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# Marine/Estuarine Site Assessment for Florida


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## A Framework for Site Prioritization
## September 2005

Laura Geselbracht, Roberto Torres, Graeme S. Cumming, Ph.D., Dan Dorfman and Mike Beck, Ph.D.

Final Report for Florida's Wildlife Legacy Initiative
a program of the Florida Fish and Wildlife Conservation Commission

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Funding for this project was provided by the State Wildlife Grants Program T-4 Grant

[1]The Nature Conservancy
2455 E. Sunrise Boulevard, Suite 1101
Ft. Lauderdale, FL 33304

[2]Department of Wildlife Ecology and Conservation
308 Newins-Ziegler Hall
University of Florida
P.O. Box 110430
Gainesville, FL 32611

[3]The Nature Conservancy
University of California Santa Cruz
Center for Ocean Health
Santa Cruz, CA 95060

*Citation:*
Geselbracht, L., R. Torres, G. Cumming, D. Dorfman, M. Beck. 2005. Marine/Estuarine Site Assessment for Florida: A Framework for Site Prioritization. Final Report for Florida's Wildlife Legacy Initiative, a program of the Florida Fish and Wildlife Conservation Commission. The Nature Conservancy, Gainesville, Florida

*Contact:*
Laura Geselbracht, The Nature Conservancy, 2455 E. Sunrise Boulevard, Suite 1101, Fort Lauderdale, Florida, 33304. *phone*: 954/564-6144    *email*: lgeselrbacht@tnc.org

## Acknowledgments


The following individuals provided invaluable input into development of this marine assessment by participating in expert workshops and/or by providing invaluable work products or advice on this framework. (* denotes participation on Central & South Florida Marine Ecoregional Plan Core Team)

Trish Adams, U.S. Fish and Wildlife Service (USFWS)
Rick Alleman, South Florida Water Management District (SFWMD)
Bill Arnold, Fish & Wildlife Research Institute (FWC)
Jeff Beal, FWC
Chad Bedee, Crystal River Preserve State Park
Chris Bergh*, TNC
Anne Birch*, TNC
Jon Blanchard, TNC
Steven Bortone, Sanibel Captiva Conservation Fdn
Katie Brill, FWC
Ron Brockmeyer, St. Johns River WMD
Georgina Bustamante, TNC
Mark Butler, Old Dominion University
Rafael Calderon, TNC
Paul Carlson, Jr., FWC
Mark Chiappone, University of North Carolina, Wilmington
Elena Contreras, TNC
Catherine Corbett, Charlotte Harbor NEP
Frank Courtney, FWC
Richard Curry, Biscayne National Park
Steve Davidson*, TNC volunteer
Bob Day, Indian River Lagoon, National Estuary Program
Jeff DeBlieu*, TNC
Anne Marie Eklund, National Marine Fisheries Service (NMFS)
Kate Eschelbach*, Duke University, Geospatial Analysis Center (DUGAP)
Chris Farrell, Audubon of Florida
Elizabeth Fleming, Defenders of Wildlife
Anne Forstchen, FWC
Bob Gasaway, USFWS
Grant Gilmore, Jr., ECOS
Bob Glazer, FWC
James Gragg, FWC
Patrick Halpin*, Nicholas School of the Environment and Earth Sciences, Duke University
Dennis Hanisak, Harbor Branch Oceanographic Institute (HBOI)
Ben Harkanson, Palm Beach County Environmental Resources Management
George Henderson, FWC
Steve Herrington, TNC
Ted Hoehn, FWC
Todd Hopkins, USFWS
Tim Huizing*, TNC
John Hunt*, FWC
Libby Johns, NOAA, AMOL
Paul Johnson, Reef Relief
Brian Keller*, Florida Keys National Marine Sanctuary
Todd Kellison, Biscayne National Park, NPS
Kevin Kemp, FWC
Phil Kramer, TNC
Robin Lewis, Lewis Environmental Services
Ken Lindeman*, Environmental Defense
Kevin Madley, FWC
Christopher Mankoff *, DUGAP
Ed Matheson, FWC
Tom Matthews, FWC
Rob Mattson, Suwannee River WMD
Sara McDonald, FWC
Anne McMillen-Jackson, FWC
Doug Morrison, Everglades & Dry Tortugas National Parks
Frank Muller-Karger, University of South Florida (USF)
Harry Norris, FWC
John Ogden, Florida Institute of Oceanography
Ernst Peebles, USF
Mark Perry, Florida Oceanographic Society
Andrea Povinelli*, TNC
John Reed, HBOI
Bernhardt Reigl, Nova Southeastern University, National Coral Reef Institute
Becky Robbins, SFWMD
Brad Rosov*, TNC
Peran Ross, University of Florida
Randy Runnels, Tampa Bay Aquatic Preserve
Tom Schmidt, Everglades National Park, NPS
Doug Shaw, TNC
Colin Simpendorfer, Mote Marine Laboratory
Christine Small, FWC
Heather Stafford*, Florida DEP, Coastal & Aquatic Managed Areas
Hallie Stevens, TNC
Jody Thomas*, TNC
Mark Thompson, NMFS
Robbin Trindell, FWC
Ginny Vail, FWC
Gabe Vargo, USF
Bernardo Vargas, NSU
Aswani Volety, FGCU
Brian Walker, NSU/NCRI
Jenna Wanat, Apalachicola National Estuarine Research Reserve/FDEP
Shannon Whaley, FWC
Jennifer Wheaton, FWC
David White, Ocean Conservancy
Jora Young*, TNC
Ricardo Zambrano, FWC

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# Introduction

This document presents the Marine/Estuarine Site Prioritization Framework for Florida, which was developed as a supplemental component of the Florida Comprehensive Wildlife Strategy. The prioritization of sites on which to focus resource management and conservation actions has been used extensively in conservation for decades and likely much longer. Efforts to prioritize sites for these purposes in marine and estuarine systems is a younger science, with perhaps 30 years of experience, beginning in the U.S. with the establishment of the National Marine Sanctuaries Program mandated by Title III of the Marine Protection, Research and Sanctuaries Act of 1972. In 1975, the Aquatic Preserve Act was passed in Florida, which initiated the creation of a network of coastal aquatic preserves. While the criteria used to establish national marine sanctuaries and Florida's aquatic preserves likely took into account the major habitat types present in other sites within their respective networks, the framework described in this document explicitly recognizes the major habitat types present in network sites by utilizing objective criteria to identify a set of network sites that represents the major marine and estuarine habitat types statewide. This approach of utilizing objective criteria to ensure representation of major habitat types within a defined planning area has been employed for both terrestrial-based and marine conservation planning for several years (Ball, 2000; Possingham et al., 2000; Airame et al., 2003; Beck, 2003; Day and Roff, 2000; Leslie et al., 2002; Margules and Pressey, 2000).

The framework presented in this document is not intended to replace site-based studies which will, by their very nature, be much more detailed and likely to rely on a larger suite of site specific resource information. The site based studies that have been completed in the state for marine and estuarine sites (e.g., the national marine sanctuary, national estuary program sites, national estuarine research reserves and state aquatic preserves) have not as yet been examined as part of a larger statewide system. The framework described here is a comprehensive statewide view that relies on the best available broad-scale information and a smaller collection of finer-scale information (not all datasets are available on a statewide or regional basis yet). Effective conservation planning demands the assessment of conservation goals and targets across multiple scales (Peterson 2000, Poiani et al, 2001). This framework and the analyses that it supports are intended to provide the broad-scale base of the pyramid of marine and estuarine resource information for Florida. The goal of the framework and representative analyses presented here is to provide resource managers, marine scientists, conservation practitioners and other stakeholders with a tool to aid in the identification of a suite of areas that can serve as focal points for statewide marine and estuarine resource management and conservation.

Site prioritization analyses used in conjunction with the other elements of the Florida Comprehensive Wildlife Conservation Strategy (threat assessment, strategy development and measures), provide resource managers, conservation practitioners, researchers and other interested individuals/groups with a set of focal areas for achieving greater resource protection, management and restoration. While some threat abatement strategies will best be achieved at a statewide level (e.g., through improved legislation), other strategies may best be developed and applied locally (with successful strategies being exported to other sites in need where appropriate).

The framework presented in this document represents the culmination of a 2-year process, originally started by The Nature Conservancy as a Central and South Florida (aka NOAA's West Indian Province) marine ecoregional assessment that was initiated concurrently with a Mid/South Atlantic (aka NOAA's Carolinian Province) marine ecoregional plan. A number of expert workshops were held as part of these processes to provide guidance and select criteria for the framework. About halfway through the Central and South Florida marine ecoregional assessment, the opportunity arose through the Florida's Comprehensive Wildlife Conservation Strategy (CWCS) process to expand the Marine Site Prioritization Assessment to a statewide assessment and to develop a more extensive framework. Florida is one of a few states that has included a marine component in its CWCS process.

Since the initiation of Florida's CWCS process, 5 workshops have been held to solicit guidance and feedback on framework development. The first of these workshops was a Northern Gulf Coast scoping meeting held in Tallahassee on October 19, 2004 (a participant list for all of the workshops held to assist with site prioritization framework development can be found in Appendix A). The intent of the first meeting was to solicit input on habitat and species targets to include in the analysis, as well as agreeing on a process for the analysis. The next three workshops, which were of similar content, were intended to solicit input from marine resource experts around the state (St. Petersburg, Tallahassee and Dania Beach). These expert workshops were titled "Site Prioritization and Threat Assessment Expert Workshops." During this set of 2-day workshops, most of the first day was devoted to the site prioritization framework, while the second day focused on threat assessment (i.e., description of problems). The purpose of the last workshop, the Florida Marine Site Prioritization Framework Expert Review Workshop, was to evaluate draft results of several analysis scenarios to solicit feedback on analysis inputs and processes. This final meeting was held on June 16, 2005 in St. Petersburg. Another set of three workshops was held as part of the larger marine CWCS component, but since these were concerned exclusively with threat abatement and strategy development (CWCS element #4), they are not covered in this document. An Interim Report that was prepared for this project (Geselbracht and Torres, 2005) provides a brief overview of the site prioritization process, describes inputs and presents some early draft results.

The analyses and results presented in this document, i.e., the draft scenarios depicting potential priority areas, are intended to be a first step in the process of identifying priority marine and estuarine sites for further or more intensive resource management and conservation action. The analyses are not intended to replace expert knowledge of marine and estuarine systems and species, but to serve as a tool to help objectively evaluate and fine-tune expert knowledge. The framework is based on a site prioritization process that uses a site optimization algorithm known as MARXAN. MARXAN was developed by Ian Ball and Hugh Possingham at the University of Adelaide (Ball, 2000; Possingham et al 2000) and a set of collaborators that included The Nature Conservancy and other conservation groups. As in any planning exercise, the validity of the results is only as good as the data inputs. As available data improve, the results can be further refined. Indeed, one of the benefits of this exercise has been to identify gaps in our current knowledge. In the development of this framework, we have used the best available statewide data relating to marine and estuarine ecosystems. Although the outer planning area boundary established for this framework extends to the 500 meter isobath, very limited data were included beyond state waters in this iteration of the framework. It will be possible to readily add datasets to future iterations. These results should be seen as the beginning of a process, rather than the end.

## Site Prioritization Process

### **Overview**

This section provides a description of the site prioritization framework. First, an overview is provided of a key component of this framework, the MARXAN site optimization model, that is used to identify potential priority sites. Next, a description is provided of the MARXAN inputs and how we derived the information to create each of these inputs. The final portion of this section provides some draft application of this site prioritization framework using several different scenarios.

The MARXAN site optimization algorithm identifies priority areas which are defined as a set of areas that efficiently represent the selected amount of each target at the scale of analysis. To use this decision support tool, we selected a planning area, stratified it into subregions, selected planning units appropriate for the scale of the analysis, identified resource targets (habitats, species and phenomena) to use in the analysis together with data describing their distributions and the levels at which to represent these targets in the model results, and chose an appropriate level of site cohesiveness. Expert consultation was solicited and obtained at each step of the process, which is described in more detail below.

The MARXAN model seeks to minimize the following objective function:

$$Total\ Cost = \sum_i Cost\ site\, i \quad + \quad \sum_j Penalty\ \cos t\ \ for\ element\ j \quad + \quad w_b \sum boundary\ length$$

MARXAN begins by selecting a random set of planning units, then iteratively explores improvements to this portfolio of sites by randomly adding or subtracting planning units. At each iteration, the new portfolio is compared with the previous portfolio, and the better one is selected. MARXAN uses a method called “simulated annealing” to reject sub-optimal portfolios, thus greatly increasing the probability of converging on the most efficient portfolio. In our draft analyses presented later in this document, the algorithm was run for 10 million iterations.

MARXAN and the related models, SPEXAN and SITES, have been used for a variety of marine applications. The Ecology Centre at the University of Queensland hosts a Web site on MARXAN and its known applications (http://www.ecology.uq.edu.au/index.html?page=27710). An abbreviated form of a table on known applications from this site is recreated on the following page.

**Table 1. Some Marine Applications of the MARXAN and Related Site Selection Models**

| Place of Application, Report/Publication Date & Contact Information | Program Used and Summary of Application |
|---|---|
| **Florida Keys, 2003**<br>Heather Leslie, Department of Ecology and Evolutionary Biology Princeton University | SPEXAN 3.1/Sites: This was the first marine application of the simulated annealing algorithm, which is part of the SPEXAN/Sites/MARXAN packages. |
| **Channel Islands, 2003**<br>Satie Airame, Marine Policy Coordinator for PISCO (The Partnership for Interdisciplinary Studies of Coastal Oceans) at the University of California, Santa Barbara | SITES: A working group of stakeholders used the siting tool to design a network of fully protected marine reserves for the National Marine Sanctuary. |
| **Australia - Great Barrier Reef Marine Park, 2003**<br>Suzanne Slegers, GIS Officer, GBRMPA | MARXAN: This effort evaluated the existing zoning scheme in the GBRMP to meet biodiversity conservation objectives. |
| **Northern Gulf of Mexico, 2001**<br>Mike Beck, Senior Scientist, Marine Initiative The Nature Conservancy | SITES: This was the first non-governmental application of the tool to be publishes in the peer-reviewed literature. |
| **Gulf of California, 2002**<br>Enric Sala, Center for Marine Biodiversity and Conservation | SITES: This collaborative effort between marine scientists at Scripps Institution of Oceanography (USA) and World Wildlife Fund yielded possible marine reserve network configurations for the Gulf of California. |
| **Willamette Valley-Puget Trough-Georgia Basin (USA/Canada), 2002**<br>Zach Ferdana, GIS Analyst, The Nature Conservancy of Washington | SITES: Conservation planners are using both biological community and species-based conservation targets to draft a network of priority areas for conservation action in the Pacific Northwest (USA). |
| **Galapagos Islands (Ecuador), 2000**<br>Rodrigo H. Bustamante, CSIRO Marine Research | MARXAN: The siting tool is being used to further the implementation of the Galapagos Marine Reserve and the associated zoning initiative, and to monitor its performance. |
| **Northwest Atlantic (USA/Canada), *unknown***<br>Hussein Alidina,<br>Sr. MaHunager GIS/Conservation Planning | MARXAN: WWF Canada and The Conservation Law Foundation (Boston, MA, USA) are collaborating on this initiative to designate areas of high conservation value in the Gulf of Maine/Bay of Fundy/Scotian Shelf/Georges Bank/Offshore waters. It is in the early stages. |
| **South Australia, 2002**<br>Romola Stewart<br>The Ecology Centre, The University of Qld | MARXAN: Marine reserve systems are configured using MARXAN to compare solutions that retain South Australia's existing marine reserves with reserve systems that are free to either ignore or incorporate them. |
| **British Columbia, 2002**<br>Jeff Ardron,<br>Living Oceans Society, British Columbia | MARXAN: Staff at this grassroots non-governmental organisation have used the siting tool to explore the possible configurations of a system of marine protected areas, including fully protected marine reserves, for the British Columbia Central Coast. |
| **Connecticut/New York, *unknown***<br>Amanda E. Wheeler,<br>University of New Haven | MPA designs for Estuary of Long Island Sound – Connecticut/New York were created using MARXAN. Amanda has written an excellent MPA Design Tutorial, available in .PDF format ("Download), with details on file creation, step by step methods for using MARXAN to design MPAs, and an abstract describing her work. |

**Planning Area, Subregions and Planning Units**

Planning Area: Although the Florida CWCS is intended to be a state plan, and this framework was developed as a component of it, a considerable amount of interest was expressed in marine areas beyond state waters during workshops. Thus, we decided to structure this framework using the more liberal 500 meter isobath as our outer boundary. Even so, due to data availability and scope of this project, the results within state waters should be given much greater weight than those outside state waters, as more comprehensive and detailed coarse- and fine-filter target datasets were available for state waters. We set the inner planning boundary at the inland extent of the National Wetlands Inventory marine and estuarine habitat categories, which for the most part captures the extent of ocean-derived saltwater influence.

Subregion Stratification: Marine habitats and species change gradually with latitude. To capture these regional differences, we stratified the planning area into eight regions based on expert knowledge of coastal geomorphology and faunal assemblages. The eight selected subregions are illustrated in Figure 1 and described below.

- Northeast Florida**:** From the border with Georgia on Florida's northeast coast south to Cape Canaveral, the Florida coast is characterized by a moderately broad and gently sloping continental shelf. This stretch of coastline forms the southern portion of the Georgia Bight. Coastal geomorphology has been shaped by a mixed regime of wave and tidal energies. In the northern portion of this area, coastal geomorphology is typical of a mixed energy environment. Tidal inlets are wide and deep, tidal flats and marshes are relatively extensive, and barrier islands are relatively short. South of Matanzas Inlet (the only inlet along this stretch of coast free of jetties and other stabilizing structures) the barrier island-inlet system displays wave-dominated characteristics. The barrier islands along this portion of the coast are relatively long, the dunes are relatively high, and a prominent longshore bar and trough system is mostly present. Beaches range from narrow and steep to wide and gently sloping. Due to the widely spaced inlets in this area and attenuation of tides with distance from the inlets, the areas behind the dunes most distant from the inlets are essentially fresh. The majority of the Northeast Florida coastline is composed of Holocene quartz-sand barrier islands, while about 20% is Pleistocene and includes Anastasia limerock in beach and shallow nearshore areas (Davis, 1997).

- East-Central Florida: From Cape Canaveral south to the Jupiter Inlet, the East-Central Florida Coast has a sandy beach/narrow barrier island morphology similar to the Southeast Coast except that the continental shelf becomes progressively broader at the northern end of this subregion toward Cape Canaveral. A key feature of this portion of the coastline is the Indian River Lagoon, actually an estuary, that has been characterized as the most biologically diverse in North America because it straddles both subtropical and temperate zones. Benthic habitat types common in this region include patch coral reef, shallow Sabellariid worm reef, hard bottom and deep oculina banks. A major point source of freshwater discharge into this region of coast is from Lake Okeechobee through the St. Lucie Canal.

