying critical habitat include: project relocation; environmental conditions monitoring; GPS and DPV protocols; diver assisted anchoring or mooring buoy use; pipe collars or cable anchoring; shoreline protection measures; use of upland or artificial sources of sand; direction drilling or tunneling; and sediment and turbidity control measures. See Table 20, 21 and 24 of the Draft Section 4(b)(2) report.

Even though we cannot determine relative numbers of small and large entities that may be affected by this rule, there is no indication that affected project applicants would be limited to, nor disproportionately comprised of, small entities. It is unclear whether small entities would be placed at a competitive disadvantage compared to large entities. However, as described in the Draft Section 4(b)(2) Report, consultations and project modifications will be required based on the type of permitted action and its associated impacts on the essential critical habitat feature. Because the costs of many potential project modifications that may be required to avoid adverse modification of critical habitat are unit costs (i.e., per mile of shoreline, per cubic yard of sand moved) such that total project modification costs would be proportional to the size of the project. It is not unreasonable to assume that larger entities would be involved in implementing the larger projects with proportionally larger project modification costs. We have excerpted the project modifications cost table below. Certain costs were characterized as fully co-extensive with the listing of the species because the nature of the actions that would require these modifications typically involve a large action area likely to include both the PCE and either the listed corals or other coral reef resources. Costs are also more likely to be co-extensive if another regulatory authority currently requires the modification. A cost was characterized as partially co-extensive if the project modification was identified as an RPM (i.e., to offset the impact of take on the species) for the listing, but due to our lack of knowledge whether the PCE or species will be present, we are unable to determine if the costs would be attributed to the species or PCE.

It is also unclear whether the proposed rule will significantly reduce profits or revenue for small businesses. As discussed throughout the Draft Section 4(b)(2) Report, we made assumptions that all of the future consultations will be formal and all will require project modifications, but this is likely an overestimation. In addition, as stated above, though it is not possible to determine the exact cost of any given project modification resulting from consultation, the smaller projects most likely to be undertaken by small entities would likely result in relatively small modification costs. Finally, many of the modifications identified to reduce the impact of a project on critical habitat may be a baseline requirement either due to the ESA listing of the species or under another regulatory authority, notably the Clean Water Act.

We encourage all small businesses, small governmental jurisdictions, and other small entities that may be affected by this rule to provide comment on the potential economic impacts of the proposed designation, such as anticipated costs of consultation and potential project modifications, to improve the above analysis.

Table 1. Summary of costs associated with certain project modifications. Where information was available, ranges of scopes are included.

Project Modification	Cost	Unit	Range	Approx. Totals Per Project
Fully Co-extensive				
Conditions Monitoring	\$3.5-6K	Per day	1-400 days	\$3.5K - 2.4M
Diver Education	Administrative cost	n/a	n/a	n/a
HDD/Tunneling	\$1.39 -2.44M	Per mile	0.2 - 31.5 miles	\$278K -76.9M
Pipe Collars/Cable Anchoring	\$1,200	Per anchor	13 – 2,529 anchors	\$15.6K – 3M
Sediment and Turbidity Control Measures	~\$43K	Per mile	0.05 – 7 miles	\$2-301K
Water Quality Standard Modification	Undeterminable	n/a	n/a	n/a
Partially Co-extensive				
Project Relocation	Undeterminable	n/a	n/a	n/a
Diver Assisted Anchoring /Mooring Buoy Use	\$300-1000	Per day	n/a	n/a
GPS and DPV protocol	Undeterminable	n/a	n/a	n/a
Sand Bypassing/Backpassing	\$1.5-16K	Per cu yd	75-512K cu yds	\$113K-8.1M
Shoreline Protection Measures to Reduce Frequency of Beach Nourishment Events	Undeterminable but ultimately a potential cost savings	n/a	n/a	n/a
Upland or Artificial Sources of Sand	Undeterminable	n/a	n/a	n/a

Description of projected reporting, record-keeping, and other compliance requirements of the rule, and professional skills necessary for the preparation of any report or record

The proposed critical habitat rule will subject Federal agencies to the requirement to insure their actions do not destroy or adversely modify critical habitat through section 7 consultation. See Section 1.2 of the Draft Section 4(b)(2) Report for a description of the proposed rule. As discussed above, the primary compliance requirement of the proposed rule involves implementation of mandatory project modifications to reduce the impact of federally-permitted actions on the proposed critical habitat. There are no record-keeping requirements associated with the proposed rule. Similarly, there are no reporting requirements other than those that might be associated with reporting on the progress and success of implementing project modifications, which do not require special skills to satisfy. However, third party applicants or permittees would be expected to incur costs associated with participating in the administrative process of consultation along with the permitting Federal agency. Such third party costs of consultation were estimated for the 2003 designation of critical habitat for Gulf sturgeon in the southeast United States (IEc, 2003). Translating those costs to 2006 dollars using the CPI index, the per consultation administrative costs for third parties are estimated to average from \$3,251 to \$4,596.

Identification of all relevant Federal rules which may duplicate, overlap or conflict with the proposed rule

Federal laws and regulations that directly and indirectly protect the two species of coral are described and listed in Appendix B to the Draft Section 4(b)(2) report; the subset of these laws that directly and indirectly protects the critical habitat feature are discussed in section 2.2 of the Report. No Federal laws or regulations duplicate or conflict with the proposed rule. Existing Federal laws and regulations overlap with the proposed rule only to the extent that they provide protection to marine natural resources or corals generally. However, no existing laws or regulations specifically prohibit destruction or adverse modification of critical habitat for, and focus on the recovery of, elkhorn and staghorn corals.

Description of significant alternatives

Alternative 1: No Action Alternative

No action (status quo): NMFS would not designate critical habitat for elkhorn and staghorn corals. In concept, this alternative would be feasible given NMFS' broad discretion to assign relative weights to the impacts of a designation, and to propose to exclude all areas from a designation on a determination that the benefits of exclusion outweigh the benefits of inclusion. Under this alternative conservation and recovery of the listed species would depend exclusively upon the protection provided under the "jeopardy" provisions of section 7 of the ESA. Under the status quo, there would be no increase in the number of ESA consultations or project modifications in the future that would not otherwise be required due to the listing of the corals. However, we have determined that the physical feature forming the basis for our proposed critical habitat designation is essential to the corals' conservation, and conservation for these species will not succeed without this feature being available. Thus, the lack of protection of the critical habitat feature from adverse modification could result in continued declines in abundance of elkhorn and staghorn corals, and loss of associated economic and other values these corals provide to society, such as recreational and commercial fishing and diving services, and shoreline protection services. Small entities engaged in some coral reef-dependent industries would be adversely affected by the continued declines in elkhorn and staghorn corals. Thus, the no action alternative is not necessarily a "no cost" alternative for small entities.

Alternative 2: Preferred Alternative

Under this alternative, the areas designated as critical habitat are all waters from the shoreline to the 30-meter contour in four specific areas: (Area 1) Palm Beach, Broward, Miami-Dade, and Monroe Counties, including the Marquesas Keys and the Dry Tortugas, Florida; (Area 2) Puerto Rico and associated Islands; (Area 3) St. John/St. Thomas, U.S.V.I.; and (Area 4) St. Croix, U.S.V.I. These areas contain the essential feature of substrate of suitable quality and availability, in water depths 30 meters (98 feet) and shallower, to support successful larval settlement and recruitment, and reattachment of asexual fragments. Substrate of suitable quality and availability is defined as consolidated hardbottom or dead-in-place coral skeleton that is free from fleshy macroalgal cover and sediment cover. [See GIS mappings of proposed areas for critical habitat designation, accompanying the Preamble, for greater detail.] An analysis of the costs and benefits of the preferred alternative designation is presented in the 4(b)(2) Report. Relative to the no action alternative, this alternative will likely involve an increase in the number of section 7 consultations and project modifications required to avoid adverse impacts to critical habitat, above and beyond those required due to the corals' listing alone. We have determined that no categories of activities would require consultation, and no categories of project modifications

would be required, in the future solely due to this proposed rule and the need to prevent adverse modification of critical habitat; all categories of activities have similar potential to adversely impact corals and critical habitat, and the same project modifications would remedy both sets of adverse effects. However, due to the far greater abundance of the critical habitat feature relative to the abundance of elkhorn and staghorn corals (or all coral species combined), it seems likely that specific future Federal actions within those categories have a greater potential to adversely affect the critical habitat, in which case consultation and project modification costs, and the costs small entities might incur, would be an incremental impact of this proposed rule. On the other hand, because projects with larger or more diffuse action areas are more likely to impact both the corals and the critical habitat, consultation and project modification costs associated with those projects would more likely be coextensive with the coral listings or another regulatory requirement.

The preferred alternative was selected because it best implements the critical habitat provisions of the Endangered Species Act, by including the single, well-defined environmental feature we can clearly state is essential to the species' conservation, and due to the important conservation benefits that will result from this alternative relative to the no action alternative.