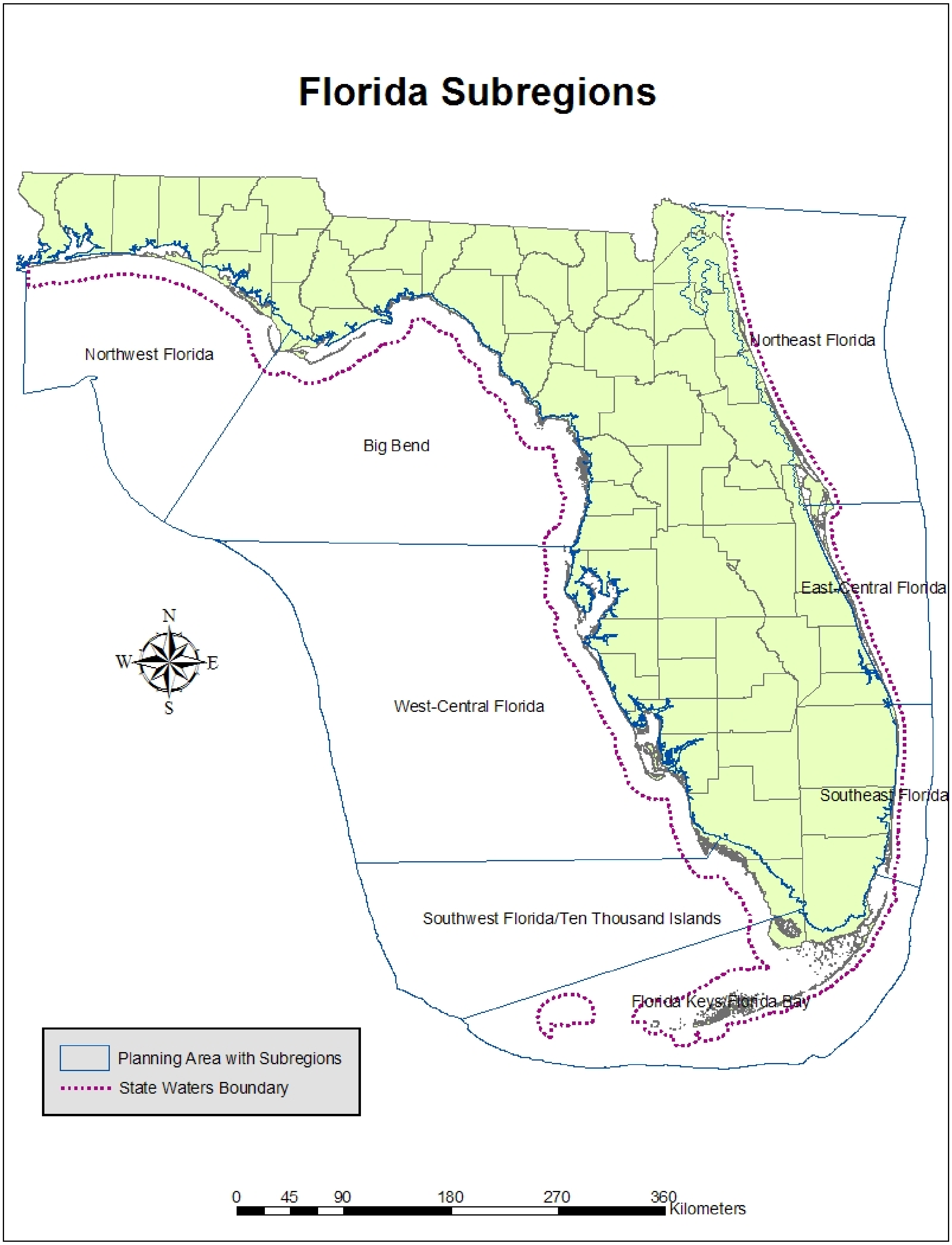
- Southeast Florida: The Southeast Coast of Florida from Jupiter Inlet south to Fowey Rocks (north end of the Florida Keys) is primarily characterized by sandy beaches, narrow barrier islands, a narrow continental shelf and reef terraces (approximately three) that run parallel to the beach. These reef terraces are dominated by octocorals and sponges rather than stony corals (Gilliam, 2004). Reef terraces along this stretch of coastline diminish north of approximately West Palm Beach making way for patch reefs. This region also includes the more impacted northern portion of Biscayne Bay, which is surrounded by urbanized Miami-Dade County.

- Florida Keys/Florida Bay: The Florida Keys/Florida Bay region at the southern tip of Florida is characterized by a low-lying string of oolitic-limestone islands that trend southwest from Key Biscayne off Miami to the Dry Tortugas more than 330 kilometers away (Randazzo and Halley, 1997). The southern side of the Florida Keys is bounded by the world's third largest fringing barrier reef, approximately 10 kilometers offshore. The continental shelf in this area is relatively shallow and makes way for the Florida Straits that separate the Florida Keys from Cuba. Florida Bay forms the large shallow water body between the Florida mainland and Florida Keys. Florida Bay is actually a patchwork of deeper "lakes" separated by shallow mud banks that in some areas support mangrove islands (Lodge, 1998). Southern Biscayne Bay is included in the northern portion of this region. This relatively undisturbed portion of the bay is a national park (Biscayne National Park).

- Southwest Florida/Ten Thousand Islands: The Ten Thousand Islands area extends from Cape Sable north to Cape Romano harbors one of the world's largest contiguous mangrove areas (more than 830 square kilometers) and is still growing seaward despite slowly rising sea level. The area is characterized by vast mangrove forests, mangrove islets, tidal channels, small embayments and abundant oyster and sabellarid worm reefs (Davis, 1997). The unique formation of mangrove islets in the Ten Thousand Islands area has been made possible by southbound longshore currents that carry sand and shells to the region allowing oysters to become established. In turn, oyster bars provide the substrate for mangroves to take hold (Lodge, 1998). In the Cape Sable area, it appears that vermetid gastropod reefs provided the substrate for mangrove islands to become established (Davis, 1997). These gastropod reefs are now relicts that no longer harbor living reef-building gastropods.

- West Central Florida: The area from Cape Romano north to Anclote Key is characterized by the world's most morphologically diverse barrier island system with its 29 barrier islands and 30 inlets (Davis, 1997). This section of the Florida coast has a wide continental shelf extending more than 160 kilometers out into the Gulf of Mexico and both large and small embayments. The largest estuaries in this area, Tampa Bay and Charlotte Harbor, have tremendous tidal prisms. One of the largest freshwater sources into this portion of the coast, besides subsurface and sheet flow, is the Caloosahatchee River, which was artificially connected to Lake Okeechobee decades ago.

**Figure 1. Subregions selected for Florida Marine/Estuarine Site Prioritization Analysis**



- Big Bend: The Big Bend coastline extends from Anclote Key at the south to Cape San Blas at the north. The continental shelf in this subregion is extremely wide at more than 150 kilometers, and the seaward gradient extremely shallow resulting in a low wave energy environment (Davis, 1997). This coastal area is characterized by extensive seagrass and salt marsh communities that extend for approximately 350 kilometers along the coast and a single circulation cell is present in the area. Other prominent features of this subregion include actively discharging freshwater springs, large oyster reefs and a delta area formed by the Suwannee River. Other rivers discharging into this area are relatively minor as they are short and spring-fed. Notably absent from this stretch of coastline is quartz sand.

- Northwest Florida: The Northwest Coast of Florida, or Panhandle Coast, has a wave dominated energy regime with barrier islands, well developed beaches and foredunes, and widely spaced inlets (Davis, 1997). The Apalachicola River, which drains much of Georgia and Alabama, ends in a large fluvial delta that drops gradually into deep waters with a shallow 1:1,800 gradient. Further to the west in this subregion, the offshore gradient is relatively steep, about 1:60 out to a depth of 20 m. Littoral drift from the Apalachicola Delta is westwardly oriented and has been estimated at 200,000 cubic meters annually.

Planning Units: To run MARXAN, the ecoregion was divided into 18,943 1,500-hectare hexagons. The hexagon shape was chosen for the planning units because more natural appearing clumps are formed as sites are selected based on the amount of boundary (six sides) shared among individual units. The size of the planning unit was selected to provide fine enough detail for statewide analysis while not overwhelming processing capabilities with excessive units that may add little to analytical resolution.

## Marine and Estuarine Resource Targets & Data Sources

In completing the CWCS process for Florida, the Florida Fish and Wildlife Conservation Commission (FWC) made the decision to use a habitat-based approach. A complete description of the decisions that the FWC has made regarding how the state will approach development of its CWCS is provided on Florida's Wildlife Legacy Initiative Web site (http://myfwc.com/wildlifelegacy/). Under this approach, habitats are used to represent the species that are associated with them. In the case of Florida's CWCS, this will be the selected species of greatest conservation need (SGCN). A complete listing of these 900+ species can be found in the Comprehensive Wildlife Conservation Strategy and on the above listed Web site. The targets that we selected for the analyses that are presented in the main body of this document are the marine and estuarine habitats found in the state's coastal waters and intertidal areas. The habitats are also referred to as coarse filter targets and should be as comprehensive as possible to fully represent the state's marine and estuarine systems.

Coarse Filter (Habitat) Targets: We used the FWC/FWRI document "Development of a System for Classification of Habitats in Estuarine and Marine Environments (SCHEME) for Florida" (Madley et al., 2002) as a guide to characterizing the habitat categories and assembling data. We assembled as comprehensive a set as possible of geospatial maps depicting marine and estuarine habitats in Florida. In assembling the data for this project, we relied on information existing at the time of project initiation (June 2004) and took into account the state-wide nature of the CWCS analysis and the time frame available for completing it. Where insufficient data or processing time were available to characterize a particular habitat, it was eliminated from this iteration of the framework. Habitat types eliminated from further consideration in this version of the site prioritization analysis include intertidal rock, subtidal unconsolidated sediments and pelagic. The site prioritization framework presented here will, however, allow for additional habitat categories to be added as new information becomes available or sufficiently processed to fit into the framework. The FWC provided geospatial maps for the following marine/estuarine habitat categories:

- mangrove forest
- salt marsh
- submerged aquatic vegetation
- tide flats
- marine hardbottom; and
- artificial structures.

The Nature Conservancy assembled habitat maps for the following habitat categories using FWC spatial information as well as information from other sources (see Table 2 for specifics):

- coral reefs,
- beach/surf zone;
- coastal tidal river or stream.

Distribution maps for the following additional habitat targets were assembled exclusively by the Conservancy from a variety of data sources: bivalve reef (oyster reefs), annelid (worm) reefs and inlets. Table 2 lists the data sources for each selected marine/estuarine coarse filter target and describes any additional processing of the dataset conducted by The Nature Conservancy or project partners. Table 3 identifies the subregions in which specific coarse filter target data was utilized for the site selection modeling process.

Figure 2 depicts the number or density of coarse filter data surveys used in the site prioritization analysis. We created this map by overlaying our planning area with all of the coarse filter target datasets used in the analysis. Planning units were given a score based on the number of data surveys/groups occurring within each planning unit. Each data survey/group as listed in Table 4 was given a score of 1. The number of data surveys/groups represented in each planning unit varied from 0 to 14. Figures 3 through 13, illustrate the distribution of the coarse filter targets included in the site prioritization analysis. Lack of coarse filter data utilized in a specific subregion may reflect target distribution limits (e.g., coral reef, mangrove forest), lack of data of sufficient quality (e.g., oyster reefs), or other factors. The target ocean inlets and passes was not utilized as target in Subregion 5, Southwest Florida/Ten Thousand Islands, due to the exceedingly large number of small islands, and consequently passes, in the area.

Where benthic habitat maps were not available, benthic habitat type was predicted using an ArcInfo GIS model developed by Duke University Marine Geospatial Ecology Laboratory (2005) based on bathymetry data (90-meter grid scale) and using four geophysical features (depth, topographic variety, amplitude of topographic change and substrate type). The rationale for this approach was that there is often a strong correlation between benthic complexity and biological diversity. Topographic variety was classified as flat, slope, ridge and canyon. Sediment classes were extrapolated from data in the ASMFC SEAMAP Project and the USGS usSEABED Project (http://walrus.wr.usgs.gov/usseabed). Application of the resulting model predicted a full range of potential benthic habitat types. The site prioritization analyses presented in the body of this report were conducted without considering the benthic complexity and hardbottom targets primarily because concerns were expressed during the expert review workshop that these datasets were based on incomplete information and that their inclusion would likely bias the results toward areas where more information was available. These datasets are, however, included in the framework, so that they may be used in future analyses when deemed helpful. Maps depicting the benthic data layers are contained in Appendix B.

Fine Filter (Species) Targets: Fine filter or species targets may be included in site prioritization analyses to represent ecologically important areas that are not likely to be adequately represented by coarse filter (habitat) targets alone. Inclusion is typically reserved for the most imperiled and/or rare species so as not to allow the fine filter information to “overwhelm” coarse filter targets in the prioritization analysis. We did not, however, include fine filter targets in the analyses presented in the body of this report so as to remain consistent with the FWC goal of using a habitat based approach for the Florida CWCS process. It would also have been impractical to include the dozens of marine species identified as species of greatest conservation need (SGCN) through the CWCS process in this analysis because the variation in available distribution information is such that it would be impossible not to bias the analysis toward species where distribution information has been more widely collected.

For those interested in other applications of this site prioritization framework beyond the CWCS process, we identified, selected and assembled distribution information on the most ecologically imperiled species for which there was appropriately scaled data. This information is presented in Appendix C along with data sources, rationales for inclusion, distribution maps and sample model output when fine filter targets are included.

**Table 2. Coarse Filter (Habitat) Source Data Used in Site Prioritization Analysis**

| TARGET | DATA TYPE | DATA SOURCE(s) | SOURCE DATASET NAME(s) | PROJECT DATA PROCESSING | DATASET EXTENT | PROJECT DATASET NAME(s) |
|---|---|---|---|---|---|---|
| Coral Reef | Polygon | FWC-FWRI | sf_benthic_97.shp | Isolated patch & platform margin reefs attributes; | SE Florida & Florida Keys | sf_benthic_97.shp |
| | | Palm Beach County | palm beach 2003_reef_OFFSHORE.shp | Used as is; | | palm beach 2003_reef_OFFSHORE.shp |
| | | | and LADS data | Created reef shapefile from LADs data; | | palm beach reefs.shp |
| | | Miami Dade County | LADS data | Created reef shapefile from LADs data; | | miami dade reefs.shp |
| | | Broward County | broward reefs.shp | Used as is. | | broward reefs.shp |
| Oculina | | NURC/UNCW | oculina.shp | | | oculina.shp |
| | | | | ------------------------- For all coral reef datasets, we identified patch (discrete reef patches, mostly shallow at 0-15 meters deep), shallow bank (0-10 meters deep), deep bank (10-30 meters deep), and deep reef resources (30-200 meters deep). | | |
| Mangrove Forest | Polygon | FWC (FL GAP) | fl_veg03.shp | Isolated mangrove forest & scrub mangrove attributes; Converted raster data to shapefile. | Statewide | fl_veg03_mangroves.shp |
| Beach/Surf Zone | Polygon | FWC (FL GAP) | beach_surf_zone.shp | Used as is (missing SE Florida beaches) | Statewide, incomplete; | beach_surf_zone.shp; |
| | | SFWMD | beaches_wmd.shp | Used as is. These 2 datasets complement each other to fill gaps in each. | Statewide, incomplete | beaches_wmd.shp |
| Salt Marsh | Polygon | FWC (FL GAP) | fl_veg03.shp | Isolated salt marsh attribute; Created shapefile from raster data. | Statewide | flveg03saltmarsh |
| Submerged Aquatic Vegetation | Polygon | FWC-FWRI | seagrass_fl_1987to1999_poly.shp | Used as is. | Statewide | seagrass_fl_1987to1999_poly.shp |

| TARGET | DATA TYPE | DATA SOURCE(s) | SOURCE DATASET(s) | PROJECT DATA PROCESSING | DATASET EXTENT | PROJECT DATASET NAME(s) |
|---|---|---|---|---|---|---|
| Coastal Tidal River or Stream | Line | FWC-FWRI<br><br>USGS | Florida coastline and tidal rivers<br><br>National Hydrography Dataset (NHD) | Overlaid “Florida coastline and tidal rivers” with NHD stream reaches | Statewide | coastal_rivers2d.shp |
| Tide Flats | Polygon | FWC (FL GAP)<br><br>FWC-FWRI | fl_veg03.shp<br><br>tidefl.shp | Isolated tide flats attribute in fl_veg03 and combined with FWC/FWRI's tide flats layer. | Statewide | fl_veg03_and_FWRI_tidalflats.shp |
| Marine Hardbottom[1] | Polygons | SEAMAP, 1997<br><br>FWC-FWRI | seamap.shp<br><br>sf_benthic_97.shp | Selected hardbottom and potential hardbottom attributes, and joined the two resulting files. | Florida Atlantic Coast with some gaps | HardbottomC.shp |
| Bivalve Reef (Oyster) | Polygon | Grizzel et al. 2002<br><br>USFWS<br><br>ANERR<br><br>A. Volety<br><br>SFWMD<br><br>SRWMD<br><br>SRWMD/ USGS-NWRC | Canaveral_Seashore_allreef-final.shp<br><br>national_wtlds_inventory_areas.shp<br><br>Oyster_Bars_ANERR.shp<br><br>Oysters bar aerials, SW FL<br><br>SLO2003beds.shp<br><br>oyster_bigbend.shp<br><br>oyster_nw_92.shp | Used as is;<br><br>Isolated intertidal mollusk reef in NWI;<br><br>Used as is;<br><br>Created shapefile from aerial images for SW FL;<br><br>Used as-is;<br><br>Used as is;<br><br>Used as is. | East-Central Florida<br><br>Statewide<br><br>Apalachicola NERR<br><br>SW Florida<br><br>St. Lucie Estuary<br><br>Big Bend<br><br>Panhandle | Canaveral_Seashore_allreef-final.shp<br><br>nwi_est_intrtdl_moll_reefs.shp<br><br>Oyster_Bars_ANERR.shp<br><br>oysterssw.shp<br><br>SLO2003beds.shp<br><br>oyster_bigbend.shp<br><br>oyster_nw_92.shp |
| Annelid Worm Reef [2] (Sabellariidae) | Polygon | D. McCarthy<br><br>D. Kirtley & W. Tanner<br><br>D. Stauble & D. McNeill | N/A | Created shapefile using graphics and text descriptions with reference points; in some cases located reefs mentioned in text above using FGDL – Digital Orthophoto Quarter Quad 3 Meter aerial images; some coordinates also used | Southeast & East Central Florida | wormreefs.shp |

| TARGET | DATA TYPE | DATA SOURCE(s) | SOURCE DATASET(s) | PROJECT DATA PROCESSING | DATASET EXTENT | PROJECT DATASET NAME(s) |
|---|---|---|---|---|---|---|
| Ocean Inlets and passes | Polygon | Univ. of FL Geoplan Center & USGS | Aerial photos (digital orthoquads, DOQQs) | Used Geoplan & USGS county aerials to ID locations; Solicited expert input re: polygon size. | Statewide | inlets_poly_statewideWkeys.shp |
| Artificial Structures | Point | FWC-FWRI<br><br>FWC-FWRI | Artreef_new.shp<br><br>ESI.shp | Used as is;<br>Isolated solid man-made structures attribute in Environmental Sensitivity Index shapefile. | Statewide<br><br>Statewide | artreef_new.shp<br><br>solidstr.shp |
| Benthic Complexity[2] | Polygon | National Geophysical Data Center | 90 meter bathymetry data | Model derived by Duke University Marine Geospatial Ecology Laboratory (DUGAP 2005); Gulf Coast dataset produced by G. Cumming | Statewide with some gaps | bc2-poly.shp |

[1]*Based on input received at expert workshops, the marine hardbottom and benthic complexity targets were left out of the draft result scenarios presented in the body of this report.*
[2]*Survey information for sabellarid worm reefs in Florida was only available for the sabellarid, Phragmatopoma lapidosa, which occurs in east-central and southeast Florida coastal areas.*

**Table 3. Subregions with Coarse Filter Target Datasets Included in Report Analysis**

| | **Subregions** | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Coarse Filter Target** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** |
| Coral Reef | | x | x | | | | | |
| Mangrove Forest | x | x | x | x | x | x | x | |
| Beach/Surf Zone | x | x | x | x | x | x | x | x |
| Salt Marsh | x | x | x | x | x | x | x | x |
| Submerged Aquatic Vegetation | x | x | x | x | x | x | x | x |
| Coastal Tidal River or Stream | x | x | x | x | x | x | x | x |
| Tide Flats | x | x | x | x | x | x | x | x |
| Bivalve Reef (Oyster) | x | x | | | x | x | x | |
| Annelid Worm Reef (Sabellariidae) | | x | x | | | | | |
| Ocean Inlets and passes | x | x | x | x | | x | x | x |
| Artificial Structures | x | x | x | x | x | x | x | x |

**Figure 2. Density of the data used in the site prioritization analysis.**

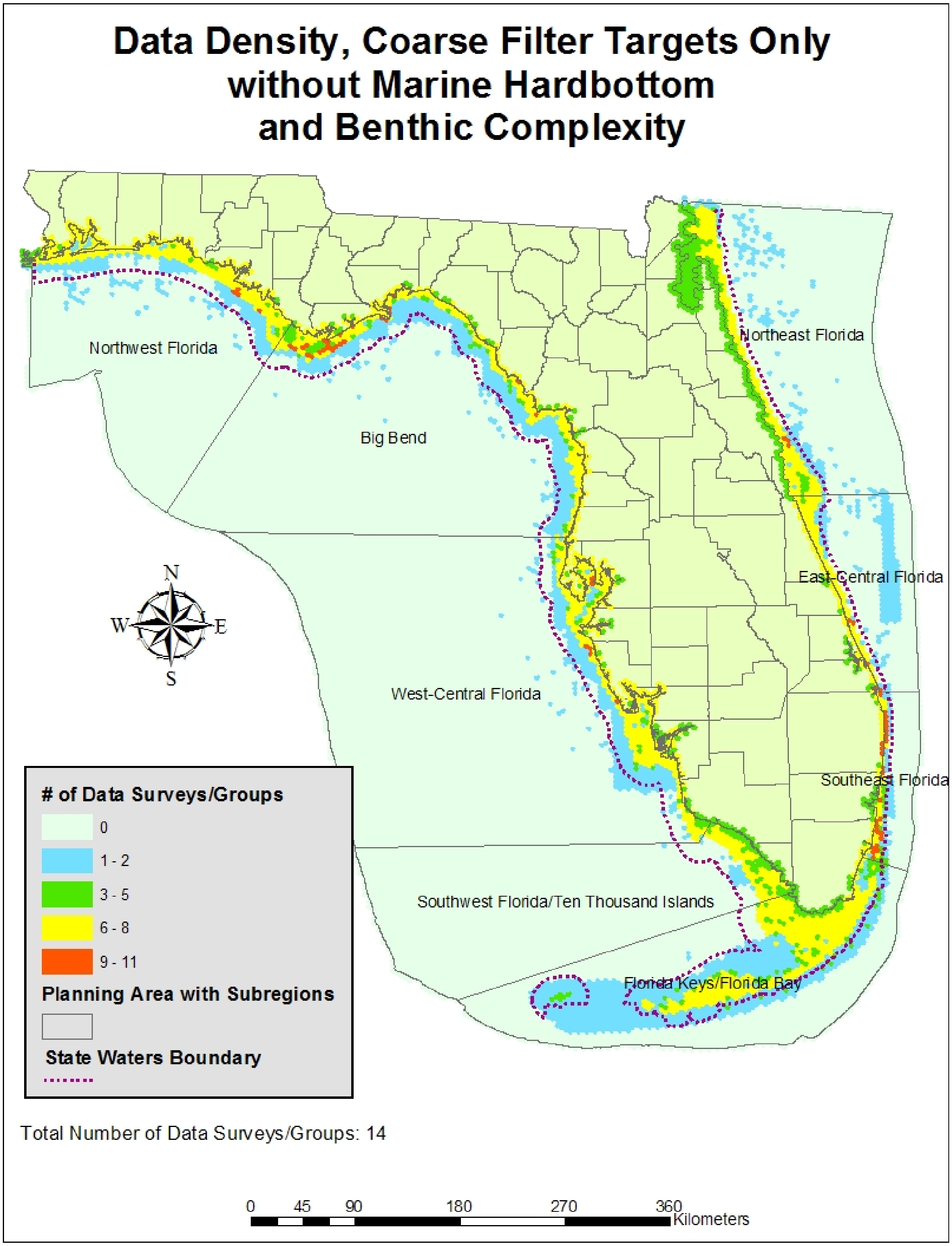


**Table 4. Coarse filter data surveys used to determine data density.**
Refer to Table 2 for additional information on the datasets/data groups listed below.

| | DATA SURVEY/GROUP NAME |
|---|---|
| 1 | Coral Reef, LADS surveys conducted for Miami-Dade, Broward and Palm Beach counties. |
| 2 | South Florida Benthic (sf_benthic_97.shp): Used for coral reef and hardbottom targets. |
| 3 | Coral Reef, Oculina (oculina.shp) |
| 4 | fl_veg03.shp (dataset includes the following targets: mangrove swamp, salt marsh and a portion of tidal flats and beaches) |
| 5 | Tidal Flats: FWRI dataset, tidefl.shp |
| 6 | beaches_wmd.shp (extracted from SFWMD Land Use 1995) |
| 7 | Submerged Aquatic Vegetation (seagrass_fl_187to1999_poly.shp) |
| 8 | Coastal Tidal Rivers or Stream (coastal_rivers2d.shp) |
| 9 | Bivalve reef, oysters (includes the 7 sources of data listed in Table 1). |
| 10 | National Wetlands Inventory |
| 11 | Aerial photos, digital orthoquads: Used for ocean inlets and passes target. |
| 12 | Environmental Sensitivity Index: Used for artificial structure, hardened shoreline target |
| 13 | Annelid worm reefs (wormreefs.shp): Surveys conducted by several individuals; May overlap, but only counted as one data survey/group. |
| 14 | Artificial Structure, artificial reef (artreef_new.shp) |