Alternative 3: Multiple Features

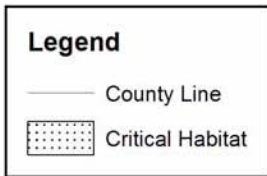
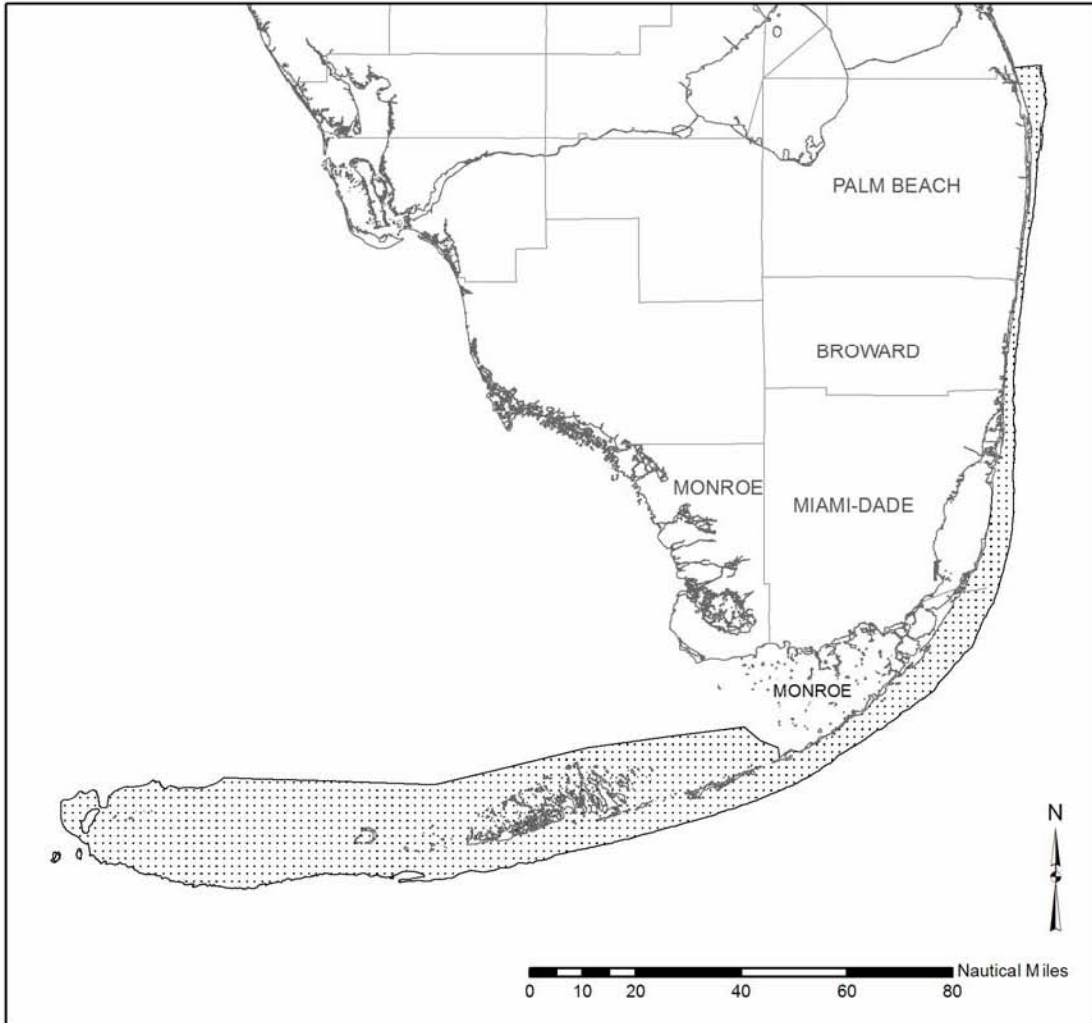
We considered a third alternative that would have a much broader focus of conservation objectives that the critical habitat designation would be designed to protect. In contrast to Alternative 2, which is narrowly focused on the species' critical conservation need for substrate to support successful larval settlement and asexual recruitment, this alternative would also include habitat features and areas associated with the survival of mature elkhorn and staghorn coral colonies. These additional habitat features include turbidity, nutrient loading, temperature, salinity, dissolved oxygen, and food resources. Many more activities would potentially affect the broad array of habitat features in Alternative 3. Thus, the total number and complexity of consultations that would be required under Alternative 3 would be higher than under either of the other alternatives. The costs of individual consultations under this alternative, to Federal agencies and to third party permittees or grantees that may be small entities, would also be higher due to the more complex analyses. Because we determined that the features identified in Alternative 3 were not separately essential to the conservation of the species, apart from the substrate PCE, or were more appropriately viewed as impacts or stressors that harm the corals rather than habitat features that provide a conservation function, we would not expect there to be added benefits in adopting Alternative 3 relative to the preferred alternative because these stressors and impacts are already managed through the jeopardy analysis required under section 7 of the ESA.

APPENDIX B

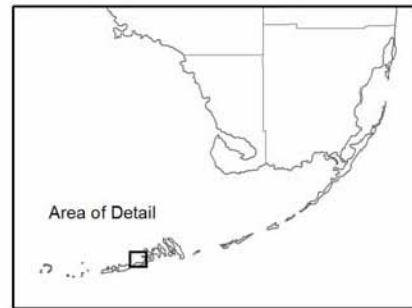
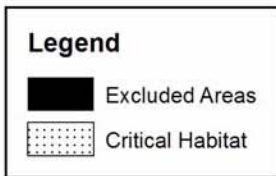
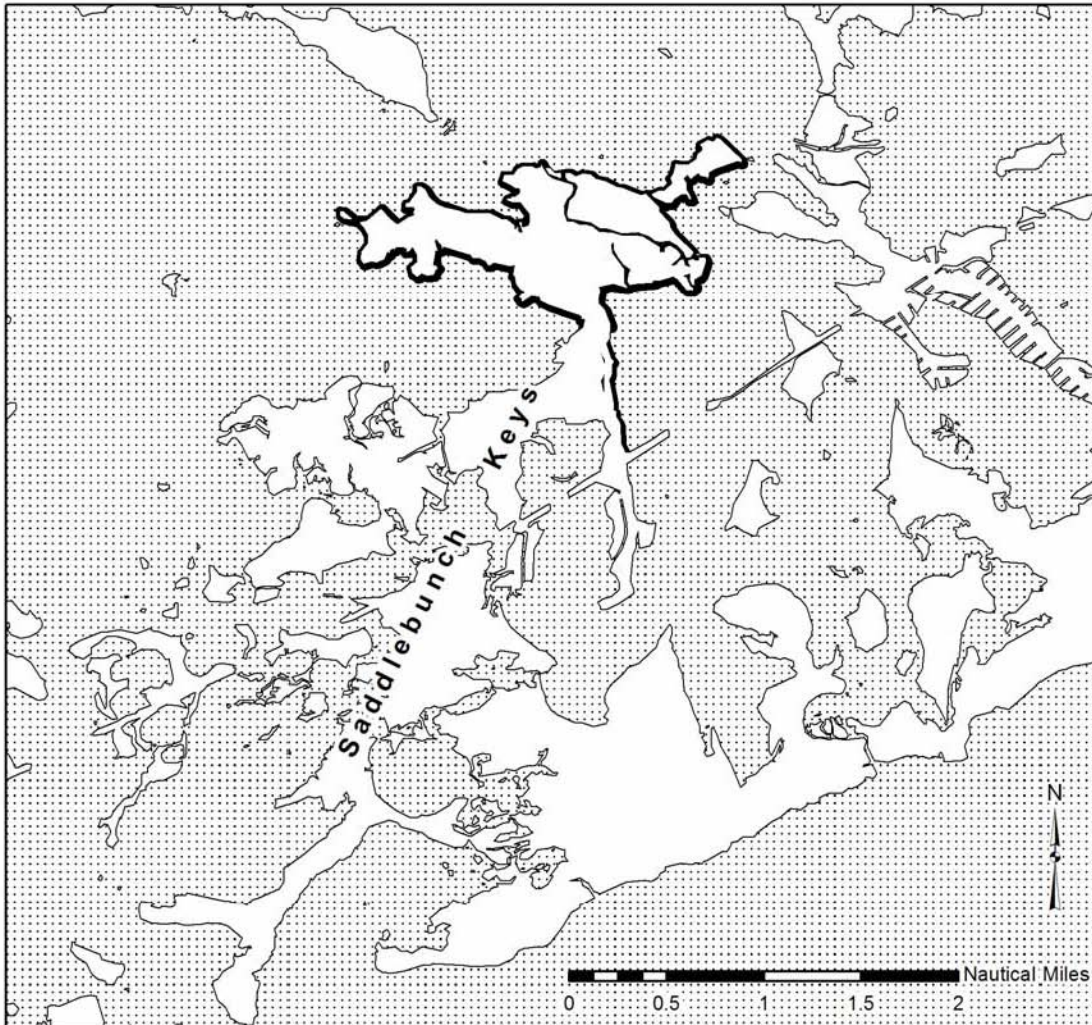
Maps of Proposed Critical Habitat for Elkhorn and Staghorn Corals



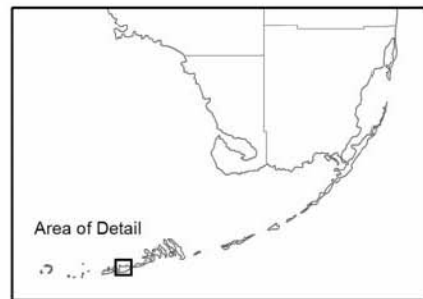
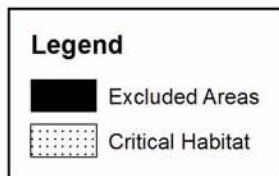
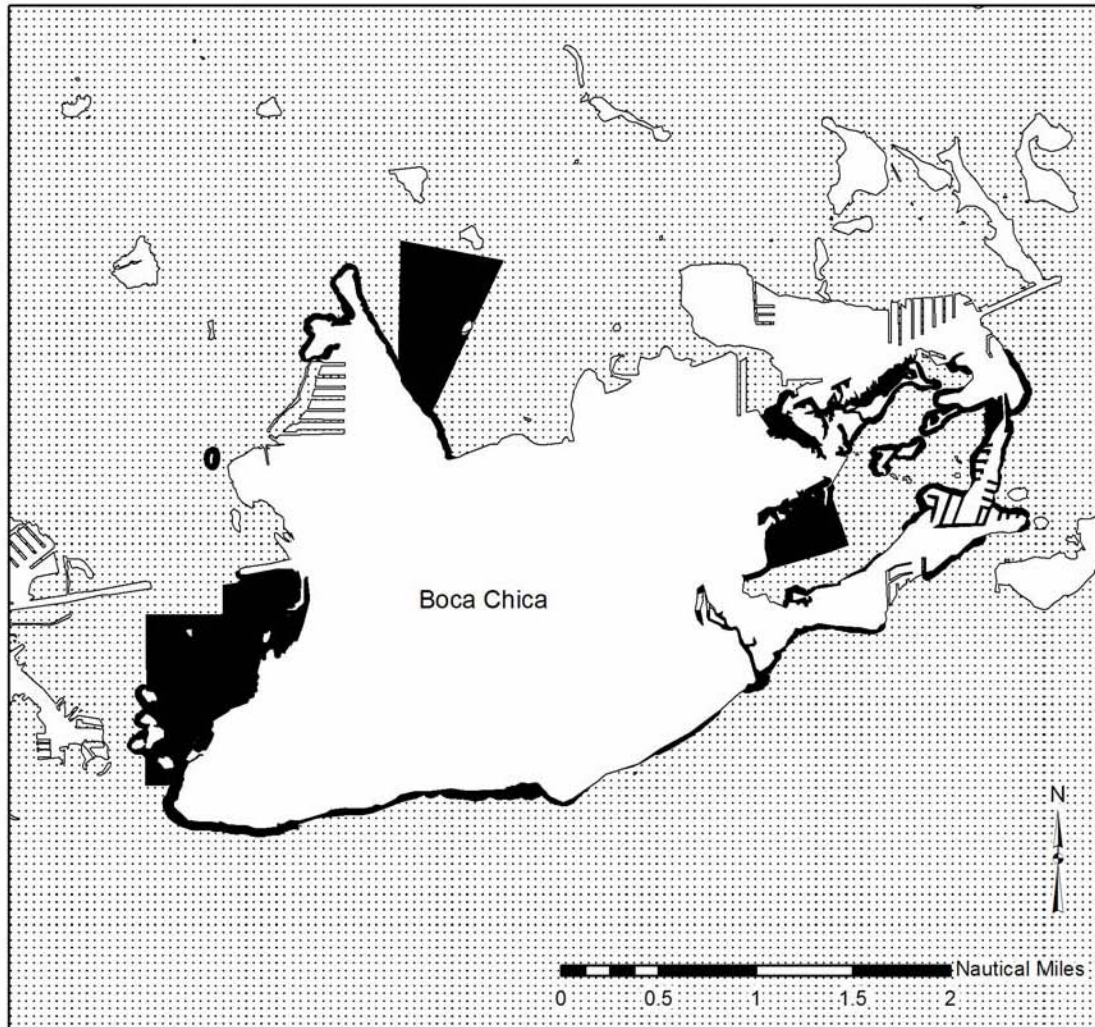
**Critical Habitat for Elkhorn and Staghorn Corals
Area 1: Florida**