**Figure 3. Coarse filter target – coral reef.**

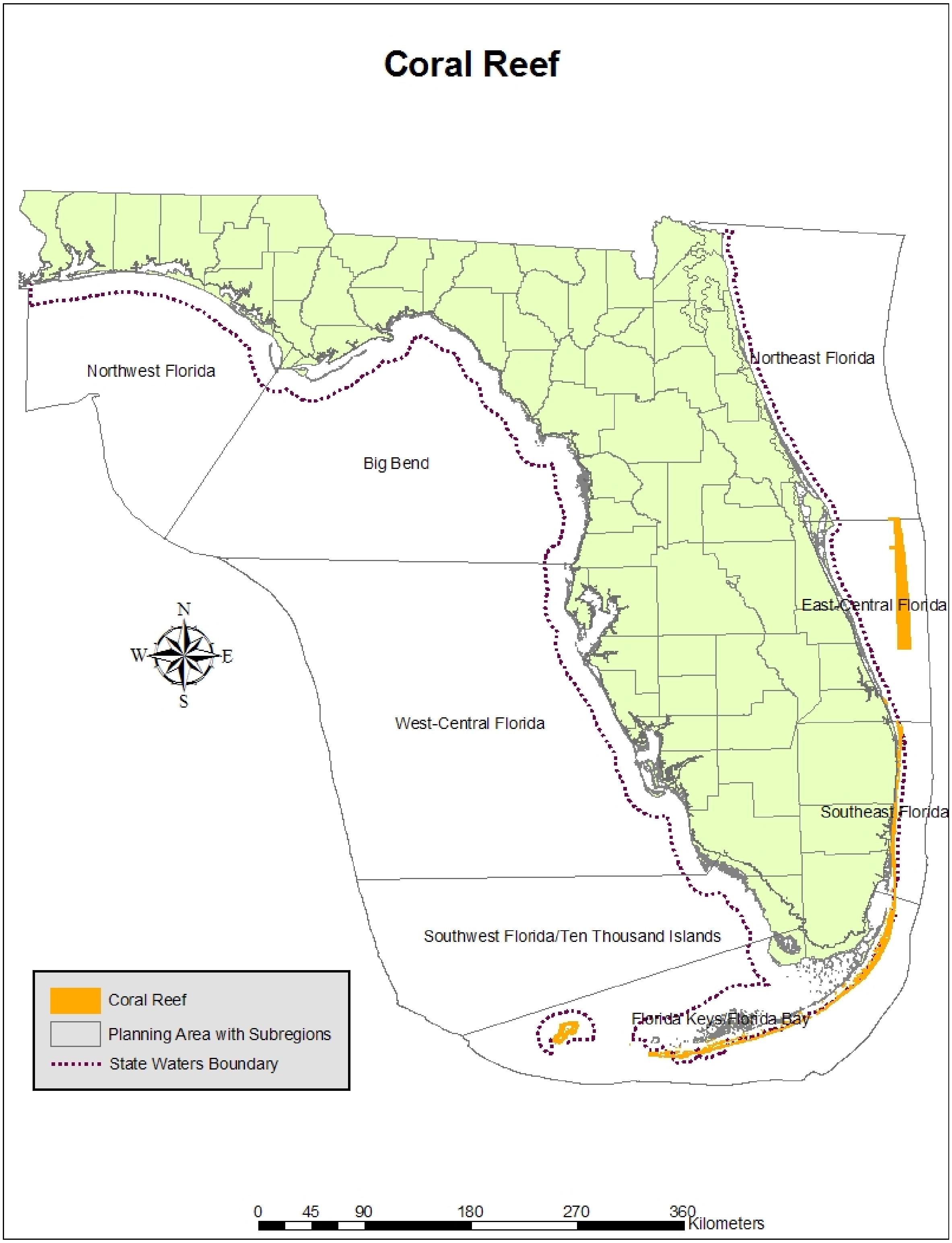


**Figure 4. Coarse filter target – mangrove forest.**

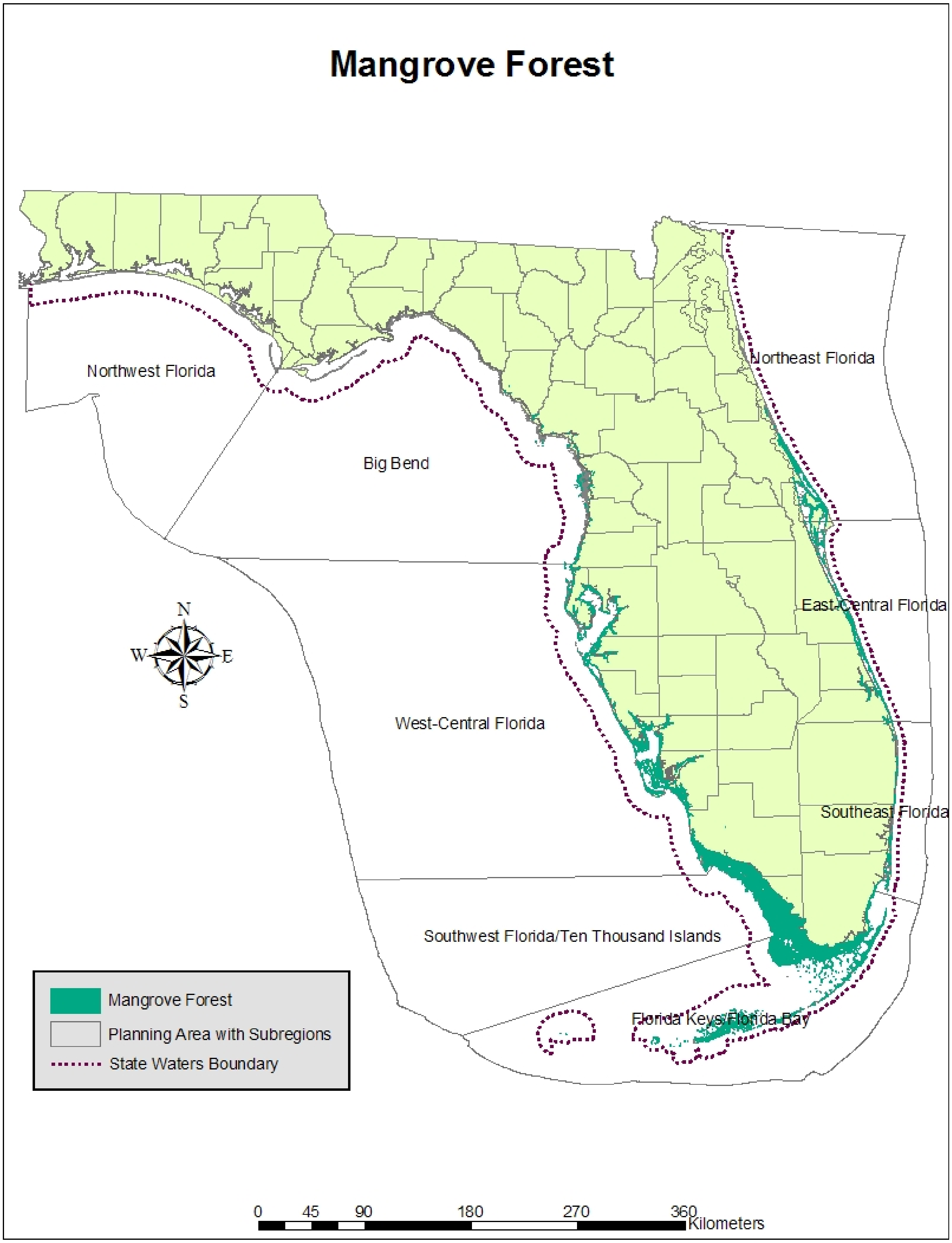


**Figure 5. Coarse filter target – beach/surf zone.**

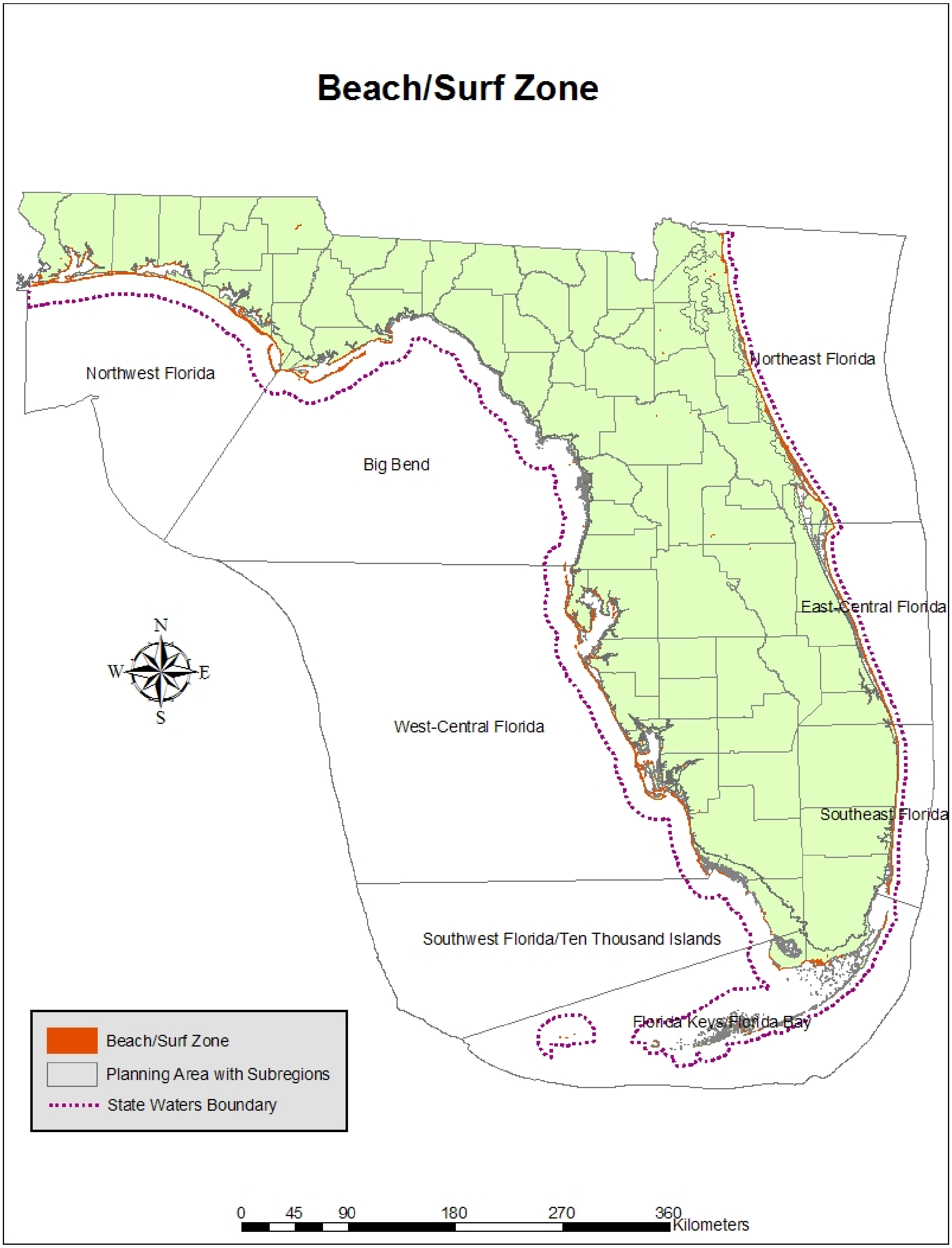


**Figure 6. Coarse filter target – salt marsh.**

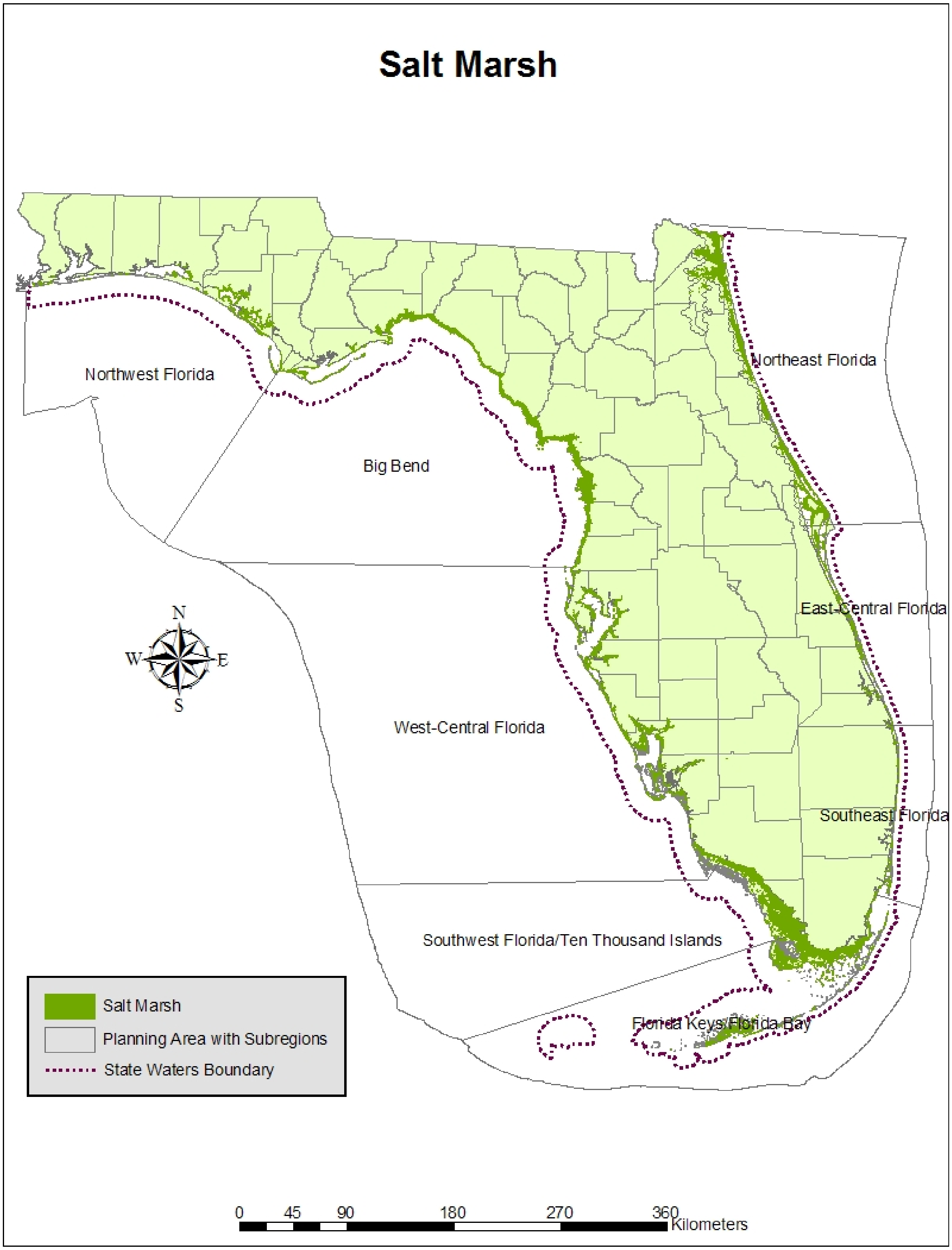


**Figure 7. Coarse filter target – submerged aquatic vegetation.**

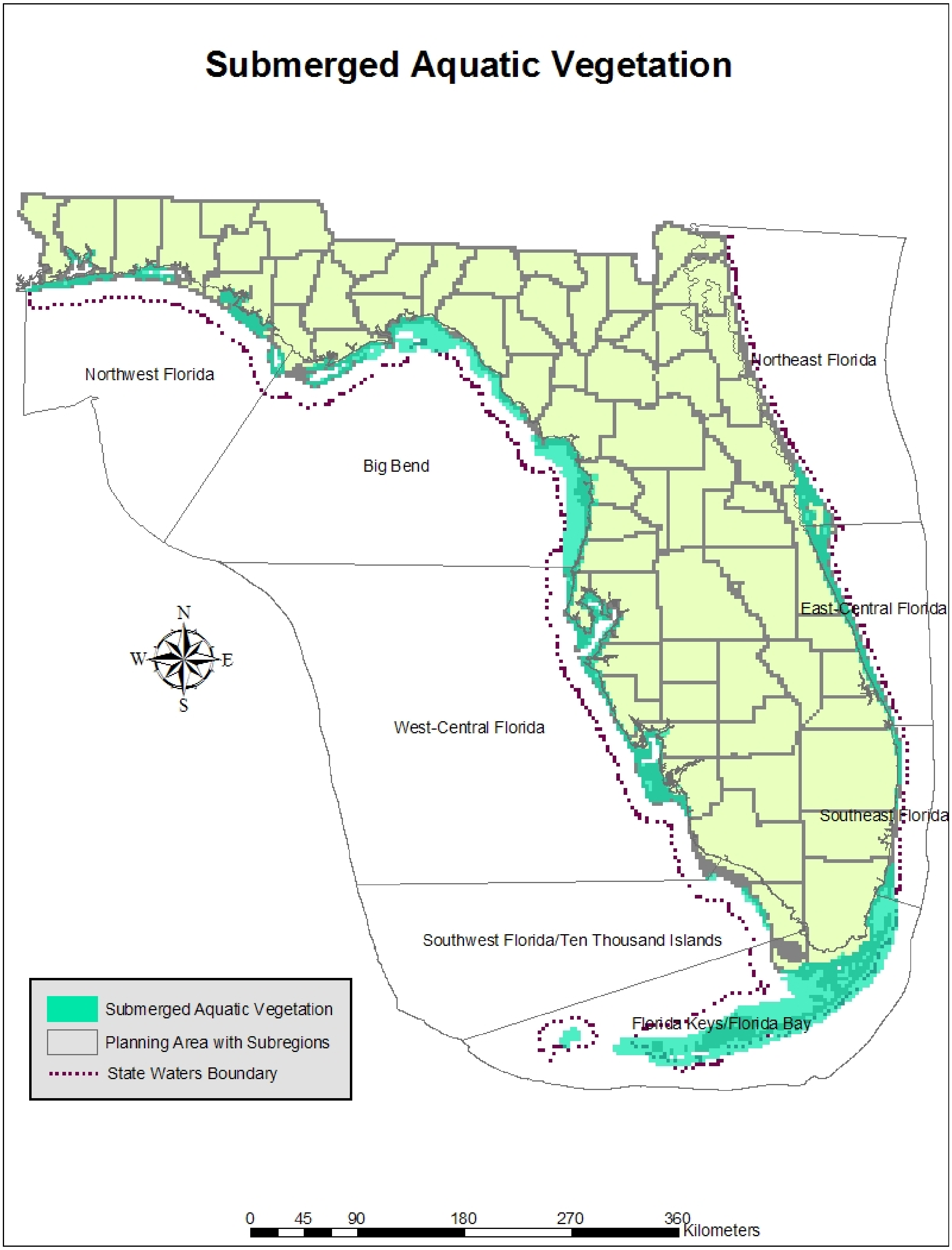


**Figure 8. Coarse filter target – coastal tidal river or stream.**

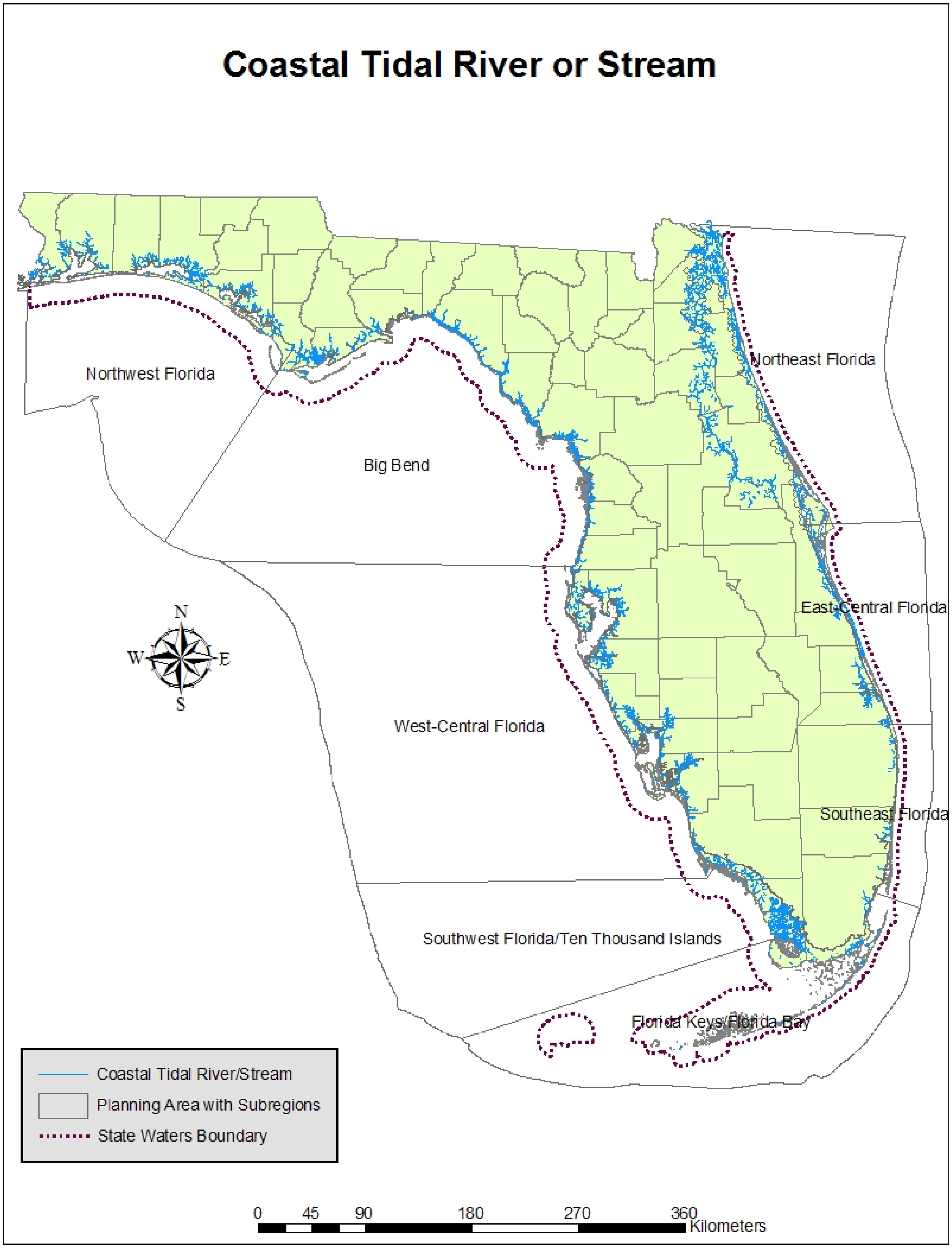


**Figure 9. Coarse filter target – tidal flats.**

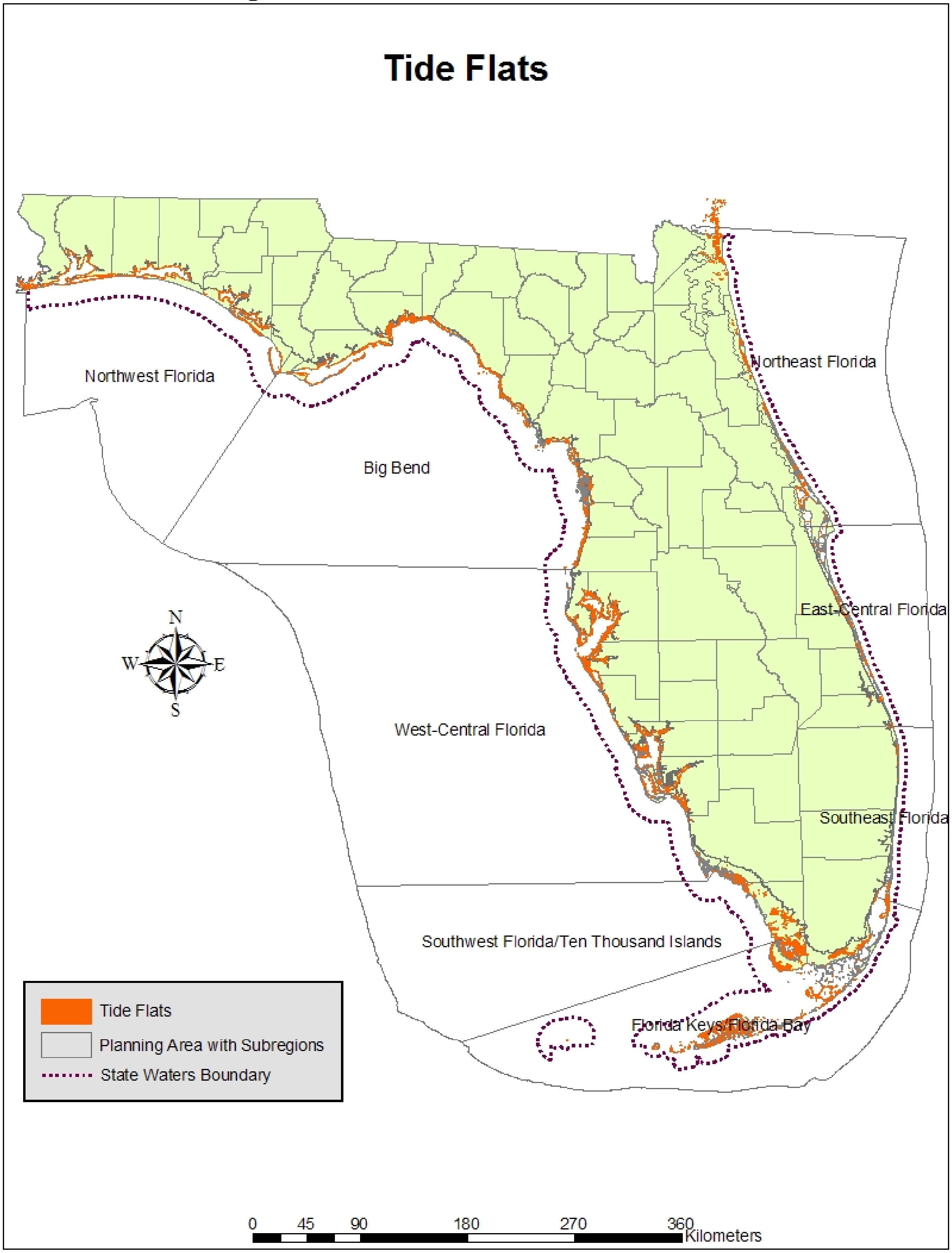


**Figure 10. Coarse filter target – bivalve reef (oyster bed).**

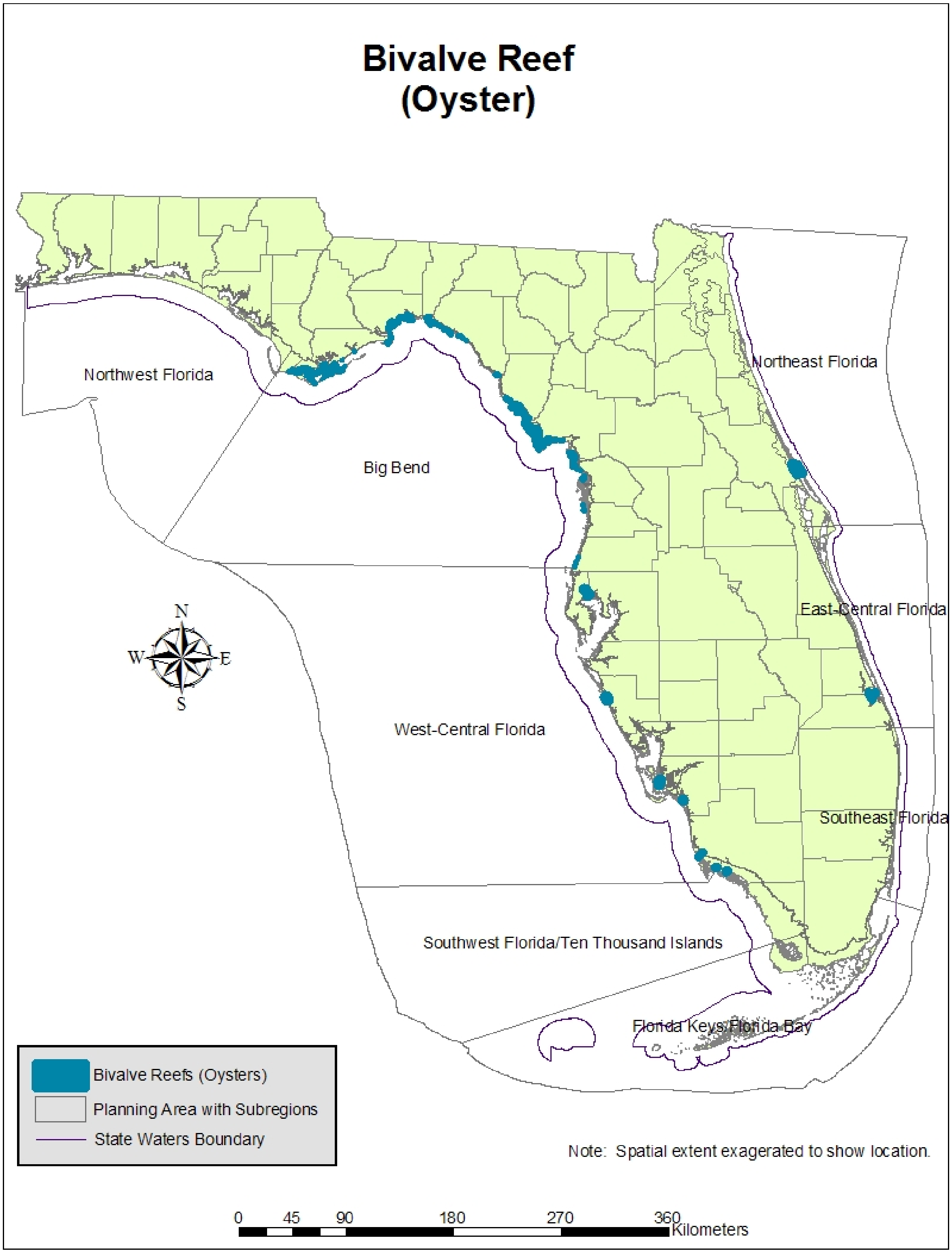


**Figure 11. Coarse filter target – annelid  worm reef.**

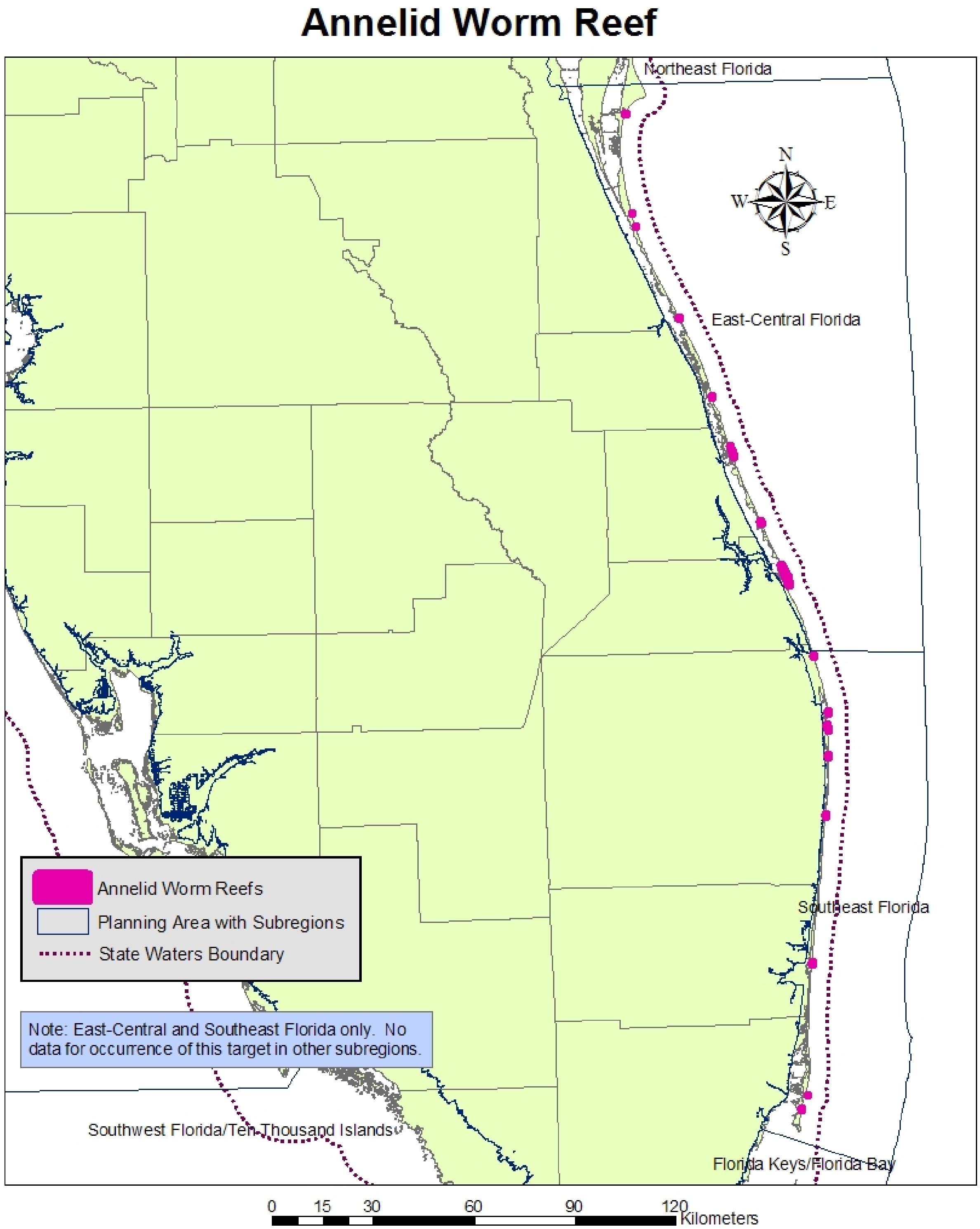


**Figure 12. Coarse filter target – ocean inlets and passes.**

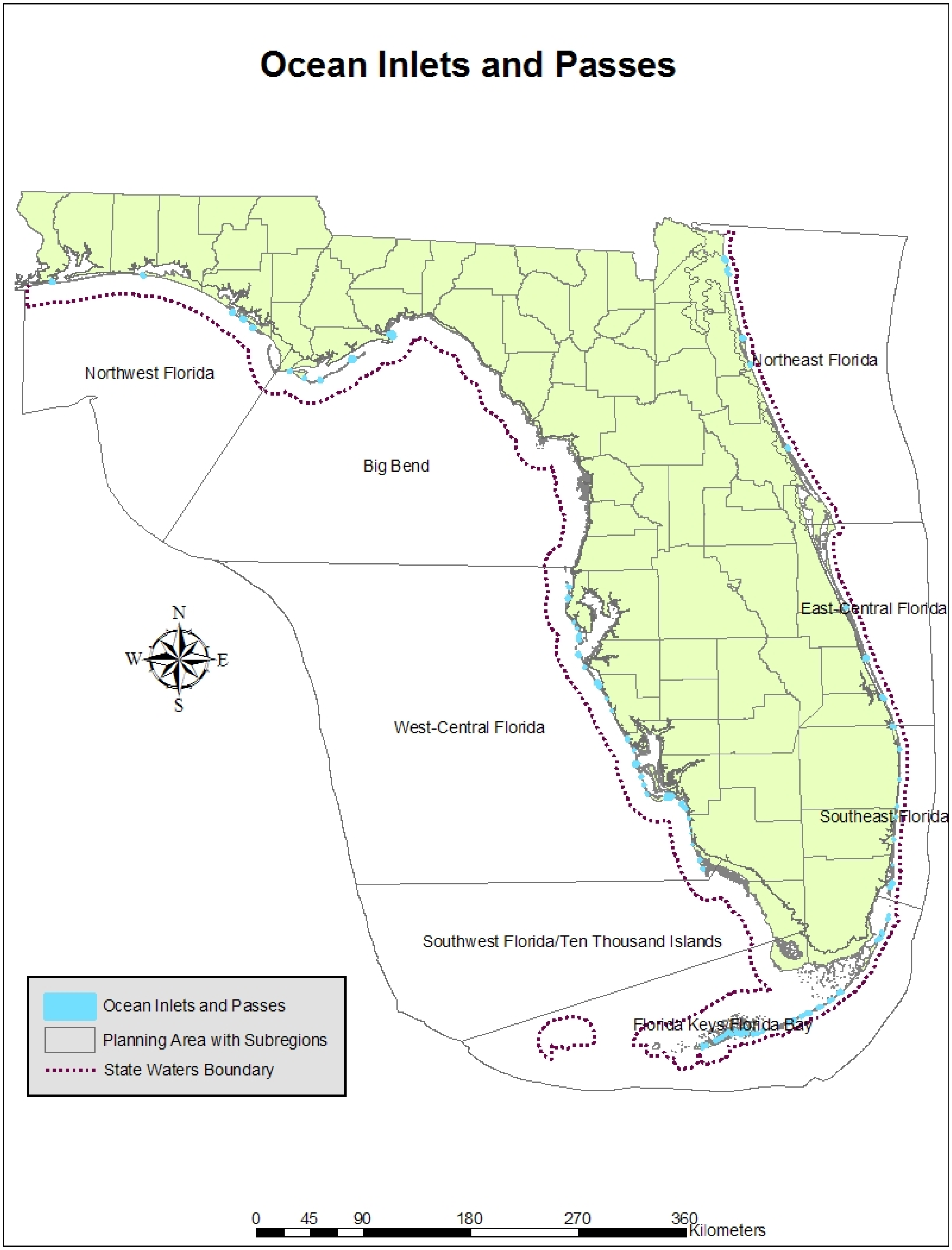
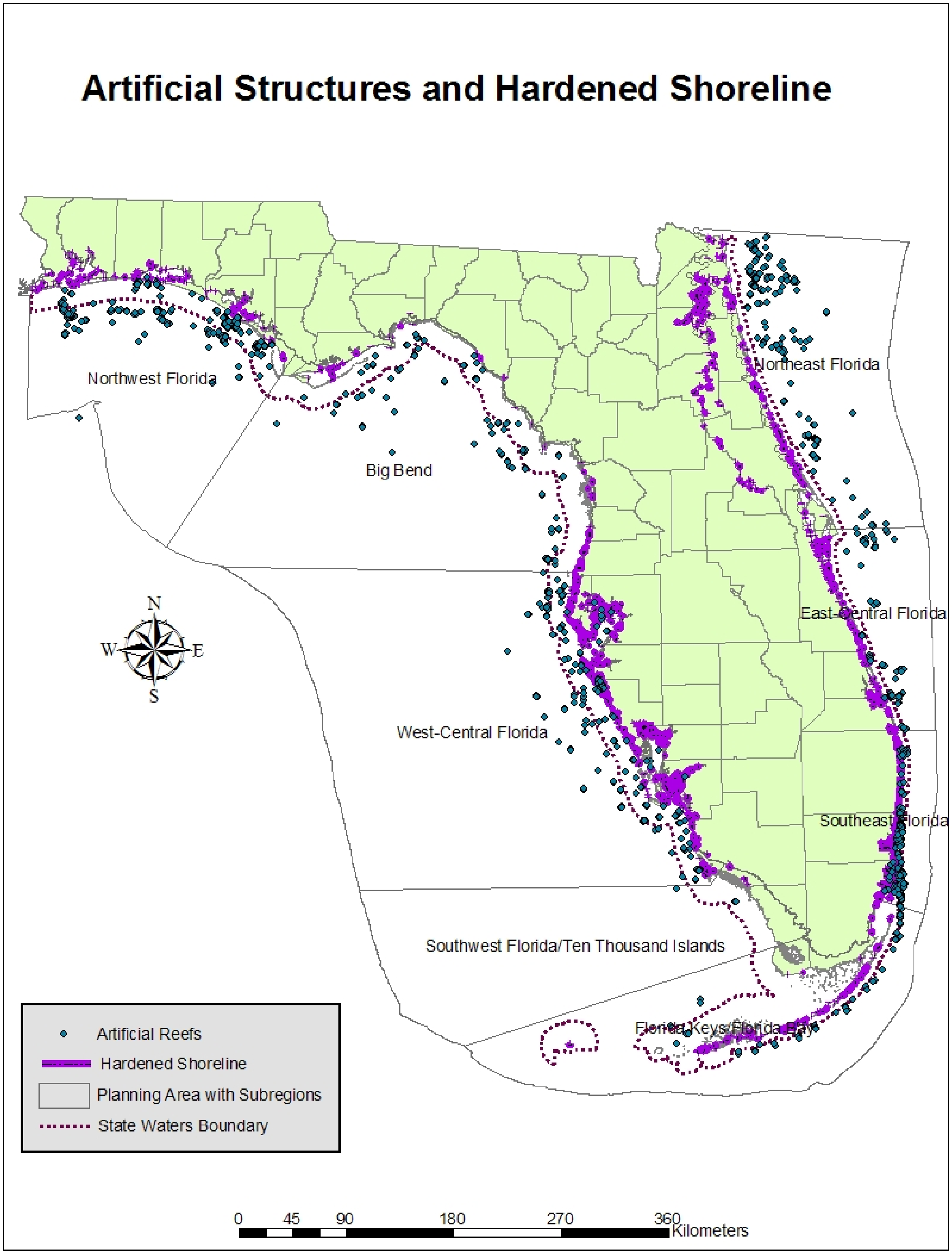


**Figure 13. Coarse filter target – artificial structures**



**Suitability Index: Determination of relative habitat condition/ecological integrity**

The MARXAN algorithm allows for inclusion of a suitability index (the "cost surface") that takes into consideration the relative condition/ecological integrity of habitat and species targets. The purpose of the suitability index is to enable the model to distinguish between less versus more impacted or heavily utilized areas to give more preference in the selection process to less impacted, less utilized areas. The cost surface also allows the inclusion of opportunity costs and other economic variables into the site selection process. For example, prioritizing potential mining sites as conservation areas may result in a loss of further revenue to local stakeholders. During expert evaluation of draft model results, a distinct preference was expressed to not include the suitability index in the site prioritization analysis prepared for Florida's CWCS. The reasoning provided was that some agencies, organizations or individuals may decide that biologically important, but heavily impacted/used areas should be the focus of additional resource management or conservation attention. Consequently, we have removed the suitability index from the site prioritization analysis, with one exception that will be discussed below under managed areas on page 29. Instead, we have run MARXAN without the suitability index while providing a spatial threat layer to be viewed in conjunction with the site prioritization results. A description of the spatial threat layer is described below in the section titled "Additional Analytical Steps" on page 43.

**Target Representation in the Site Prioritization Framework**

A required input into the MARXAN algorithm is the level at which each target is represented, or more specifically in our case, how much of each habitat to represent in the model output. Selection of habitat representation factors should take into consideration the purpose for which the site prioritization results will be used. One purpose of site prioritization may be to identify the minimum amount of each habitat type required to maintain fully viable populations and communities into the future. So far, there is no universal agreement on what this representation should be or how representation should be derived. Several recent publications on the topic suggest that target representation for such purposes be set between 20% and 30% of the habitat's historic distribution (Beck, 2003). Another purpose of site prioritization, and perhaps the one that best meets CWCS goals includes selecting a set of priority sites on which to focus additional resource management or conservation activities. This approach recognizes, of course, that all areas are important for natural resource conservation, but attempts to appropriately direct limited financial resources, staff and time to locations where the chance of success is greatest and/or conservation actions will be most effective.

We utilized several different target representation approaches in the model output presented in this report to illustrate the extent to which different target representation approaches influence model results. We used two universal representation factors (all targets set at a single factor of either 20% or 40%) and a method for objectively setting variable target representation factors developed by Chatwin (2004) for the Conservancy's Caribbean Ecoregional Assessment. Chatwin's method bases target representation on the following four attributes: degree of rarity, vulnerability to human activities, current status as compared to historic, and whether the target represents a source area (i.e, a reproductive aggregation site such as nesting colony, spawning aggregation, etc.)

In the variable target representation approach, we rated four attributes (degree of rarity, vulnerability to human activities, current status as compared to historic and whether target is a source area) on a scale of 1 to 3 with 1 being less rare, vulnerable or compromised and 3 being more rare, vulnerable or compromised. The source area attribute was rated either a “1” for not a source area or a “3” for a source area. Scores were based on information available in scientific literature. We then determined the frequency distribution of the total attribute scores and assigned a representation factor ranging from 20% to 50% to coarse filter targets. The frequency distribution and assigned representation factors for the coarse filter targets are presented in Figure 2 and Table 4. The attribute scores, overall ratings and representation factors ascribed to each target (both coarse and fine filter) in each subregion can be found in Appendix D.

**Figure 14. Frequency Distribution of Target Representation Scores**

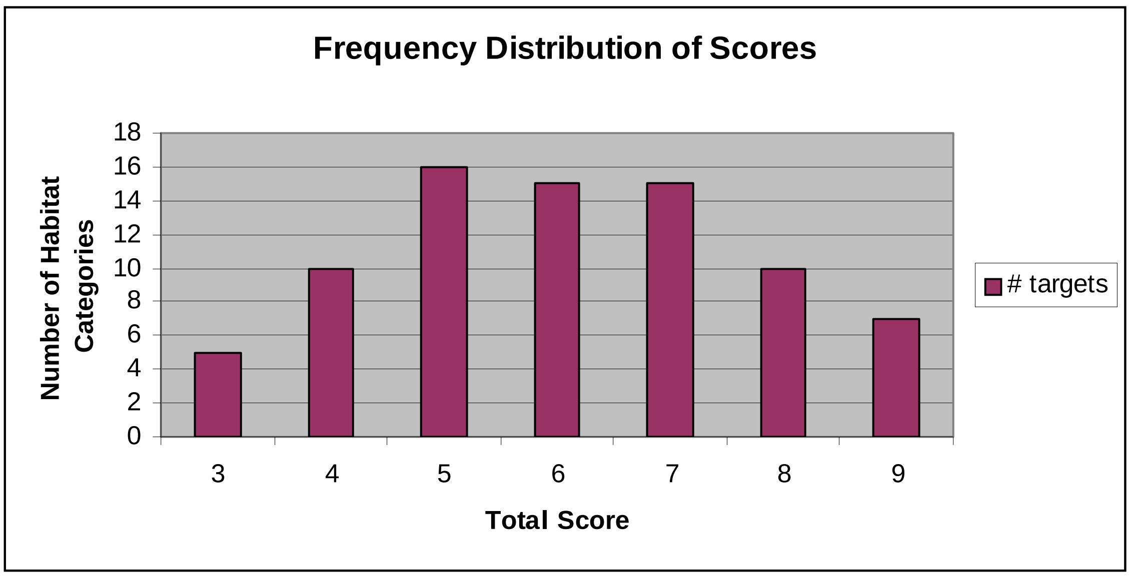



**Table 5. Total scores, number of coarse filter (habitat) targets & assigned representation factors**

| Total Attribute Score | Number of Targets | Assigned Representation Factor |
|---|---|---|
| 3 | 5 | 20% |
| 4 | 10 | 25% |
| 5 | 16 | 25% |
| 6 | 15 | 30% |
| 7 | 15 | 30% |
| 8 | 10 | 30% |
| 9 | 7 | 50% |

## Site prioritization assessment using the MARXAN Model

We used MARXAN, a site selection algorithm, to help us select and design a portfolio of priority sites. MARXAN was originally developed to inform reserve design. In this analysis, we used MARXAN, a simulated annealing algorithm, to assist in the identification of potential priority marine and estuarine sites that may warrant additional conservation or management attention. In our application, MARXAN identifies a set of areas that meet all of our selected target representation (i.e., habitat) goals while minimizing the size of the total area selected. The MARXAN analyses presented here were conducted by Dr. Graeme Cumming, Wildlife Ecology Department, University of Florida.

The input parameters for the MARXAN algorithm that we used are the spatial distribution of the selected coarse filter (habitat) targets, the representation factors for each habitat target in each subregion, and a boundary length modifier. The Boundary Length Modifier (BLM) regulates how spatially aggregated the results will be and can be set anywhere between 0 and 1. At a setting of 0, the BLM does not influence the model results and they will constitute the most spatially efficient solution (i.e., MARXAN will select the fewest number of planning units). As the BLM is increased, results will be progressively more spatially aggregated. The purpose of increasing the BLM is to avoid "speckling," which may make less sense from either an ecological or a management perspective. Diffusely scattered priority areas would likely be less effective for species conservation and would be more difficult to manage or monitor than priority areas that meet all of the same goals but display a more aggregated arrangement, even if the contiguous solution is somewhat less spatially efficient. As of yet, there is no universal agreement regarding what degree of spatial aggregation is optimal. For this report, we have presented sample model output using a BLM of 0.05. Interested parties may use this framework to rerun the model using any number of BLMs as a means of identifying a particular scenario that may be optimal for their purposes.

Using the input parameters, the model randomly generates an initial selection of planning units to meet selected representation factors. The model then calculates the cost of the initial selection in terms of total area and boundary length. After assessing the initial set, the program randomly selects individual planning units and determines the value of keeping, adding or deleting them. This process is repeated ten million times in each model run to achieve an optimal solution. Each model run is in turn repeated 100 times and the best configuration from all 100 runs is identified. Figures 4 through 9 illustrate the draft results of six model runs. In all the model runs, only coarse filter targets were included and BLM was set at 0.05. The target representation approach and the handling of managed areas (described below) were varied.

Managed Areas: Two model scenarios were run with regard to managed areas. In one scenario, no special consideration was given to whether an area was part of an existing managed area. In a second scenario, the cost of including managed areas in the model solution was reduced. This reduction in the cost of managed areas increases the likelihood that MARXAN will select existing managed areas over otherwise equally valued areas in the model solution. For our scenarios that differentially valued managed areas, we reduced the base cost of a planning unit containing 25% or more of its area as managed by 10 points to 75 points (each planning unit was given a base cost of 85 points). Where managed areas were also designated as "no-take" zones, planning unit cost was reduced by an additional 25 points to 50 points. Since most no-take zones are relatively small, and most occur inside managed areas anyway, the 25% criterion was not applied to no-take zones. Planning units were scored as no-take and assigned a cost of 50 if they contained any no-take area at all. In model run scenarios where no special consideration was given to managed areas, planning units were all assigned the same cost. Figure 3 illustrates how we handled the cost of managed areas in scenarios where the cost of planning units containing managed areas was reduced. Planning units are assigned a base cost to enable MARXAN to minimize the area selected by minimizing overall cost of the solution.

The sample model outputs of the optimal solution presented in this report (Figures 4-9), meet all of the coarse filter (habitat) representation goals set in each subregion. In every case, target representation goals are met at 100% or greater. We also calculated overall statewide percent of habitat representation exceeding 130% of the selected representation goals (see Table 5). Tables listing the percentages at which each target's representation goal is met in each subregion is available upon request. For all of the sample model outputs, the percent of targets exceeding 130% of the target representation factor for the entire planning area ranged between 25% to 33% (0 to 67% in subregions). The most efficient of these runs at meeting, but minimizing exceedance of target goals was the run with variable target representation and managed areas given a lower cost (i.e., greater likelihood of being selected in the final solution). The least efficient of these runs was the model run with target representation set at 20% for all targets and managed areas given no special attention. Another means for comparing model runs is spatial efficiency as illustrated in Table 6. Using this criterion, the model run with all target representation factors set at 20% and with managed areas given a lower cost selected fewer planning units overall than any other run. We expected runs with lower overall target representation factors to select fewer planning units in the solution. Spatial efficiency and efficiency at meeting set target representation factors should, however, be viewed as only two factors in the site selection process.