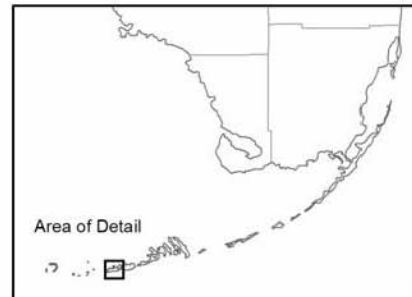
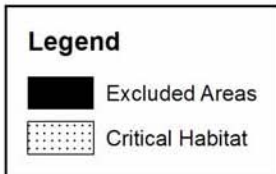
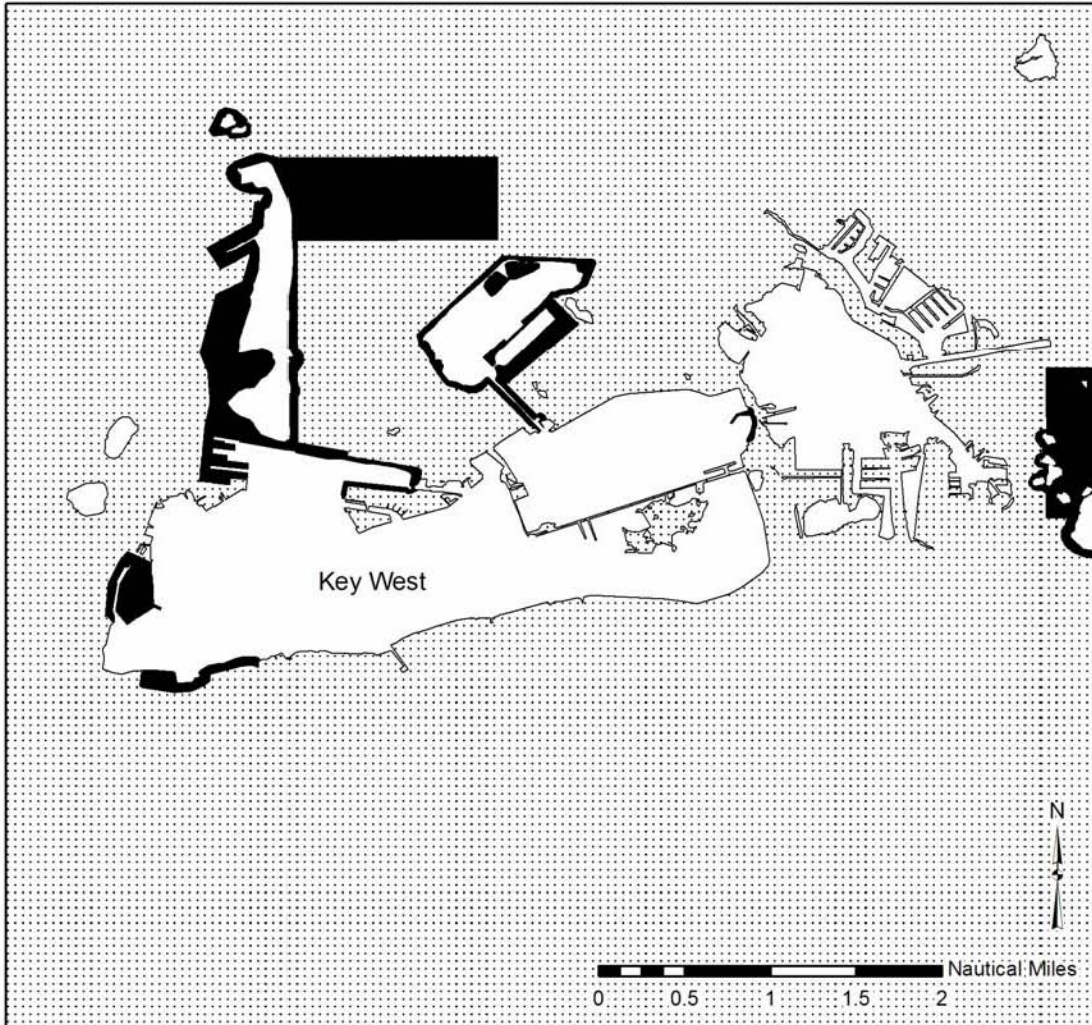
**Critical Habitat for Elkhorn and Staghorn Corals
Area 1a: NASKW Excluded Area**



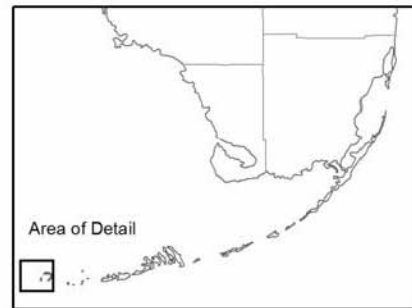
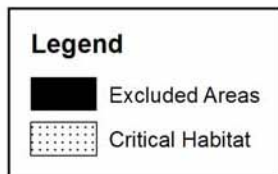
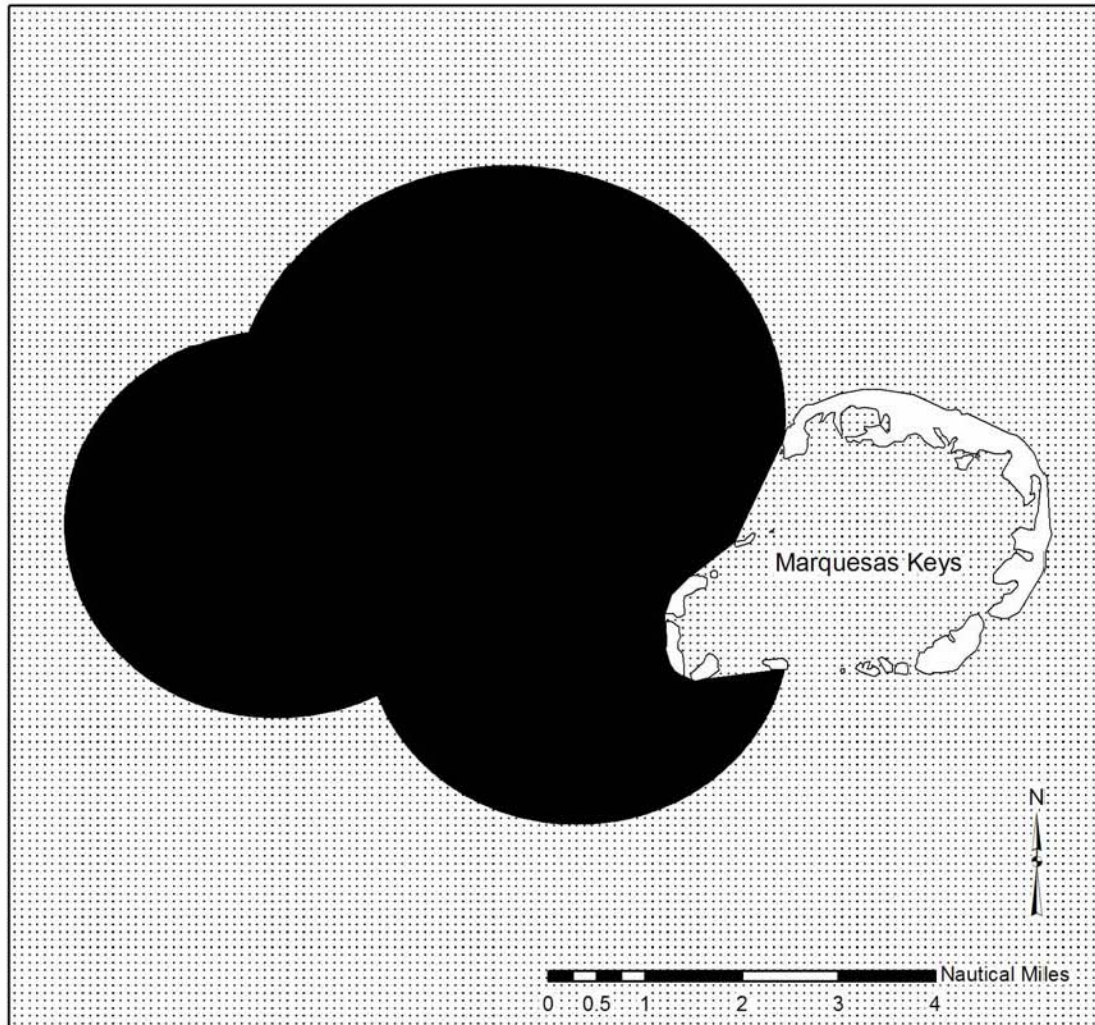
**Critical Habitat for Elkhorn and Staghorn Corals
Area 1b: NASKW Excluded Area**