Viewing the sample model output of the summed solutions (Figures 10-12) is also informative. The summed solutions represent the number of times out of 100 runs a particular planning unit is selected. The sample model outputs showing summed runs illustrate planning units that were selected more than 50 times out of the 100 runs (each run went through 10 million iterations). The sample model outputs presented in this report should be viewed as a starting point for selecting areas that may warrant additional resource management or conservation attention. The site selection framework presented in this document may not, for example, be currently capable of identifying all ecologically important areas that should be subject to additional management and/or conservation attention. Substantial expert input recognized that the large central portion of the Big Bend Area was largely ignored in the sample model output of potential priority sites. This is not clearly understood and should be further examined as part of the development of future iterations of this framework. Optimally, the results presented in this document will be used as a guide for expert discussions to select final priority areas and can be used in conjunction with additional analyses such as the spatial threat analysis presented in the next section.

**Table 6. Efficiency of Meeting the Model Run Target Representation Factors. Only coarse filter targets included (marine hardbottom and benthic complexity excluded).**

| **Percent of Targets with Goals Exceeding 130% of the Target Representation Factor** **SUBREGION ->** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **Entire Planning Area** |
|---|---|---|---|---|---|---|---|---|---|
| Variable Target Representation, managed areas given no special attention | 44% | 42% | 45% | 9% | 43% | 13% | 13% | 0% | 26% |
| Variable Target Representation, managed areas given lower cost | 44% | 42% | 45% | 0% | 43% | 13% | 13% | 0% | 25% |
| 20% Target Representation, managed areas given no special attention | 44% | 50% | 45% | 36% | 29% | 13% | 13% | 33% | 33% |
| 20% Target Representation, managed areas given lower cost | 44% | 67% | 45% | 27% | 14% | 13% | 13% | 33% | 32% |
| 40% Target Representation, managed areas given no special attention | 56% | 50% | 45% | 18% | 43% | 25% | 0% | 0% | 30% |
| 40% Target Representation, managed areas given lower cost | 56% | 58% | 45% | 18% | 43% | 13% | 0% | 0% | 29% |

**Table 7. Percent Planning Area Selected by Model Run. Only coarse filter targets included.**

| **Model Run** | **# Planning Units Selected*** | **% Planning Area Selected** |
|---|---|---|
| Variable Target Representation, managed areas given no special preference | 645 | 3.4 |
| Variable Target Representation, managed areas given lower cost | 642 | 3.4 |
| Target Representation = 20%, managed areas given no special preference | 462 | 2.4 |
| Target Representation = 20% managed areas given lower cost | 480 | 2.5 |
| Target Representation = 40%, managed areas given no special preference | 928 | 4.8 |
| Target Representation = 40%, managed areas given lower cost | 940 | 5.0 |

*Total planning units = 18,943

**Figure 15. Cost Surface for model run scenarios where managed areas are given a greater probability of selection.**

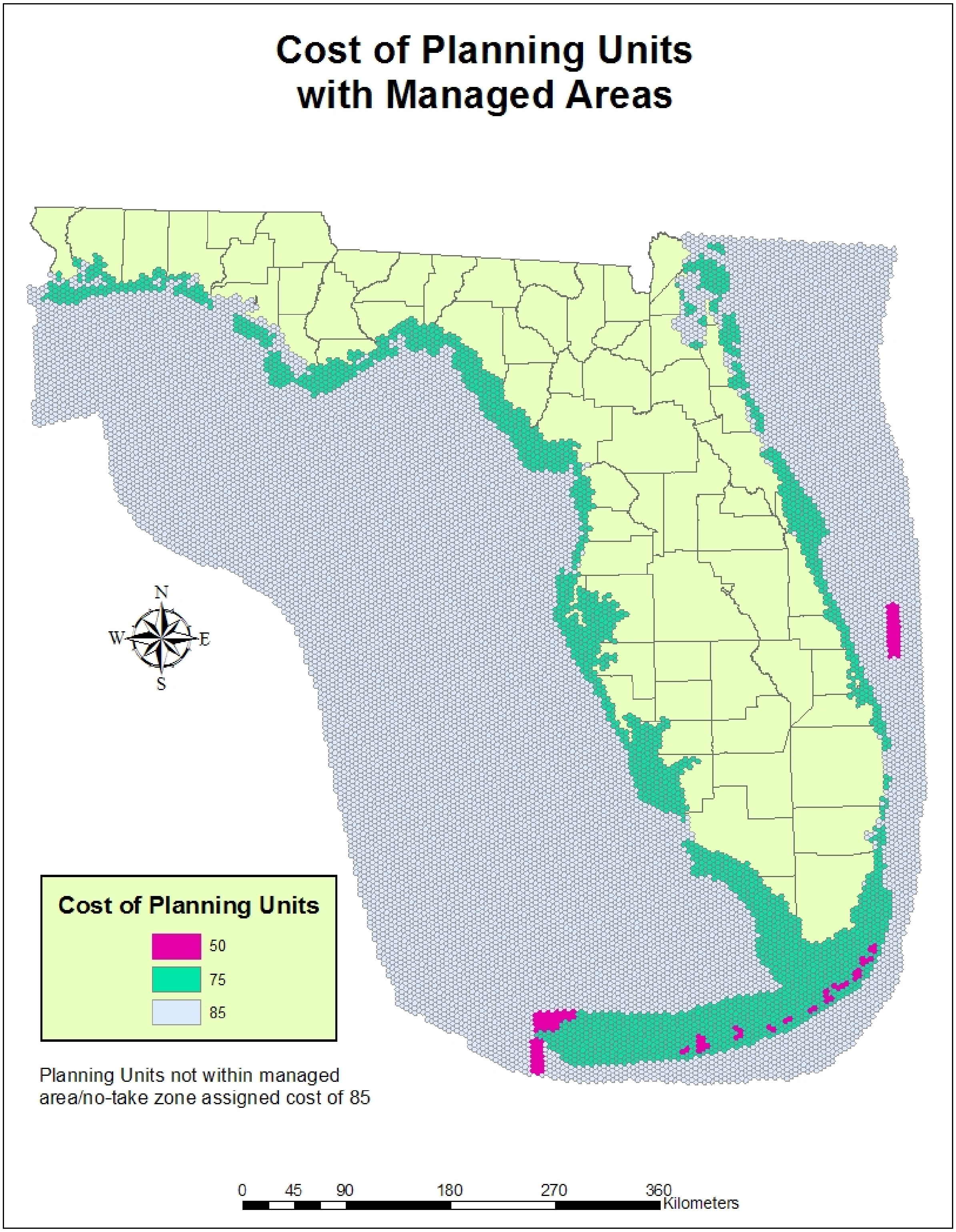


**Figure 16. Sample Model Output, Optimal Solution - variable target representation, existing managed areas given no special preference.**

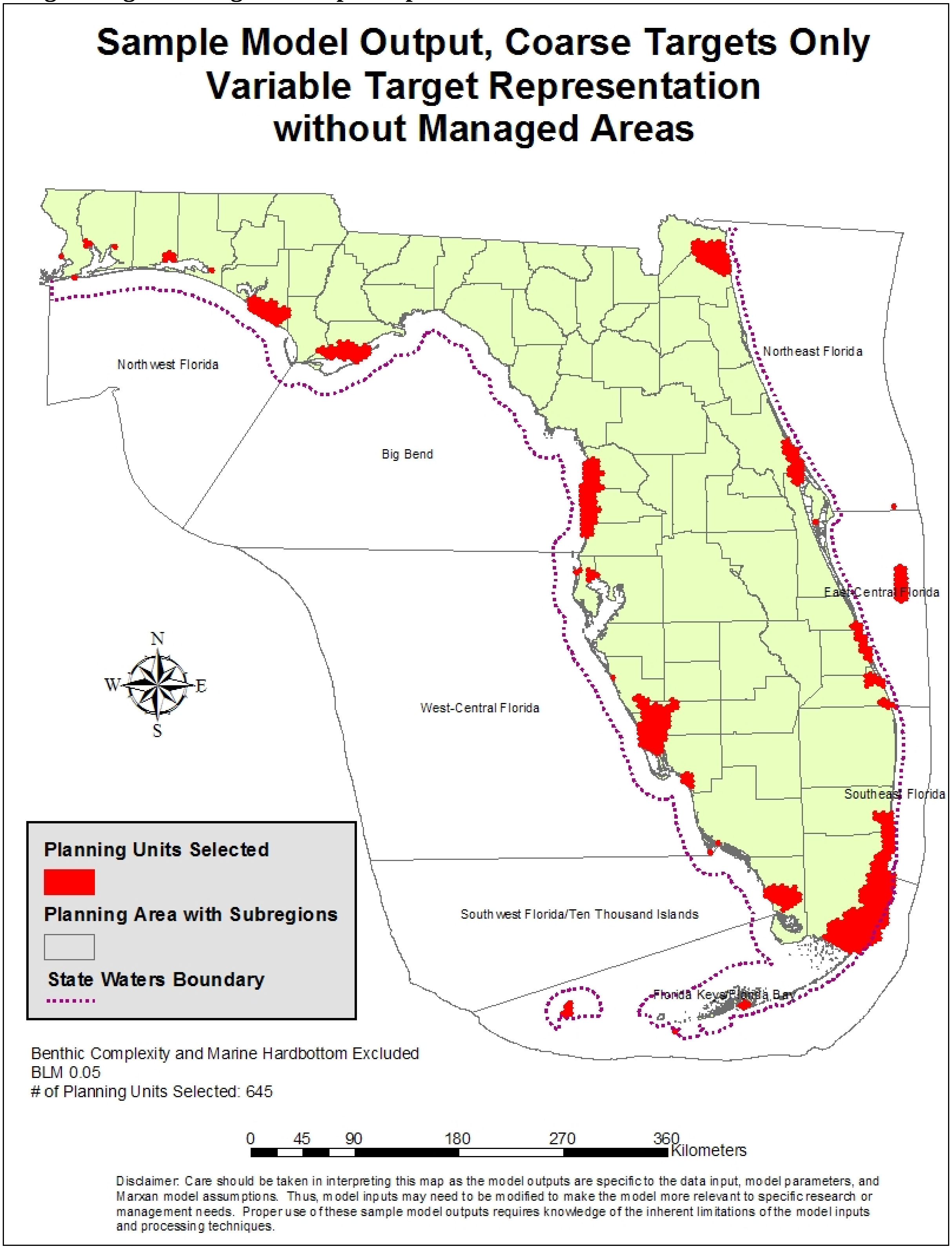


**Figure 17. Sample Model Output, Optimal Solution - variable target representation, existing managed areas given lower cost**

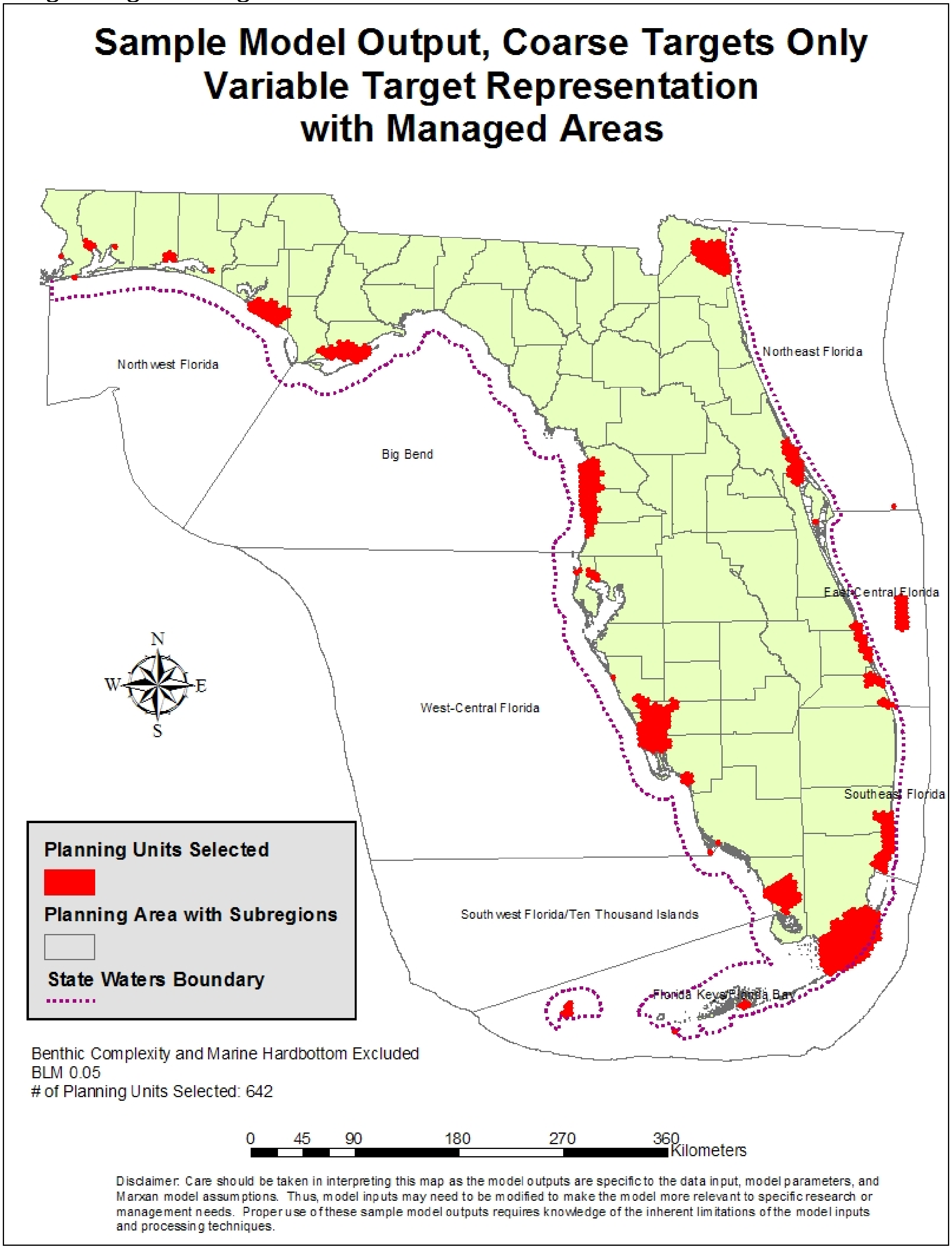


**Figure 18. Sample Model Output, Optimal Solution - target representation set at 20% for all targets, existing managed areas given no special preference.**

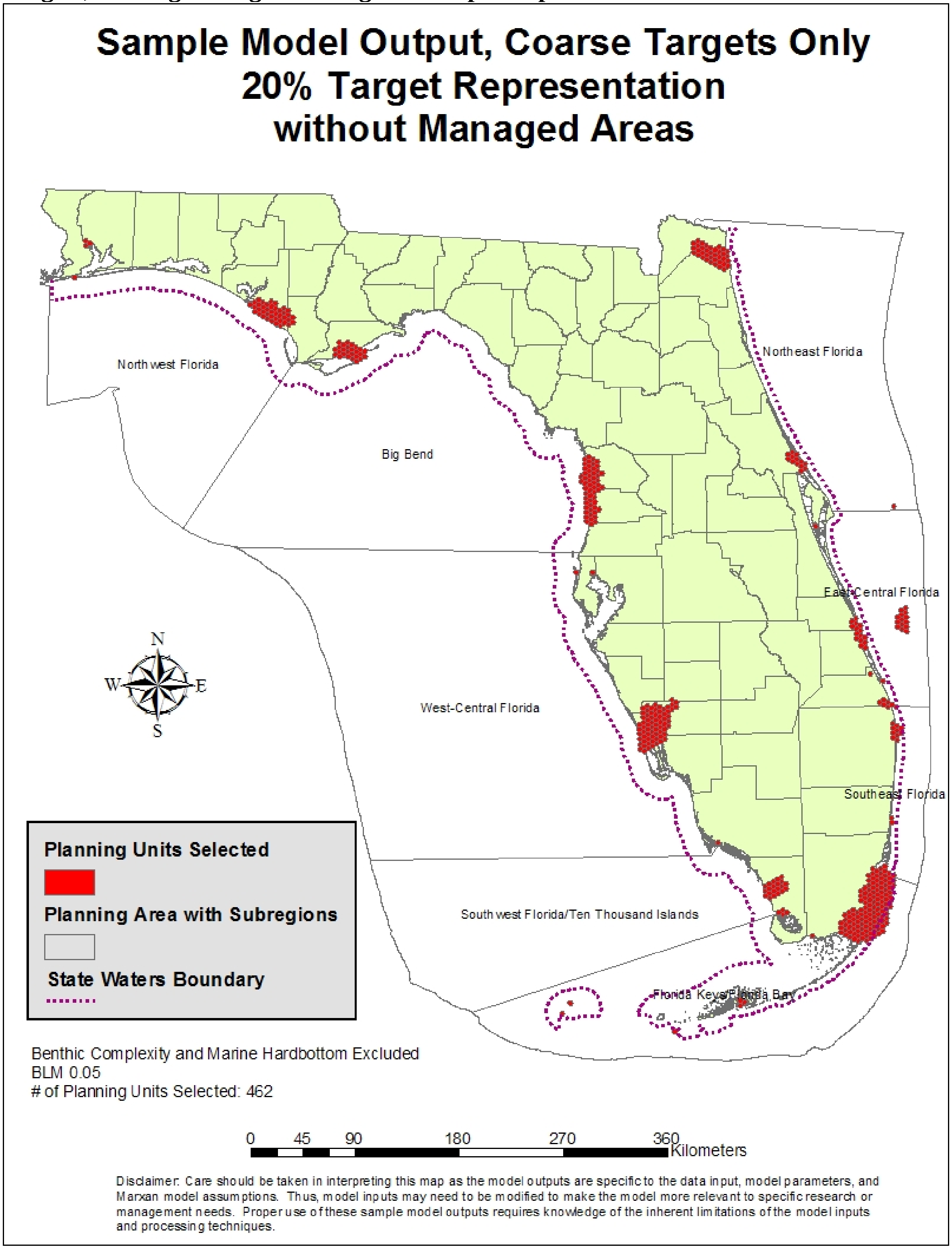


**Figure 19. Sample Model Output, Optimal Solution - target representation set at 20% for all targets, existing managed areas given lower cost.**