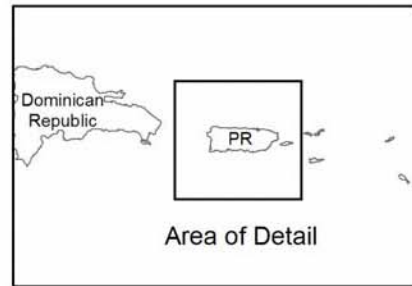
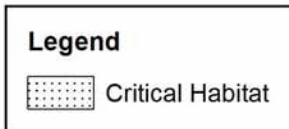
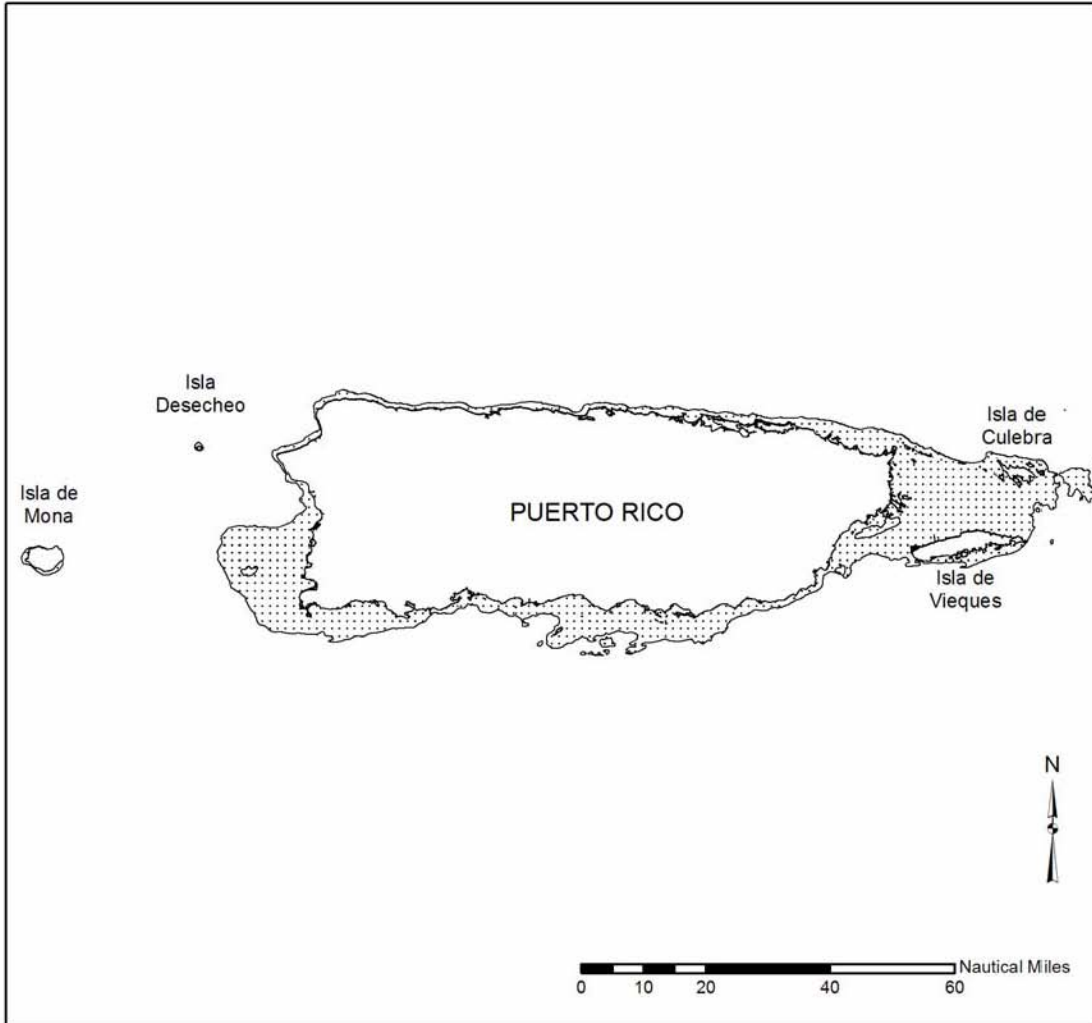
**Critical Habitat for Elkhorn and Staghorn Corals
Area 1c: NASKW Excluded Area**



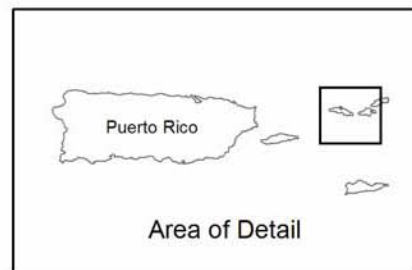
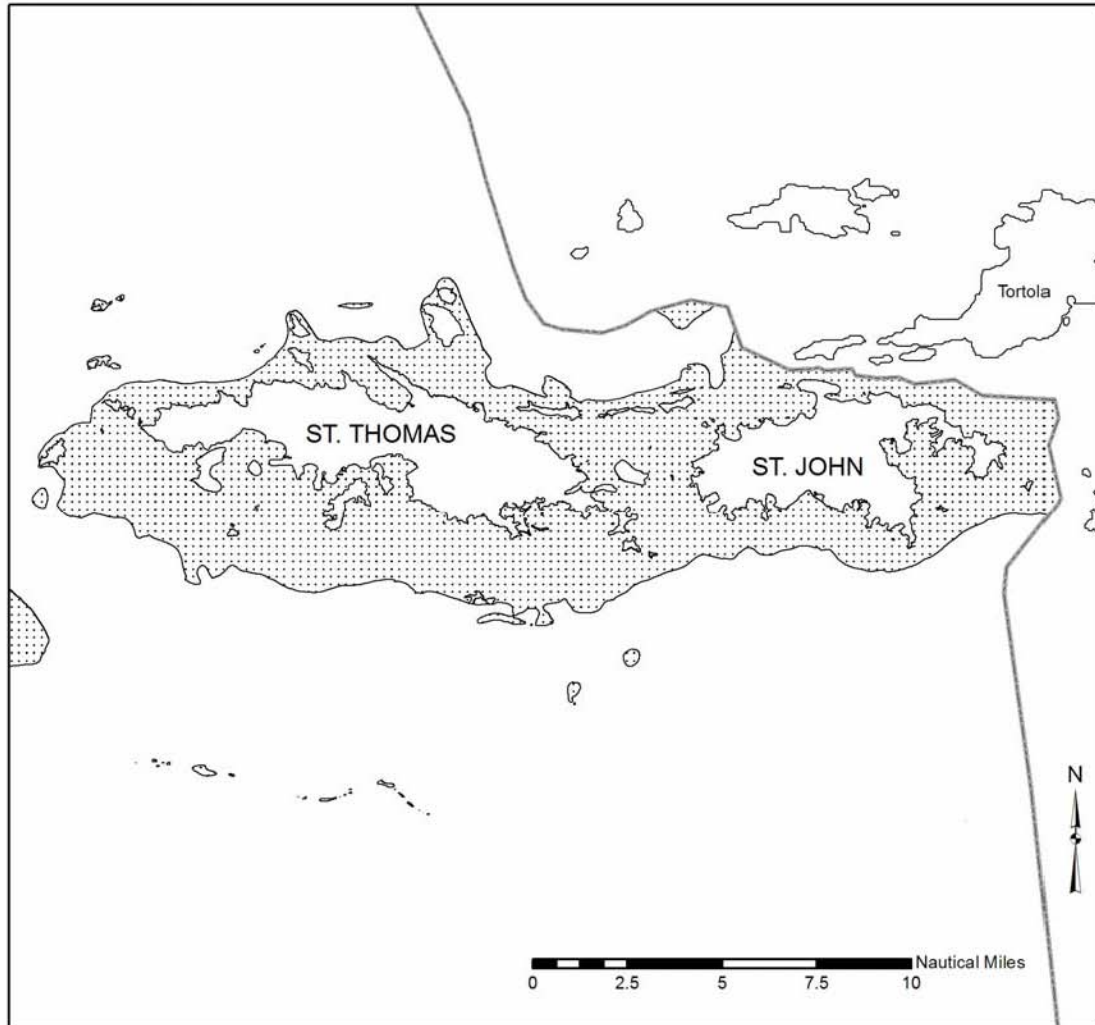
**Critical Habitat for Elkhorn and Staghorn Corals
Area 1d: NASKW Excluded Area**



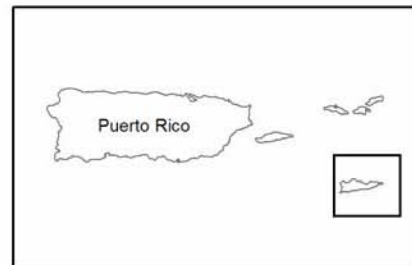
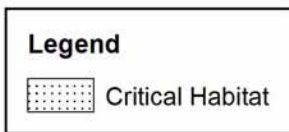
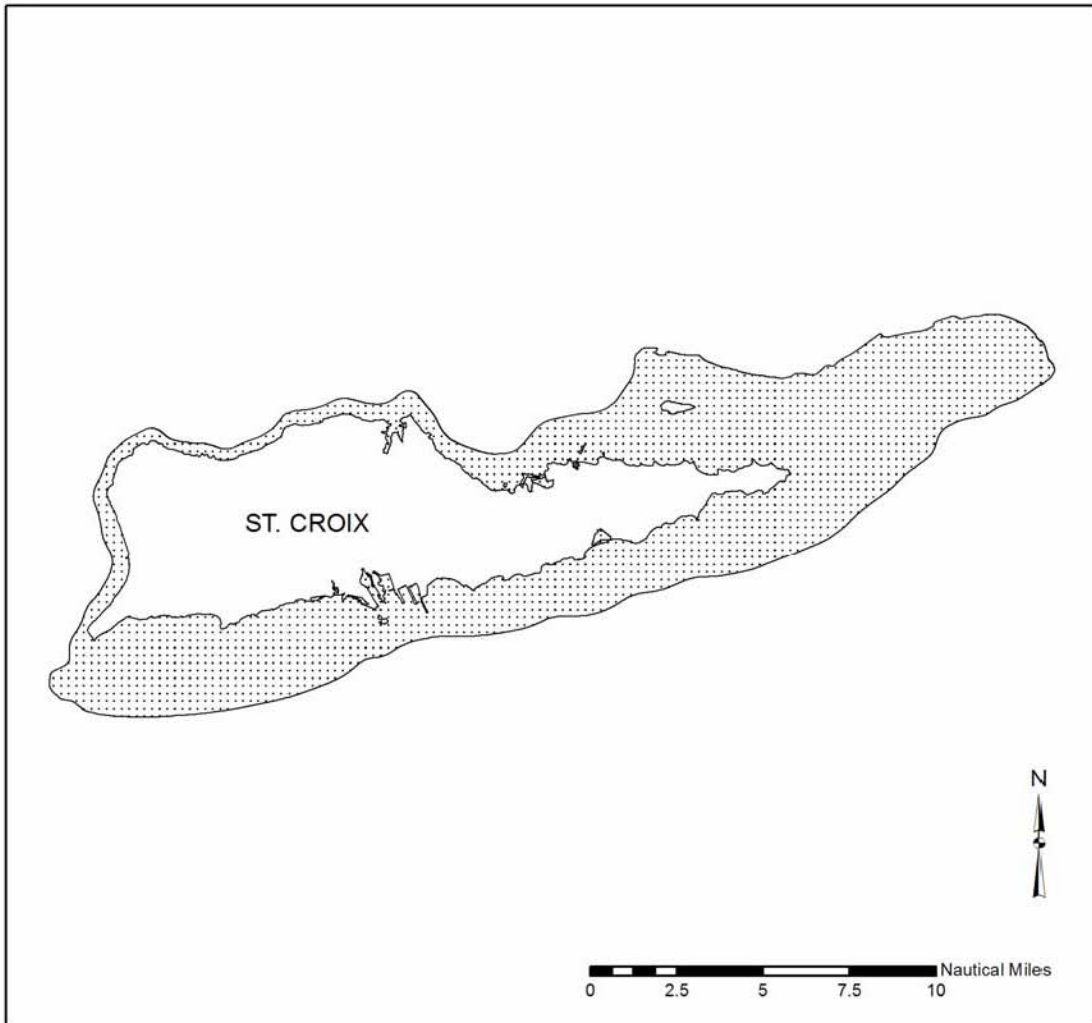
**Critical Habitat for Elkhorn and Staghorn Corals
Area 2: Puerto Rico and Associated Islands**



**Critical Habitat for Elkhorn and Staghorn Corals
Area 3: St. John/St. Thomas, U.S.V.I.**



**Critical Habitat for Elkhorn and Staghorn Corals
Area 4: St. Croix, U.S.V.I.**



APPENDIX C

Existing Federal, State and Territorial Laws and Regulations Directly and Indirectly Protecting Corals and Coral Reef Ecosystems

INTRODUCTION

Existing Federal, State, and Territorial laws and regulations directly and indirectly protect elkhorn and staghorn corals and affect economic activities proposed and conducted in areas where elkhorn coral and/or staghorn coral are found. Consequently, a discussion of economic activities must consider which and how activities are currently restricted in areas where either coral is found. For instance, Florida, Puerto Rico, and U.S.V.I. laws prohibit take of these corals in their waters, and these prohibitions must be acknowledged when evaluating the incremental impact of the proposed regulation.

Federal

Endangered Species Act (ESA)

Currently, elkhorn and staghorn corals are listed as threatened species under the ESA, and as listed species, are protected under Section 7 of the ESA (See 71 FR 26852 for listing). Section 7 requires federal agencies to ensure that actions they fund, authorize, or carry out will not jeopardize the continued existence of listed species or adversely modify designated critical habitat. “Action,” in this case, is defined broadly to include federal grants, permitting, licensing, or other regulatory actions (16 USC 1536(a)(2)). In general, if a listed species may be present in an action area, the Federal action agency must conduct a biological assessment to determine whether the proposed action may affect listed species. If the action agency’s assessment shows, and NMFS concurs, that the proposed action is not likely to adversely affect any listed species or designated critical habitat, then the consultation is concluded.

If the Federal action agency’s biological assessment shows that a proposed action may adversely affect a listed species or designated critical habitat, formal consultation and issuance of a biological opinion is required. During the formal consultation process, the action agency supplies NMFS with information that includes descriptions of the proposed action, action area, listed species that may be affected, and how the species may be affected by that action. NMFS has up to 135 days to complete consultation and prepare a biological opinion that contains the analysis of whether or not the proposed action would be likely to jeopardize the continued existence of the species or adversely modify designated critical habitat. If a jeopardy or adverse modification determination is made, the biological opinion must identify reasonable and prudent alternatives (RPAs), if any, that would not jeopardize the continued existence of the listed species or adversely modify designated critical habitat and are economically and technologically feasible. The action agency may choose to implement an RPA, modify the proposed action and consult with NMFS again, decide not to authorize, fund or otherwise proceed with the action’ or apply for an exception, a process rarely undertaken.

A biological opinion includes an incidental take statement (ITS) if prohibited take will result from the action. Incidental take is take that is incidental to, and not the purpose of, an otherwise lawful activity. The ITS also specifies reasonable and prudent measures (RPMs) considered necessary or appropriate to minimize the impact of the anticipated incidental take to the species.

Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)

CITES is an international agreement between governments, which applies to international trade. Scleractina species are CITES Appendix II specimens (www.cites.org/eng/app/appendices.pdf). Both elkhorn and staghorn corals are among those species and as such, a permit from the country

of origin is required in order to export live or dead specimens of these stony corals. Section 9(c) of the ESA prohibits any person subject to the jurisdiction of the U.S. from engaging in any trade in any specimens contrary to the provisions of CITES or to possess any specimens traded contrary to the provisions of CITES (16 USC §1538(c)).

Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act)

NMFS manages coral resources pursuant to regulations implementing the joint Gulf of Mexico and South Atlantic Coral Fishery Management Plan and the Caribbean Coral Fishery Management Plan (Coral FMPs), promulgated pursuant to the Magnuson-Stevens Fishery Conservation and Management Act. The management objectives addressed in the Coral FMPs and their implementing regulations are: 1) develop scientific information necessary to determine feasibility and advisability of harvesting coral; 2) minimize, as appropriate, adverse human impacts on coral and coral reefs; 3) provide, where appropriate, special management for Coral Habitat Area of Particular Concern; and 4) increase public awareness of the importance of sensitivity of coral and coral reefs (49 FR 29607, July 23, 1984).

NMFS has defined “prohibited coral” to include all coral belonging to the order Scleractinia, including elkhorn and staghorn corals (50 CFR 622.2). No person may fish for, harvest, or possess prohibited coral without a Federal permit in the Caribbean, Gulf of Mexico, or South Atlantic Exclusive Economic Zones (EEZ), where the Caribbean EEZ is defined as the portion of the EEZ that is the Caribbean Sea around Puerto Rico and U.S.V.I. (50 CFR 622.4(a) (3)(iv) and 622.7(k)). Moreover, no person may sell or purchase either species if taken from the EEZ; and if either species is sold in Puerto Rico or U.S.V.I., it is presumed to have been harvested in the EEZ unless it is accompanied by documentation showing that it was harvested elsewhere (50 CFR 622.45(a)).

Essential fish habitat (EFH) is defined as “those waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity (16 USC § 1802(10)). NMFS has designated coral substrate as EFH. As such, the Magnuson-Stevens Act requires any Federal agency to consult with NMFS with respect to any action authorized, funded or undertaken, or proposed to be authorized, funded or undertaken by such agency that may adversely affect the coral. NMFS can provide recommendations to avoid or reduce the adverse impacts on EFH; however, Federal agencies are not required to follow those recommendations.

Other federal regulations under the authority of the Magnuson-Stevens Act that directly or indirectly protect corals include the following:

- 50 CFR 622.31(a) prohibits use of explosives (except an explosive in a powerhead) to fish in the Caribbean, Gulf or South Atlantic EEZ.
- 50 CFR 622.31(b) prohibits use or possession of a toxic chemical in a coral area, and prohibits use of a chemical, plant, or plant-derived toxin to harvest a Caribbean coral reef resource in the Caribbean EEZ.
- 50 CFR 622.31(c)(1) prohibits use of a fish trap in the South Atlantic EEZ, and (c)(2) which currently limits the use of a fish trap in the Gulf EEZ and will ban the use of a fish trap in the Gulf EEZ after February 7, 2007.
- 50 CFR 622.32(f) prohibits use of a power-assisted tool in the Caribbean EEZ to take a Caribbean coral reef resource or in the Gulf or South Atlantic EEZ to take prohibited coral.

- 50 CFR 622.33(B)(4)(i) requires any prohibited coral taken as incidental catch in the EEZ to be returned immediately to the sea in the general area of fishing. In fisheries where the entire catch is landed unsorted, such as scallop and groundfish fisheries, unsorted prohibited coral may be landed ashore; however, no person may sell or purchase such prohibited coral.
- 50 CFR 622.34(d) prohibits fishing for any species and anchoring by fishing vessels in the Tortugas marine reserves.
- 50 CFR 622.34(j) prohibits fishing with bottom longline, bottom trawl, dredge, pot, or trap in the West and East Flower Garden Banks Habitat Areas of Particular Concern.
- 50 CFR 622.4(a)(3)(i and v) require an individual who takes or possesses fish or other marine organisms with an allowable chemical in a coral area a Federal allowable chemical receive a permit if not landed in Florida; and for those that do, appropriate Florida permits and endorsements.
- 50 CFR 622.4(a)(3)(iv) requires a Federal permit to take or possess Gulf and South Atlantic prohibited coral or Caribbean prohibited coral only as scientific research activity, exempted fishing, or exempted educational activity.
- 50 CFR 622.41(a)(2)(ii) prohibits individual aquaculture from being placed over naturally occurring reef outcrops, limestone ledges, coral reefs, or vegetative areas.

Rivers and Harbors Act

The Rivers and Harbors Act (RHA; 33 USC §§ 401 et seq.) authorizes the U.S. Army Corps of Engineers (USACE) to issue permits for dams or dikes in intrastate waters of the U.S. (section 9) and construction or other work, such as docks/piers and aquaculture structures, in or affecting navigable waters (section 10). In issuing these permits, USACE conducts a “public interest balancing,” which can include evaluation of benefits and detriments of a project to fish and wildlife values, such as corals. As a general matter, adverse impacts to coral reefs and coral reef systems are considered to be detrimental to the public interest, and the USACE findings for Section 10 permits must document how these impacts have been avoided. Through this evaluation, USACE requires applicants to avoid and minimize impacts to corals by altering the design of a project or by imposing mitigation actions (e.g., relocation and monitoring of corals).

The Rivers and Harbors Act also authorizes the U.S. Coast Guard (USCG) to protect U.S. navigable waters. Navigable waters are those waters that at some time in the past, present or future are used to transport interstate or foreign commerce. Under 14 USC § 81, USCG is charged with establishing, maintaining, and operating aids to navigation to serve the needs of U.S. armed forces and maritime commerce, and when those aids are electronic, air commerce as well when requested by the Federal Aviation Administration. Some of these aids to navigation are found in areas where elkhorn coral and/or staghorn coral occur. For example, USCG maintains navigational aids in the Florida Keys National Marine Sanctuary (FKNMS) that are intended to help ships avoid grounding on coral reefs. Protection of navigable waters also includes regulating bridge-related activities. In general, a bridge cannot be constructed across any navigable water(s) until USCG has approved the location and construction plans.