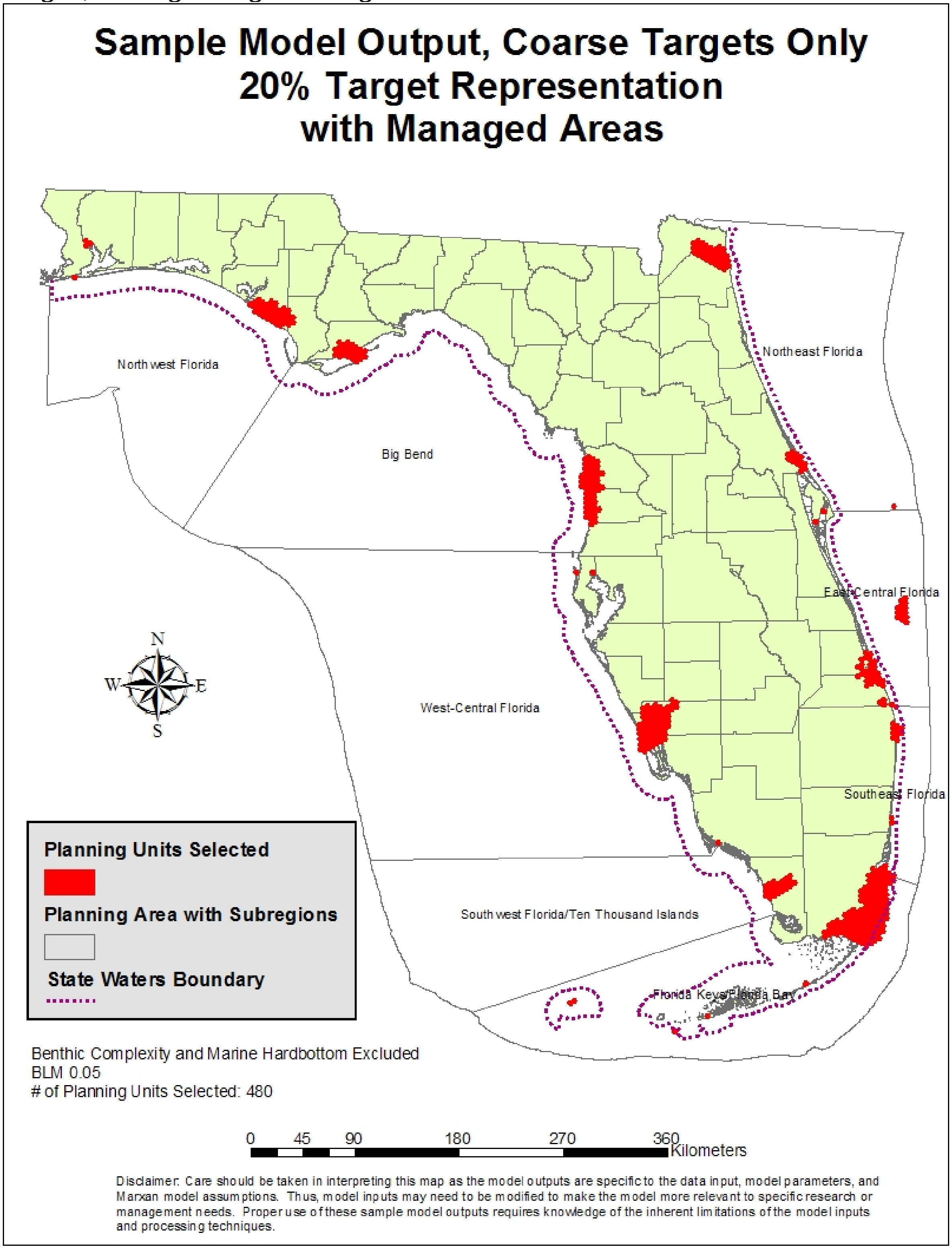


**Figure 20. Sample Model Output, Optimal Solution - target representation set at 40% for all targets, existing managed areas given no special preference.**

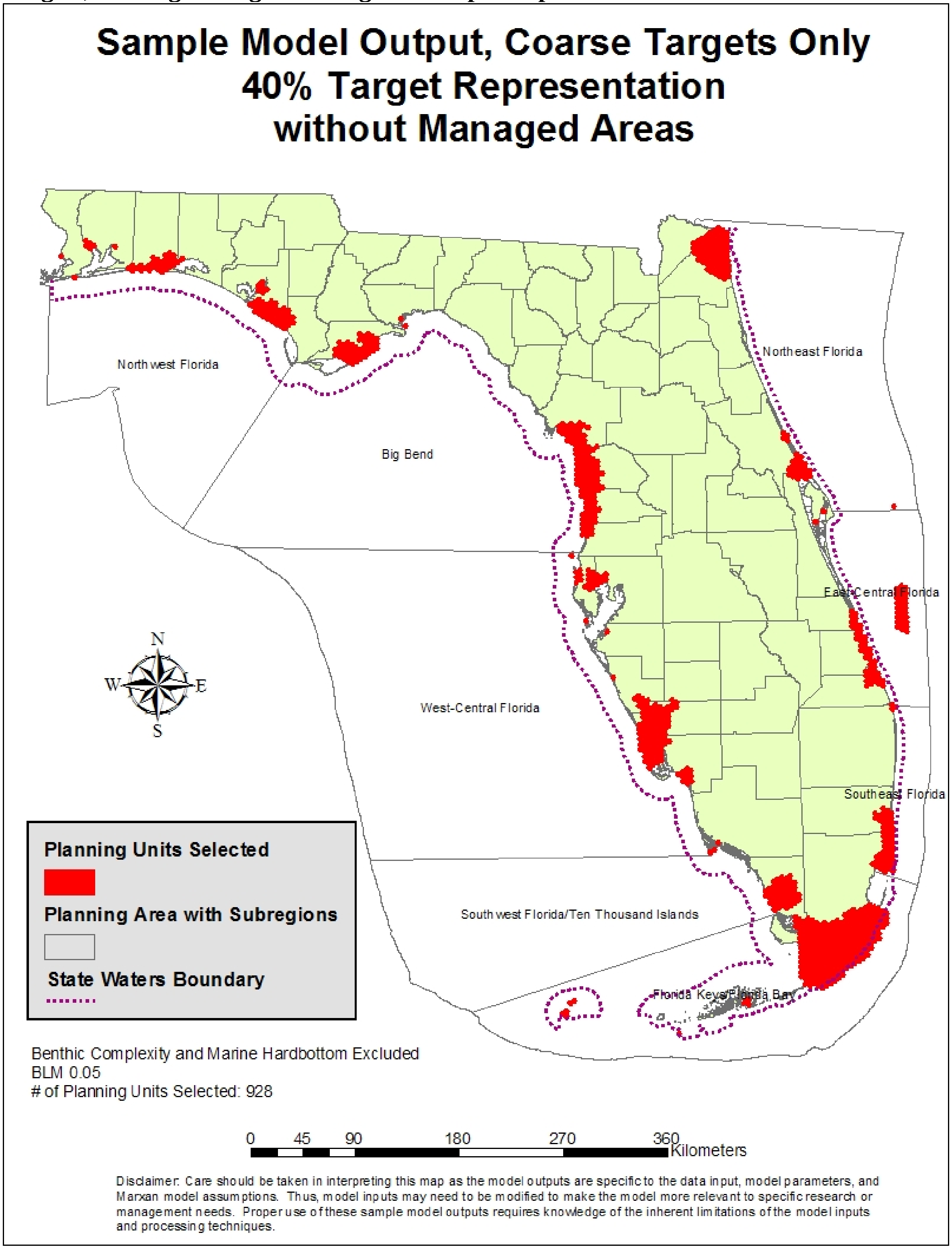


**Figure 21. Sample Model Output, Optimal Solution - target representation set at 40% for all targets, existing managed areas given lower cost.**

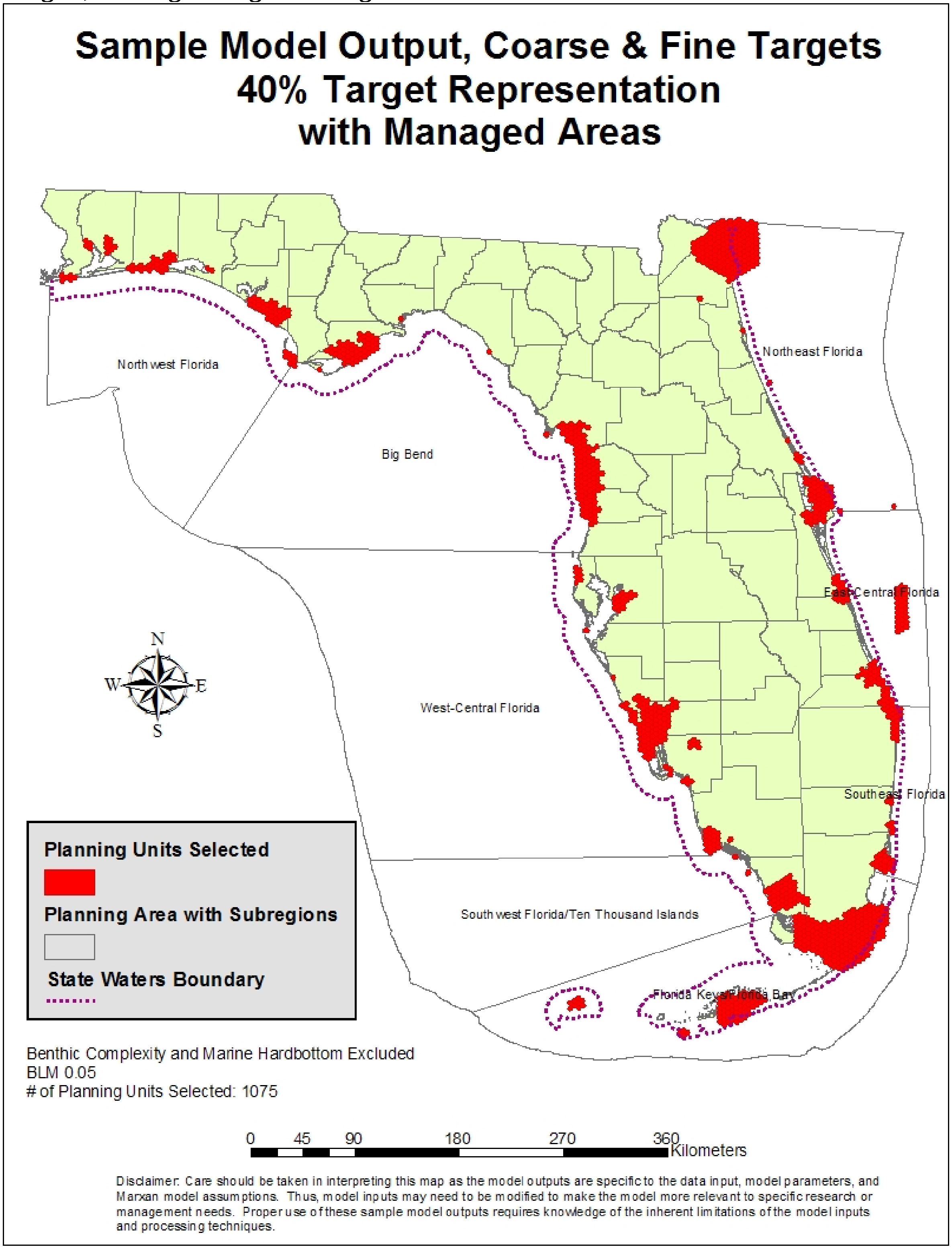


**Figure 22. Sample Model Output, Summed Solution - variable target representation, existing managed areas given no special preference.**

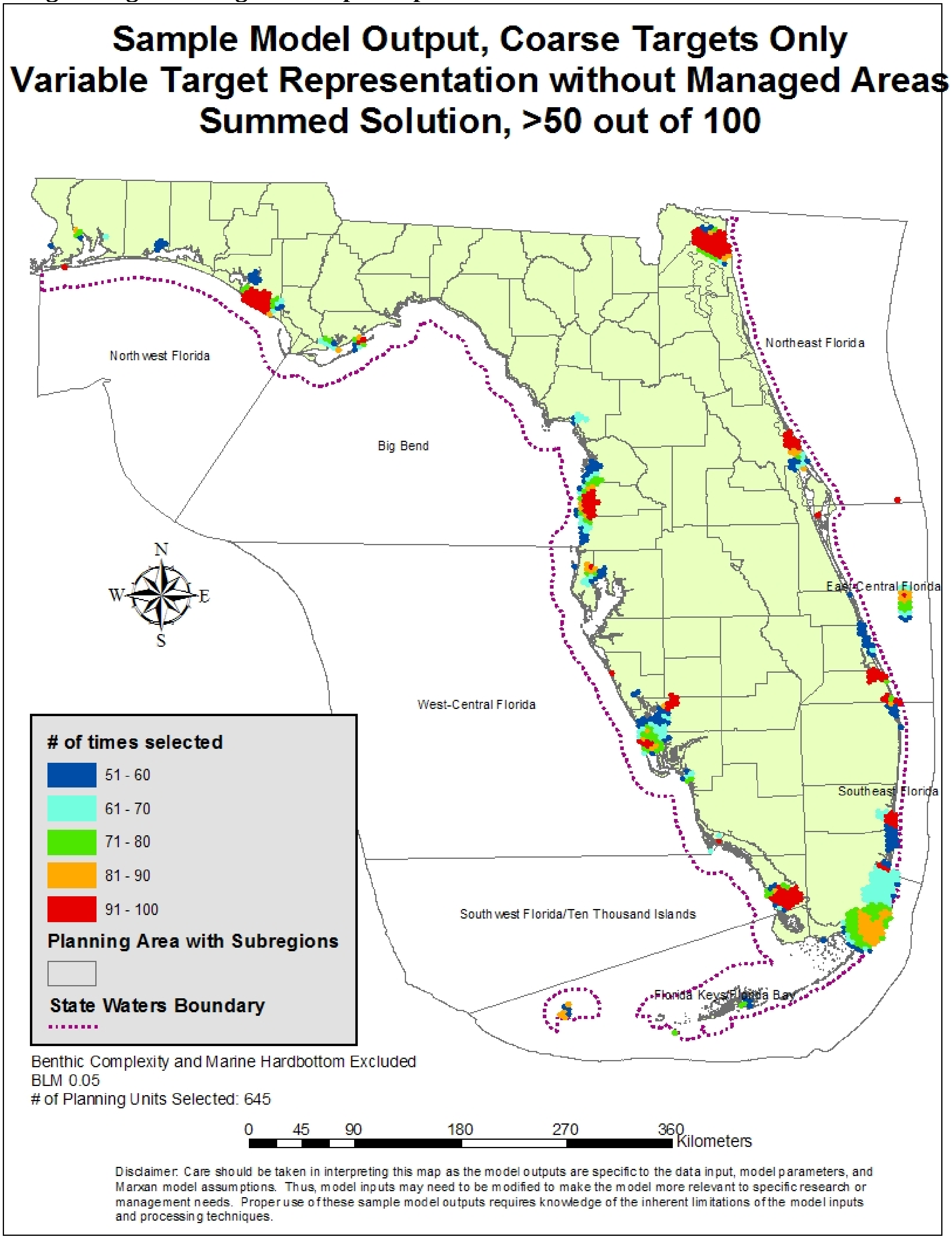


**Figure 23. Sample Model Output, Summed Solution - target representation set at 20% for all targets, existing managed areas given no special preference.**

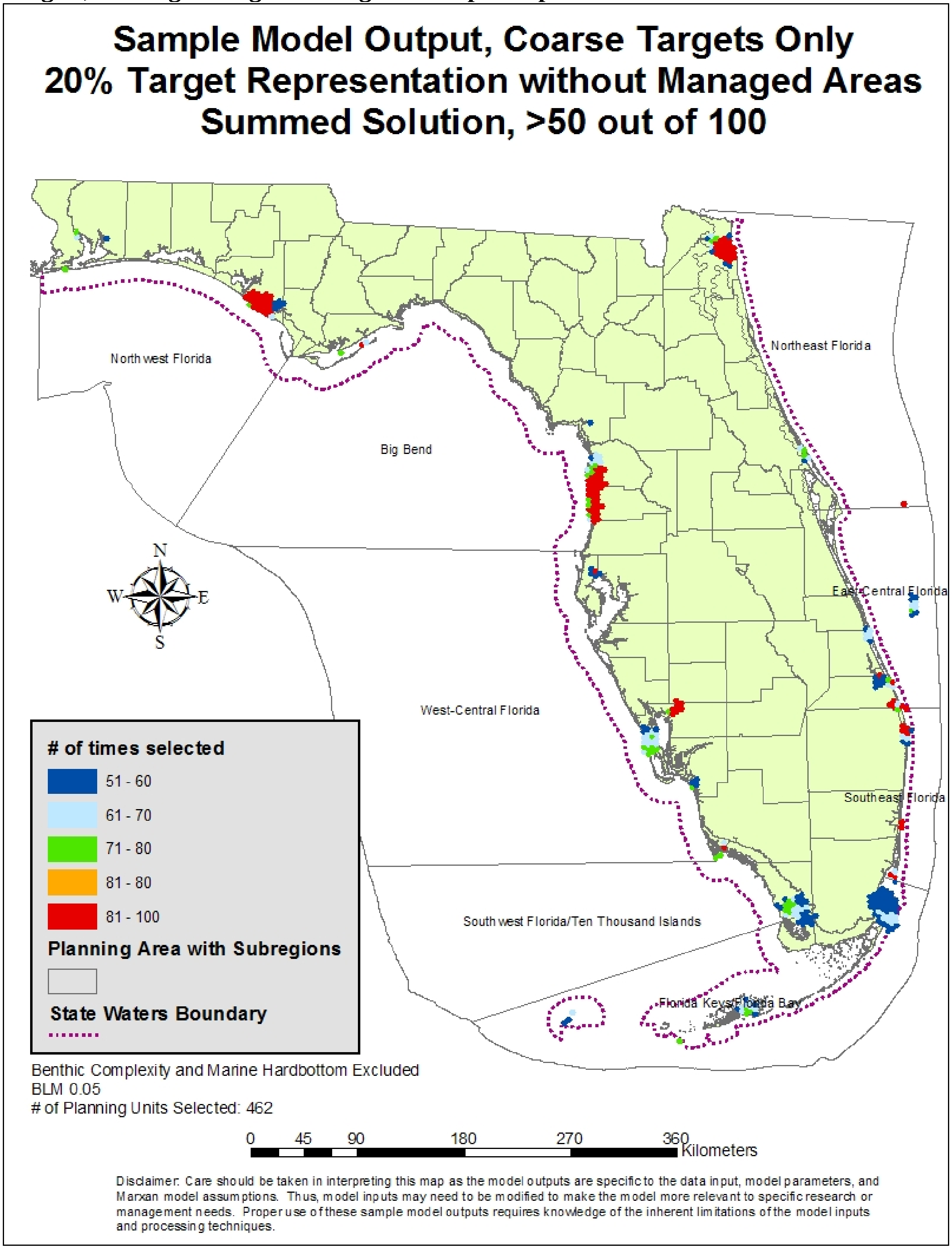
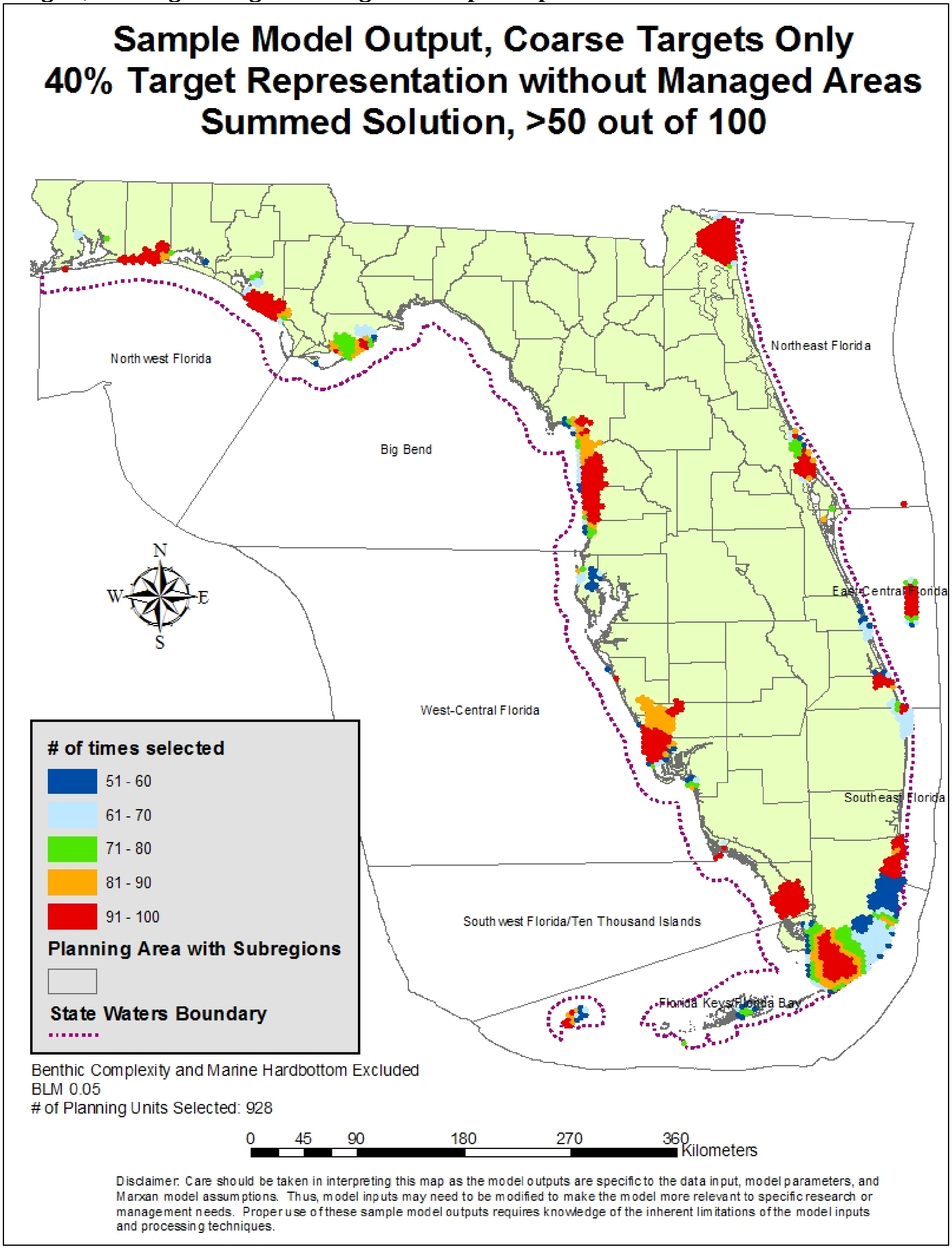


**Figure 24. Sample Model Output, Summed Solution - target representation set at 40% for all targets, existing managed areas given no special preference.**



## Additional Analytical Steps

Spatial Threat Index

As a means of better informing decisions on where marine resource managers and conservation practitioners might want to focus priority attention, we created a spatial threat index. This index is composed of threats that are not likely to be reversible, or would be reversible at a high to very high cost. We define threats as human uses that have an adverse impact on native habitats and species and take the form of structures, facilities or activities. We identified 11 such threats to marine and estuarine habitats in Florida where geospatial information was available. The 11 threat factors selected and the scoring used to describe level of threat are listed in Table 5 and include proximity to areas of high population and road density, port facilities, major shipping lanes, hardened shorelines, Superfund sites, major National Pollutant Discharge Elimination System permitted point source (NPDES) discharges, marine facilities and boat ramps, offshore dredged disposal sites, and dredged shipping channels. A map of the spatial threat index and each of the threats comprising the spatial threat index are illustrated in Figures 25 through 35. The spatial threat index described here is not directly related to the qualitative threat assessment that was prepared as part of the Florida Comprehensive Wildlife Conservation Strategy (Gordon et al., 2005).