Clean Water Act; Comprehensive Environmental Response, Compensation, and Liability Act; Oil Pollution Act of 1990

Sections 303(c), 304(a), and 402 of the Clean Water Act (CWA) provide the authority for the Environmental Protection Agency (EPA) to issue water quality standards and Nation Pollution

Discharge Elimination System (NPDES) permits. Section 303(c) of the CWA gives the primary responsibility for the development of water quality standards to the States and Territories, with oversight and approval by EPA. EPA also has the authority to issue Federal water quality standards when necessary to meet the requirements of the CWA. Additionally, section 304(a) of the CWA authorizes the EPA to publish water quality criteria to serve as scientific guidance to the States and Territories for the development of regulatory water quality standards. Lastly, section 402 of the CWA establishes the NPDES permitting program, which requires a permit for any point source discharge of a pollutant (other than dredge and fill material) into the waters of the U.S. EPA issues these permits unless they have delegated their authority to a State or Territory, in which case EPA retains oversight, review, and rescission responsibility.

Although sewage is defined as a pollutant under the CWA, sewage from cruise ships and other vessels is exempt (Congressional Research Service, 2005). EPA regulations implementing the NPDES permit program provide that “discharges incidental to the normal operation of vessels” are excluded from regulation and thus from permit requirements (40 CFR §122.3(a)). Section 311 of the CWA (33 USC §§2701-2720) applies to cruise ships and bans discharge of oil or hazardous substances in harmful quantities into or upon U.S. navigable waters, or into or upon the waters of the contiguous zone, or which may affect natural resources in the EEZ. USCG regulates the uptake and discharge of vessel ballast water under the authority of the CWA, and its regulations prohibit such uptake or discharge in areas within or that may directly affect marine sanctuaries, marine preserves, marine parks or coral reefs (33 CFR 151.2035(a)).

Section 404 of the CWA established the permitting program to regulate excavation and the discharge of dredged and fill material into U.S. waters. EPA and USACE jointly administer the Dredge and Fill Permitting Program. The CWA Section 404(b)(1) Guidelines establish the environmental standards used by the EPA and USACE in the review of permit applications. The Guidelines specifically recognize coral reefs as a special aquatic site that deserves a high level of protection (Subpart E, Section 230.44). Similar to the process described under the RHA, EPA or USACE require project modifications or mitigation measures through the permit review process.

In 1999, the USACE and EPA released a joint Field Memorandum entitled Special Emphasis Given to Coral Reef Protection under the CWA; Marine Protection, Research and Sanctuaries Act, Rivers and Harbors Act, and Federal Project Authorities (www.epa.gov/owow/wetlands/guidance/coral.html). The Memorandum states the “[a]gencies should be particularly careful to consider potential direct, indirect, and cumulative impacts to coral reefs...” Consequently, the EPA and USACE may deny a permit on the basis of significant impacts to corals, even if compensatory mitigation is proposed.

Section 401 of the CWA requires any applicant for an USACE permit to obtain a certification or waiver from the state agency that regulates water pollution in order to discharge dredged or fill materials. The state agency reviews the effect of the discharge on water quality standards.

Clean Water Act; Comprehensive Environmental Response, Compensation, and Liability Act and Oil Pollution Act of 1990

The CWA, Comprehensive Environmental Response, Compensation, and Liability Act (42 USC §§ 9601 et seq.), and Oil Pollution Act of 1990 (33 USC §§ 2701 et seq.) mandate that parties that release hazardous materials or oil into the environment are responsible not only for the cost of cleaning up the release, but they are also responsible for restoring any injury to natural resources that results from the actual or threatened release, or from response actions. These provisions are applied to address impacts to coral reefs from release incidents.

Ocean Dumping Act

The Ocean Dumping Act prohibits any person from dumping, or transporting for the purpose of dumping, sewage sludge or industrial waste into ocean waters without a permit (16 USC §1411b). No permits can be issued to dump radiological, chemical, and biological warfare agents, high-level radioactive waste, and medical waste (16 USC §1412). The EPA has responsibility for regulating the dumping of all material except dredged material; and in the case of dredged material (see above).

Coastal Zone Management Act

The Coastal Zone Management Act (CZMA) encourages states to preserve, protect, develop, and where possible, restore or enhance valuable natural coastal resources, which include coral reefs. Participation by the states is voluntary, but to encourage participation, the act makes federal financial assistance available to any coastal state or territory that is willing to develop and implement a comprehensive coastal management program. A state with a coastal zone management program approved by NOAA's Office of Ocean and Coastal Resource Management, can deny or restrict any activity that is inconsistent with that plan. Florida's Coastal Management Program was approved in 1981, Puerto Rico's in 1978, and U.S.V.I.'s in 1979. Both elkhorn and staghorn corals are protected by the CZMA through these States' coastal zone management plans. Moreover, consistent with the provisions of section 307(c)(3) of the CZMA, the USACE may not issue any permits or authorizations under section 404 of the CWA (33 USC § 1344), section 103 of the MPRSA (33 USC § 1413), or section 10 of the RHA (33 USC § 403) that do not have a State CZMA consistency determination. Similarly, the EPA will not designate an ocean dumping site under MPRSA section 102 without meeting the requirements of the CZMA.

National Marine Sanctuaries Act

The National Marine Sanctuaries Act (16 USC §§ 1431 et seq.) authorizes the Secretary of Commerce to designate any discrete area as a national marine sanctuary and promulgate regulations implementing the designation (16 USC §1433). NOAA National Ocean Service (NOS) manages and protects the Sanctuaries for their habitats, ecological value, threatened and endangered species, and historic, archeological, recreational and aesthetic resources.

The Florida Keys National Marine Sanctuary (FKNMS) is comprised of 9,660 square kilometers (2,900 square nautical miles) of coastal waters off the Florida Keys. The following are some of the pertinent activities that are regulated through permits or prohibited throughout the FKNMS (15 CFR 922.163):

- Moving, removing, taking, harvesting, damaging, disturbing, breaking, cutting, or otherwise injuring, or possessing (regardless of where taken from) any living or dead coral or coral formation, or attempting any of these activities.
- Exploring for, developing, or producing minerals or hydrocarbons.
- Drilling into, dredging, or otherwise altering the seabed of the Sanctuary, or engaging in prop-dredging; or constructing, placing or abandoning any structure, material, or other matter on the seabed of the FKNMS is prohibited, except as an incidental result of lawful activities.
- Discharging or depositing, from within the boundary of the FKNMS, any material or other matter.

- Operating a vessel in such a manner as to strike or otherwise injure coral, seagrass, or any other immobile organism attached to the seabed, including, but not limited to, operating a vessel in such a manner as to cause prop-scarring.
- Having a vessel anchored on living coral other than hardbottom in water depths less than 40 feet when visibility is such that the seabed can be seen.
- Possessing or using explosives, except powerheads, or releasing electrical charges.

The FKNMS is divided into five management zones: Wildlife Management Areas, Ecological Reserves, Sanctuary Preservation Areas, Existing Management Areas, and Special Use/Research Only Areas. There are 27 Wildlife Management Areas; 20 of them are managed by the U.S. Fish and Wildlife Service, and the remaining seven are managed by NOS, Florida Department of Environmental Protection (FDEP), and Monroe County⁸. There are two Ecological Reserves: Western Sambo Ecological Reserve and Tortugas Ecological Reserve. Both of the reserves are no-take zones and are managed by NOS Florida Keys National Marine Sanctuary; however, the Tortugas Ecological Reserve is divided into two sections, each with a different set of regulations. There are eighteen Sanctuary Preservation Areas that protect popular shallow coral reefs, and these areas are managed by NOS, FDEP, and Monroe County⁹. It is illegal to touch or stand on dead or living coral or anchor on living or dead coral or any attached organism in any of the Ecological Reserves or Sanctuary Preservation Areas. Moreover, fishing by any means or removing, harvesting, or possessing any marine life is prohibited in the Ecological Reserves and Sanctuary Preservation Areas. There are 21 Existing Management Areas of which 15 are managed by FDEP, four by the Fish and Wildlife Service, and two by NOS¹⁰. Finally, there are four Special Use Areas, which are managed by NOS, FDEP, and Monroe County¹¹. There four areas are found in the vicinity of Conch Reef, Tennessee Reef, Looe Key (Hawk Channel patch reef), and Eastern Sambo Reef. Four permits are available for activities in the FKNMS: General Permit, Survey/Inventory of Historical Resources Permit, Research/Recovery of Sanctuary Historical Resource Permit, and Special-Use Permit.

⁸ The 27 Wildlife Management Areas are: Bay Keys, Boca Grande Key, Woman Key, Cayo Agua Keys, Cotton Key, Snake Creek, Cottrell Key, Little Mullet Key, Big Mullet Key, Crocodile Lake, East Harbor Key, Lower Harbor Keys, Eastern Lake Surprise, Horseshoe Key, Marquesas Key, Marvin Key, Mud Keys, Pelican Shoal, Rodriguez Key, Dove Key, Tavernier Key, Sawyer Keys, Snipe Keys, Upper Harbor Key, East Content Keys, West Content Keys, and Little Crane Key.

⁹ The 18 Sanctuary Preservation Areas (SPAs) are: Alligator Reef, Carysfort/South Carysfort Reef, Cheeca Rocks, Coffins Patch, Conch Reef, Davis Reef, Dry Rocks, Grecian Rocks, Easter Dry Rocks, The Elbow, French Reef, Hens and Chickens, Looe Key, Molasses Reef, Newfound Harbor Key, Rock Key, Sand Key, and Sombrero Key. Six of the SPAs are found in State waters: Cheeca Rocks, Eastern Dry Rocks, Hens and Chickens, Newfound Harbor Key, Rock Key, and Sand Key.

¹⁰ Two of the Existing Management Areas are the Key Largo National Marine Sanctuary and Looe Key National Marine Sanctuary, which are managed by NOS. The 4 Existing Management Areas managed by the U.S. Fish and Wildlife Service are the Great White Heron National Wildlife Refuge, Key West National Wildlife Refuge, Crocodile Lakes National Wildlife Refuge, and National Key Deer Refuge. There are 15 Existing Management Areas within the FKNMS that are managed by the FDEP. They are: Bahia Honda State Park, Curry Hammock State Park, Fort Zachary Taylor State Historic Site, Indian Key State Historic Site, John Pennkamp Coral Reef State Park, Key Largo Hammocks State Botanical site, Lignumvitae Key State Botanical Site (includes Shell Key State Preserve, Long Key State Recreation Area, San Pedro State Underwater Archaeological Site, Windley Key State Geological Site, Biscayne Bay and Carl Sound Aquatic Preserve, Coupon Bight Aquatic Preserve, and Lignumvitae/Indian Key Aquatic Preserve.

¹¹ The four Special-Use/Research Only Areas are: Conch Reef, Eastern Sambo, Looe Key, and Tennessee Reef.

Antiquities Act

The Antiquities Act authorizes the President of the United States to declare by public proclamation historic landmarks, historic and prehistoric structures, and other objects of historic or scientific interest to be national monuments (16 USC § 431). Elkhorn and staghorn corals are found in two national monuments located in the U.S.V.I.: Buck Island Reef National Monument (BINM) in St. Croix and Virgin Islands Coral Reef National Monument (VINM) in St. John, which are managed by the National Park Service. The following activities are prohibited in BINM: extraction of corals; dredging and filling; fishing of any kind; boat operation that damages underwater features; anchoring other than in deep sand bottom areas (36 CFR 7.73). The following activities are prohibited in VINM: extraction of corals; fishing other than for bait; dredging and filling; boat operation that damages underwater features; anchoring except in emergency situations (36 CFR 7.46).

National Park System Act

The National Park System Act authorizes the Secretary of the Department of the Interior to recommend areas to Congress for inclusion in the National Park system, and authorizes the Secretary to administer designated parks, including through promulgation of regulations. Virgin Islands National Park (VINP) on St. John comprises more than half of the island of St. John and almost 9 square miles of water surrounding the island. Collecting coral, dead or alive, and dredging, excavating, or filling operations are prohibited and anchoring is restricted (36 CFR 7.74).

The Dry Tortugas National Park is managed by the National Park Service, in collaboration with the FDEP. Both spearfishing and lobstering are prohibited in the park; however, sport fishing is allowed. Snorkeling, diving, and swimming are allowed, while personal watercraft are banned. In January 2007, a Research Natural Area (RNA) was established in the park, and it is a 46-square mile no-take, no-anchor marine reserve. The RNA is adjacent to the Tortugas Ecological Reserve (TER), and combined they represent the largest no-take marine reserve in the continental United States.

Biscayne Bay National Park includes approximately 173,000 acres in Dade County, and is about 22 miles long. The park extends from shore about 14 miles to the 60-foot contour. The Park contains approximately 72,000 acres of coral reefs. The Park has not updated a general management plan since the early 1980s. Under existing Supervisor's rules for the Park, several areas are closed year-round to public entry to protect sensitive resources and wildlife. Beaching or anchoring of vessels is prohibited in several areas of the Park.

National Wildlife Refuge Administration Act

The National Wildlife Refuge Administration Act directs the U.S. Fish and Wildlife Service manage the Refuge System as a national system of lands and waters devoted to conserving and, where appropriate, restoration of fish, wildlife, and plant resources and their habitats (15 USC § 668dd). The law also declared that compatible wildlife-dependent recreational uses are acceptable activities on refuges. Some of the deepest occurring elkhorn coral are found at the Navassa National Wildlife Refuge (Margaret Miller pers. comm.). Navassa is an uninhabited, open-ocean island with significant coral reef resources, and was designated a National Wildlife Refuge in 1999. It is closed to the public (www.fws.gov/caribbean/PDF/navassa.pdf).

Water Resources Development Act

The Water Resources Development Act (33 USC §§ 2201 et seq.) authorizes the construction or study of USACE projects and applies to all features of water resources development and

planning, including environmental assessment and mitigation requirements. For example, the Act required USACE to construct its 1986 Dade County shoreline protection project so as to minimize the adverse effects on coral reefs.

Act to Prevent Pollution from Ships (APPS) as amended by the Marine Plastic Pollution Research and Control Act (MPPRCA)

The APPS, as amended by the MPPRCA, protects coral reefs by requiring all U.S. ships and all ships in U.S. navigable waters or the EEZ to comply with the International Convention for the Prevention of Pollution from Ships (33 USC §§ 1901 et seq.). Under the regulations implementing APPS as amended by MPPRCA, the discharge of plastics, including synthetic ropes, fishing nets, plastic bags, and a biodegradable plastic, into the water is prohibited. Discharge of floating dunnage, lining, and packing materials is prohibited in the navigable waters and in areas offshore less than 25 nautical miles from the nearest land. Food waste or paper, rags, glass, metal, bottles, crockery and similar refuse cannot be discharged in the navigable waters or in waters offshore inside 12 nautical miles from the nearest land. Finally, food waste, paper, rags, glass, and similar refuse cannot be discharged in the navigable waters or in waters offshore inside three nautical miles from the nearest land. USCG has the primary responsibility of enforcing regulations under the APPS, and the APPS applies to all vessels, including cruise ships, regardless of flag, operating in U.S. navigable waters and the EEZ.

The Lacey Act

The Lacey Act, as amended in 1981 (16 USC §§ 3372 et seq.), prohibits the trade of fish, wildlife, or plants taken in violation of any foreign, state, tribal or other U.S. law. For example, it is a violation of the Lacey Act for a retail store in New York to sell either elkhorn or staghorn coral taken illegally from Florida or other waters.

Florida

Oceans and Coastal Resources Act

The Oceans and Coastal Resources Act states that the coral reefs of southeast Florida and the barrier reef of the Florida Keys are a national treasure and must continue to be protected (Florida Statute §161.72(e)). Both the FDEP and Florida Fish & Wildlife Conservation Commission (FWC) are authorized to promulgate regulations under this act (Florida Statute §161.75).

Florida law prohibits taking, attempting to take, or otherwise destroy, or sell or attempt to sell any hard or stony coral (Order Scleractinia) in state waters, with exceptions for permitted scientific research, educational purposes and aquaculture (Chapter 68B-42.009 of the Florida Administrative Code; <http://fac.dos.state.fl.us/faconline/chapter68.pdf>). It also prohibits possession of such fresh, uncleaned or uncured coral. Any person who willfully violates the above prohibitions is subject to fines (section 253.04 of Florida Statutes). Any person in possession of elkhorn or staghorn coral legally harvested outside of Florida waters or the U.S. EEZ adjacent to state waters and entering Florida in interstate or international commerce must establish the chain of possession from the initial transaction after harvest, by appropriate receipt(s), bill(s) of sale, or bill(s) of lading, and any customs receipts, and to show that such species originated from a point outside Florida waters or the U.S. EEZ adjacent to state waters and entered the state in interstate or international commerce (68B-42.009(2)(a)).

The Florida Aquatic Preserve Act

One of the goals of the Florida Aquatic Preserves Act (18 Florida Administrative Code 258) is to preserve, promote, and utilize indigenous life forms and habitats, including hard corals. The

Florida Aquatic Preserve Act implemented a system of protected areas within Florida, such as Biscayne Bay Aquatic Preserve.

Biscayne Bay Aquatic Preserve was established in 1974 and it encompasses 69,000 acres of State submerged lands. The preserve extends from Miami-Dade County to Monroe County. The Act establishing Biscayne Bay Aquatic Preserve restricts dredge and fill activities and alteration of physical conditions, and discharge of wastes that substantially inhibit the purposes of the preserve.

Coupon Bight Aquatic Preserve is the southern most aquatic preserve located in the lower half of the Florida Keys. It is a shallow semi-enclosed basin approximately 3.5 kilometers (2.2 miles) long and 2.5 kilometers (1.6 miles) wide with an average depth near the center of 1.8 meters (6 feet). Its waters have been designated as Outstanding Florida Waters, and as such, the FDEP cannot issue permits for direct pollutant discharges, which would lower existing water quality, and indirect discharges, which would significantly degrade that water body.

John Pennekamp Coral Reef State Park

The John Pennekamp Coral Reef State Park in Monroe County encompasses 178 nautical square miles of coral reefs, seagrass beds, and mangrove swamps and is contained within the FKNMS. Florida Statute §258.083 states it is unlawful for any person, firm, or corporation to (1) bring into or transport through any part of the state, including its waters, any coral or other material taken from the subsoil or seabed of any portion of the John Pennekamp Coral Reef State Park adjacent to or in the vicinity of the state which has been taken in violation of any law or regulation of the Federal Government, or (2) destroy, damage, remove, deface, or take away any coral, rock or other formation or any part thereof, of any portion of the John Pennekamp Coral Reef State Park adjacent to or in the vicinity of the state in which such action is in violation of any law or regulation of the Federal Government. The Park's management plan requires protection of the park's marine resources from among other things, all dredging, filling, and other construction activity by outside sources, and requires installation and maintenance of channel markers and mooring buoys to reduce anchor and boating impacts.

Chapter 18-21, Florida Administrative Code

Chapter 18-21 of the Florida Administrative Code prohibits installation of telecommunication lines that originate from or extend into federal waters on or under submerged lands within Biscayne Bay Aquatic Preserve, Biscayne Bay National Park, and Monroe County. Moreover, the law requires conduits for telecommunication lines to be directionally drilled under nearshore benthic resources, including the first reef and any other more inshore reefs off Southeast Florida, to the maximum extent practicable and to punch out in a location that avoids or minimizes the impacts to benthic resources such as seagrasses and live bottom communities including corals and sponges. The same chapter also requires that activities on submerged sovereignty lands be designed to minimize or eliminate any adverse impacts on fish and wildlife habitat, and other natural or cultural resources, with special attention and consideration given to endangered and threatened species habitat.

Florida's Coastal Zone Management Act of 1978

Florida's Coastal Zone Management Act of 1978 authorized the development of a comprehensive state Coastal Management Program (CMP) based on existing Florida Statutes and regulations. Florida's CMP is comprised of 23 statutes, which are administered by nine State agencies and five water Districts. The Federal CZMA and Florida law requires Federal agencies and applicants to provide a detailed description of proposed Federal activities that may affect the State's coastal resources, and the State's Department of Community Affairs coordinates the

review of such activities to ensure that they are consistent with the State's CMP and Coastal Zone Management Act.

Section 403.061 of the Florida Statutes is part of the State's CMP and it authorizes FDEP to identify water bodies worthy of special protection because of their natural attributes. These waters are designated as "Outstanding Florida Waters", and the designation is intended to protect existing good water quality. FDEP cannot issue permits for direct pollutant discharges to Outstanding Florida Waters, which would lower existing water quality, and indirect discharges, which would significantly degrade that water body. Waters with the Outstanding Florida Water designation in which elkhorn and staghorn corals occur are: (a) in Palm Beach County: John D. MacArthur Beach State Park; (b) in Broward County: John U. Lloyd Beach State Recreation Area, and North Beach; (c) in Miami-Dade County: Biscayne National Park, ITT/Hammock, and Biscayne Bay; (d) in Monroe County: Dry Tortugas National Park, Key West National Wildlife Refuge, National Key Deer National Wildlife Refuge, Bahia Honda State Park, Bill Baggs Cape Florida State Recreation Area, Hugh Taylor Birch State Recreation Area, Long Key State Recreation Area, Fort Zachary Taylor Historic Site, Indian Key State Historic Site, Indian Key State Historic Site, Key Largo Hammock State Botanical Site, Windley Key Fossil Reef State Geological Site, San Pedro Underwater Archaeological Preserve, Coupon Bight, Curry Hammock, North Key Largo Hammock, Port Bougainville, and Biscayne Bay.

FDEP regulates activities that involve alteration of surface water flows through the Environmental Resource Permit (ERP) Program. The purpose of the ERP Program is to ensure that construction activities do not degrade water quality, cause flooding, or degrade habitat for aquatic or wetland dependent wildlife. Activities requiring permits involve, but are not limited to involving, the following: 1) solid waste, hazardous waste, domestic waste, and industrial waste facilities; 2) mining; 3) docking facilities and attendant structures and dredging that are not part of a larger plan of residential or commercial development; navigational dredging conducted by government entities, except when part of a larger project that a Water Management District has the responsibility to permit; systems located in whole or in part seaward of the coastal construction control line; seaports; and smaller, separate water-related activities not part of a larger plan of development, such as boat ramps, mooring buoys, and artificial reefs. Similar to the process described under the Federal RHA, the state of Florida requires project modifications and mitigation measures for corals through the ERP permit review process.

Pollution Discharge Prevention and Control Act

The Pollution Discharge Prevention and Control Act (28 Florida Statutes §§ 376.011 et seq.) prohibits the discharge of pollutants into or upon any coastal waters, estuaries, tidal flats, beaches, or lands adjoining the seacoast of the state. Pollution is defined as the presence in the outdoor atmosphere or waters of the state any one or more substances or pollutants in quantities which are or may be potentially harmful or injurious to human health or welfare, animal or plant life, or property or which may unreasonably interfere with the enjoyment of life or property, including outdoor recreation.

Florida and Cruise Ship Industry MOU

In 2001, the State of Florida entered into a Memorandum of Understanding (MOU) with the cruise ship industry through the International Council of Cruise Lines and related organizations. Under the MOU, cruise lines must eliminate wastewater discharges in Florida waters within 4 nautical miles of the State's coast, report hazardous waste off-loaded in the U.S. by each vessel on an annual basis, and submit to environmental inspections by USCG (Congressional Research Service, 2005).

Monroe County Code of Ordinances

The Monroe County Code of Ordinances does not permit dredging of hard bottom communities to construct a boat ramp (section 9.5-349(1)(7)). Docking facilities may be permitted which terminate over hardbottom communities where the water depth at the terminal platform is at least 4 feet above the top of all corals at mean low water and access to open water is continuous (section 9.5-349(m)(5)). Water access walkways are not permitted when designed to terminate over hardbottom communities (section 9.5-349(n)(1)(f)).

Puerto Rico

The Act for the Protection, Conservation and Management of Coral Reefs in Puerto Rico (Law 147)

Law 147 authorizes Puerto Rico's Department of Natural and Environmental Resources (DNER) to take all measures needed for the protection, conservation, and management of coral reefs and coral communities throughout the territorial waters of Puerto Rico (12 LPRA 241c). These measures include adopting a program for the protection, conservation and management of coral reefs. Among the program's tasks is to identify every source of environmental pollution harmful to coral reefs and coral communities and to recommend the control measures necessary to prevent said pollution and any negative impacts on these coral resources.

Law 147 also requires an Environmental Impact Statement for every project that may cause a negative impact on coral reefs, coral communities and associated marine systems. It also requires the Planning Board and DNER to draft zoning regulations to limit the development of residential, recreational, and tourist projects to areas free from adverse and detrimental impact on coral reefs, coral communities, and associated marine life (12 LPRA § 241e).

Law 147 authorizes DNER to create reserves, reef recovery and ecologically sensitive areas and identify them with buoys or other floating markers; identify those reef formations and coral communities that may be impacted by vessels that have run aground or been anchored, and prepare maps identifying coral reef sites. DNER can impose fines on any person for: 1) extracting, removing, mutilating, or otherwise destroying or damaging any coral reef or reef community or portions thereof; 2) offering for sale, exchange, donation, or otherwise trafficking in or disposing of live or dead coral reef or live or dead portions thereof and organisms deemed attractive for aquariums and ponds; 3) polluting, depositing solid or liquid waste or using any chemical substance on coral reefs and coral communities or portions thereof or on associated ecosystems, such as marine grasslands; and 4) fishing, snorkeling, or skin diving in reef recovery areas, marine reservations and other duly identified areas (12 LPRA §241f). There are exceptions for scientific, educational, and management purposes (12 LPRA § 241g). The law also authorizes DNER to undertake all pertinent measures against owners or captains of vessels that run aground on coral reefs so as to have them restore said system (12 LPRA § 241d).

Law 137

Law 137 directs the DNER to designate priority areas as marine reserves, including a minimum of 3 percent of the insular platform within three years (2003). Marine reserves are defined as areas where all extractive activities are prohibited in order to help recover depleted fishery resources and protect biodiversity; such reserves can protect *Acropora* sp. by preventing impacts from fishery gear. To date, three marine reserves have been established: Luis Peña Channel Marine Reserve, Isla de Desecheo Marine Reserve, and Tres Palmas Marine Reserve. The Luis Peña and Desecheo Reserves are entirely no-take, Tres Palmas has a no-take zone, and all have mooring buoys to protect benthic habitats. Elkhorn coral and/or staghorn coral are found in the

following protected areas: Isla de Mona Natural Reserve (Mona Island), Arrecifes de Guayama Natural Reserve (off the municipality of Arrojo on the south coast), Arrecifes de la Cordillera Natural Reserve (off the municipality of Fajardo on the east coast), Tres Palmas Marine Reserve (off the municipality of Rincón on the west coast), Punta Guaniquilla Natural Reserve (north of Boquerón Bay off the municipality of Cabo Rojo on the southeast coast), Canal Luis Peña Natural Reserve (Culebra Island), Isla de Desecheo Marine Reserve (Desecheo Island), and La Parguera Natural Reserve (off the municipality of Lajas on the south coast).

Fishery Law 83 of 1936

Fishery Law 83 of 1936 prohibits harvest or take of corals or live rock for commercial purposes, except under permit, and use of poisonous substances when fishing. The territory prohibits fishing by means of explosives in its maritime waters (12 LPRA §57), and it is illegal to transport or sell articles derived from rare or endangered species as designated by the DNER (12 LPRA §107d).

U.S. Virgin Islands (U.S.V.I.)

The Endangered and Indigenous Species Act of 1990

The Endangered and Indigenous Species Act of 1990 (12 Virgin Islands Code §105) mandates that no person may take, catch, possess, injure, harass, kill or attempt to take, catch, possess, injure, harass, or kill, or sell or offer for sale, or transport or export, whether or not for sale, any indigenous species, including live rock, which includes elkhorn and staghorn coral; except that persons holding valid fishing or hunting licenses, scientific or aquarium collecting permits, or indigenous species retention permits, may operate within the scope and under the terms and conditions expressed in those licenses and permits. To date, there have been no permits issued to collectors to take either elkhorn or staghorn coral in the U.S.V.I.

St. Croix East End Marine Park

The U.S.V.I. established the St. Croix East End Marine Park in 2002 to protect territorially significant marine resources, promote sustainability of marine ecosystems, including coral reefs, and to conserve and preserve significant natural areas for the use and benefit of future generations. The park surrounds the entire east end of St. Croix and encircles Buck Island Reef National Monument and is managed by the Virgin Islands Department of Planning and Natural Resources. The park encompasses an area of approximately 60 square miles (155 square kilometers). Moving, removing, taking, harvesting, damaging, disturbing, breaking, cutting, or otherwise injuring, or possessing any living or dead coral or coral formation or attempting any of these activities is prohibited throughout the park, except when permitted (Virgin Islands Code, Title 12, Chapter 1, Section 98-4). The following activities are also prohibited in the St. Croix East End Marine Park (ibid):

- Drilling into, dredging, or otherwise altering the seabed of the Park, or engaging in prop dredging; or constructing, placing or abandoning any structure, material, or other matter on the seabed of the Park, except as an incidental result of otherwise allowed activities.
- Discharging, depositing, placing or abandoning, or allowing the discharge, deposit, placement or abandonment of, any natural or man-made material that a person or vessel has brought into the Park from outside the Park.
- Operating a vessel in such a manner as to strike or otherwise injure coral, seagrass, or any other immobile organism attached to the seabed, including, but not limited to, operating a vessel in such a manner as to cause prop scarring.

- Operating a vessel outside officially marked channels that creates a wake within 100 yards of navigational aids that indicate emergent or shallow reefs or operating in such a manner as to endanger marine resources.
- Anchoring a vessel in hardbottom or coral communities¹².

Other Marine Parks and No-Take Zones

The taking of any living organism or part thereof is prohibited in The Cas Cay/Mangrove Lagoon Marine Reserve and Wildlife Sanctuary, St. Thomas, the St. James Marine Reserve and Wildlife Sanctuary, St. Thomas, and the Salt River Bay Marine Reserve and Wildlife Sanctuary, St. Croix (12 VIC § 906).

U.S.V.I. law (12 VIC § 906) states that sand, rock, mineral, marine growth and coral, natural materials or other natural products of the sea, excepting fish and wildlife, shall not be taken from the shoreline without first obtaining a coastal zone permit, and no permit shall be granted unless it is established that such materials or products are not otherwise obtainable at reasonable cost, and that the removal of such materials or products will not significantly alter the physical characteristics of the area or adjacent areas on an immediate or long-term basis.

International

The FKNMS falls within a Particularly Sensitive Sea Area (PSSA), as designated by the International Maritime Organization. A major benefit of this designation, which became official in December 2002, is that it provides international recognition of the “Areas To Be Avoided” by vessel operators and no-anchoring zones on the Tortugas Bank.

As stated previously, the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) is an international agreement between governments, which applies to international trade. Scleractina species are CITES Appendix II specimens (www.cites.org/eng/app/appendices.pdf). Both elkhorn and staghorn corals are among those species and as such, a permit from the country of origin is required in order to export live or dead specimens of these stony corals.

¹² The above does not list all prohibited activities, such as the prohibition of the sale of any consumer item or the conduct of any commercial activity, except as authorized by special permit.