**Table 8. Spatial threat index - factors and scoring for each planning unit**

| THREAT FACTOR | UNIT | INDEX POINTS | DATA SOURCE |
|---|---|---|---|
| Population density (ranges from .000218/km$^2$ - 18998/km$^2$) | For each 38.6 people per/km$^2$ | 10 points | U.S. Census Census 2000 |
| Road density (ranges from .004 km – 246 km) | For each kilometer | 10 points | U.S. Census Census 2000 |
| Port facilities (ranges from 1 - 31 facilities) | For each facility | 20 points | USACE-Navigation Data Center (NDC) |
| Major NPDES discharges | Presence in hexagon | 500 points | NOAA-OPIS |
| Superfund sites (ranges from 1 - 2 facilities) | For each Superfund site | 500 points | NOAA-OPIS |
| Hardened shoreline (ranges from 0.003 – 115 km) | For every 2.5 kilometers | 100 points | FWRI |
| Offshore dredge disposal sites (ranges from 1 - 2 sites) | For each site | 500 points | NOAA-OPIS |
| Major shipping lanes | Uptonnage ≥272,155 metric tons | 250 points | USACE-NDC |
| Marine facilities and boat ramps (ranges from 1 – 33) | For each facility or boat ramp | 10 points | FWC/FWRI |
| Dredged shipping channels (ranges from 1 - 15) | For each dredging project | 25 points | USACE-Navigation Data Center |

**Figure 25. Spatial Threat Index**

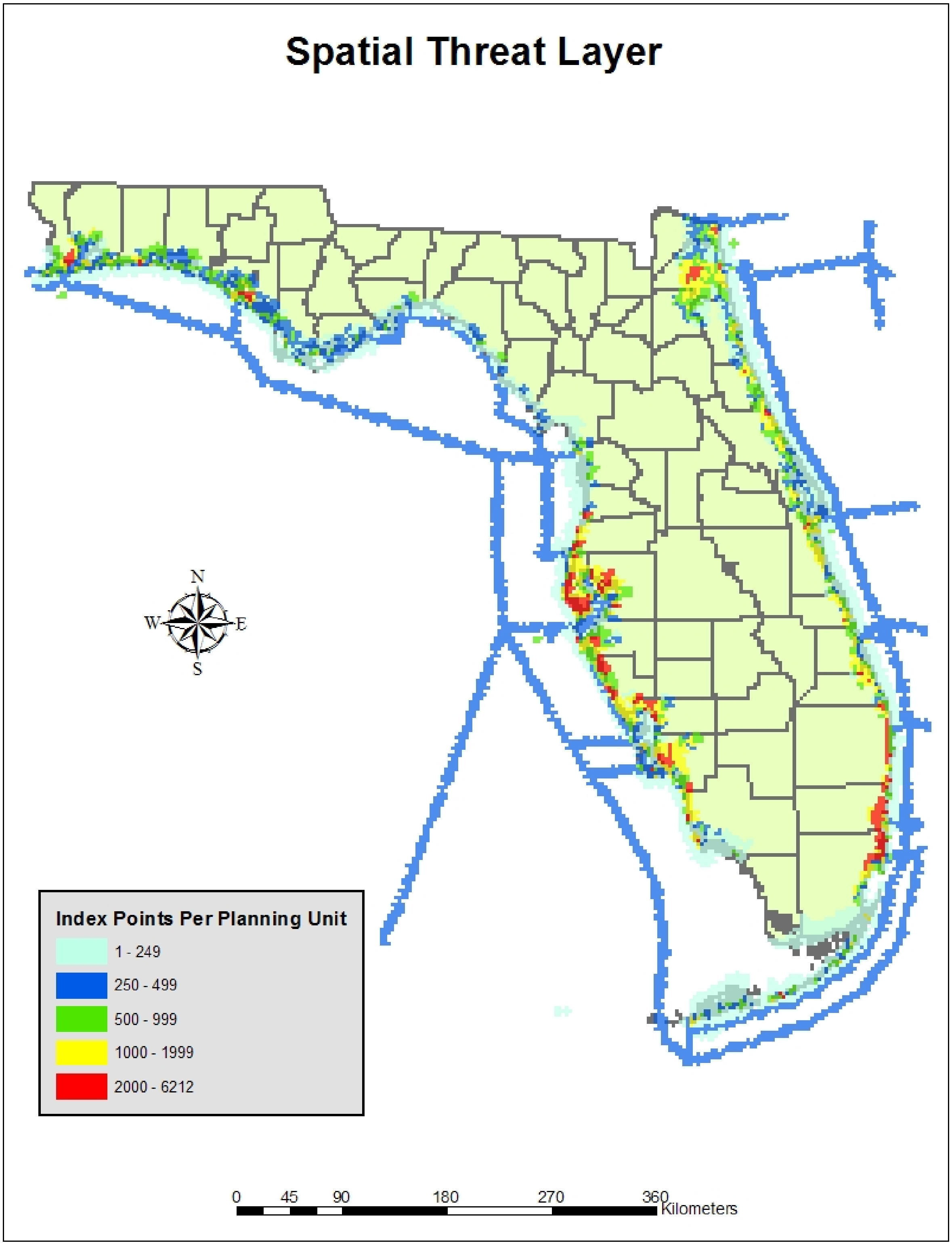


**Figure 26. Threat Index Component - Population density, statewide.**

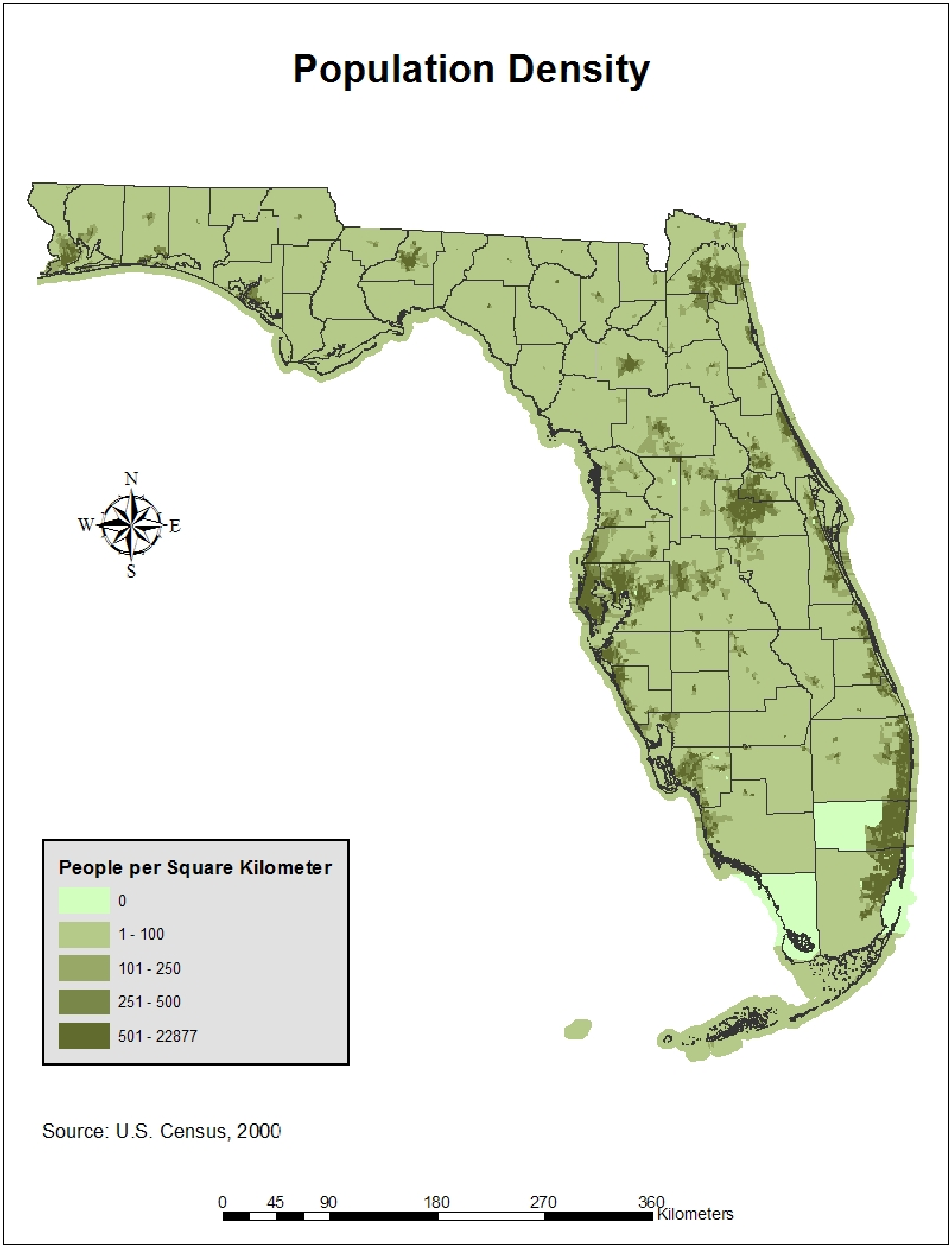


**Figure 27. Threat Index Component – Road density, marine/estuarine planning area only.**

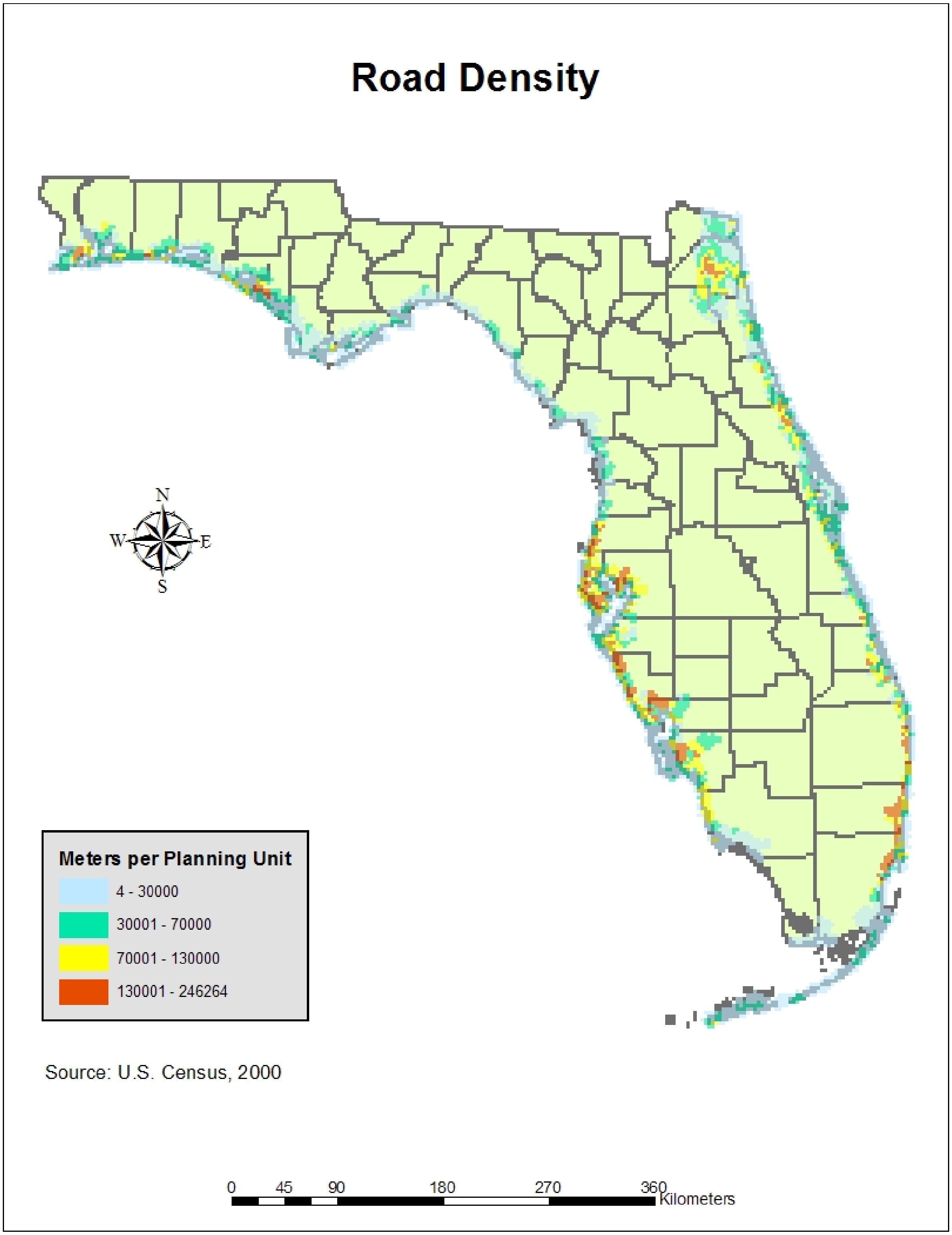


**Figure 28. Threat Index Component – Port Facilities, marine/estuarine planning area only.**

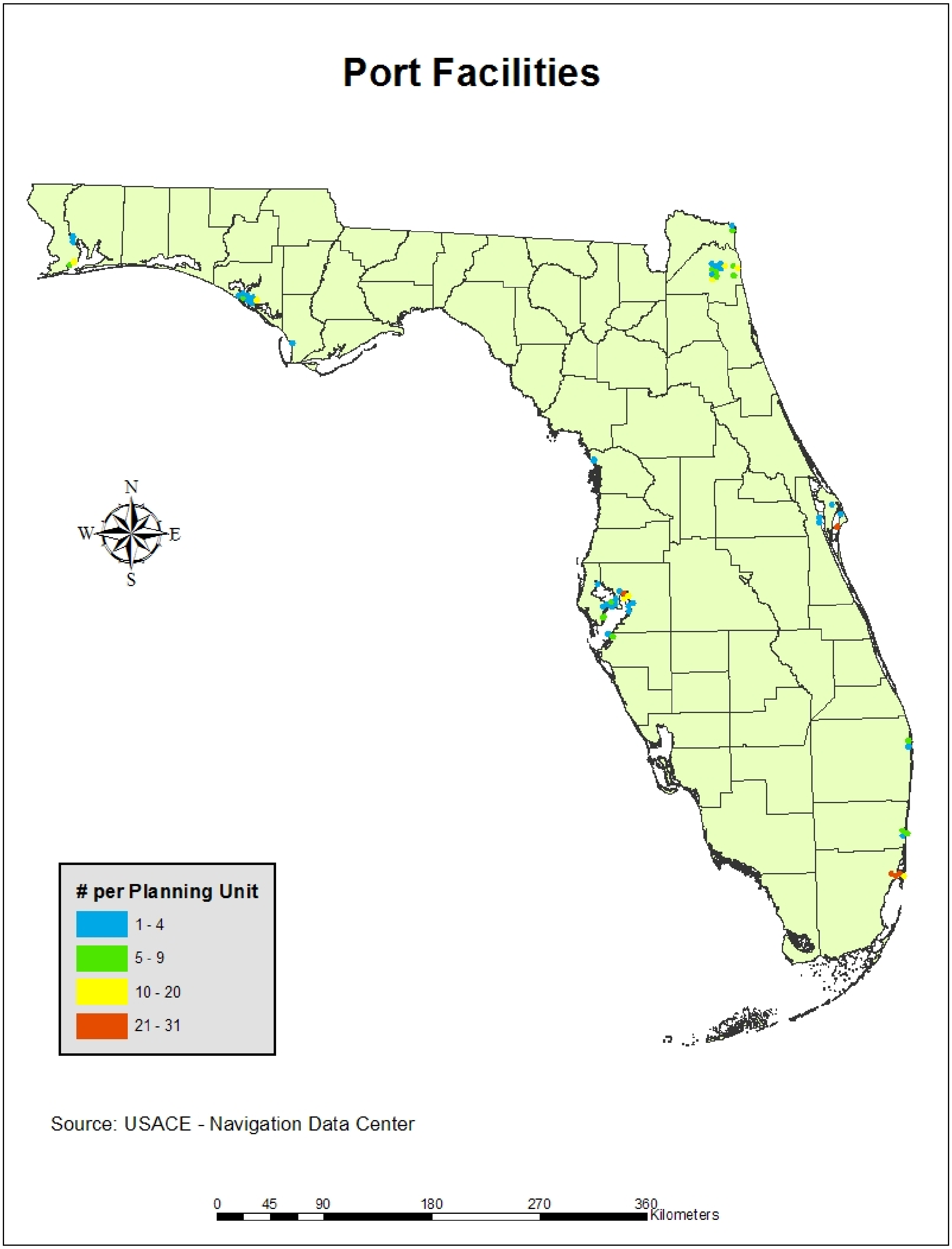


**Figure 29. Threat Index Component – Major National Pollution Discharge Elimination System Permitted Discharges, marine/estuarine planning area only.**

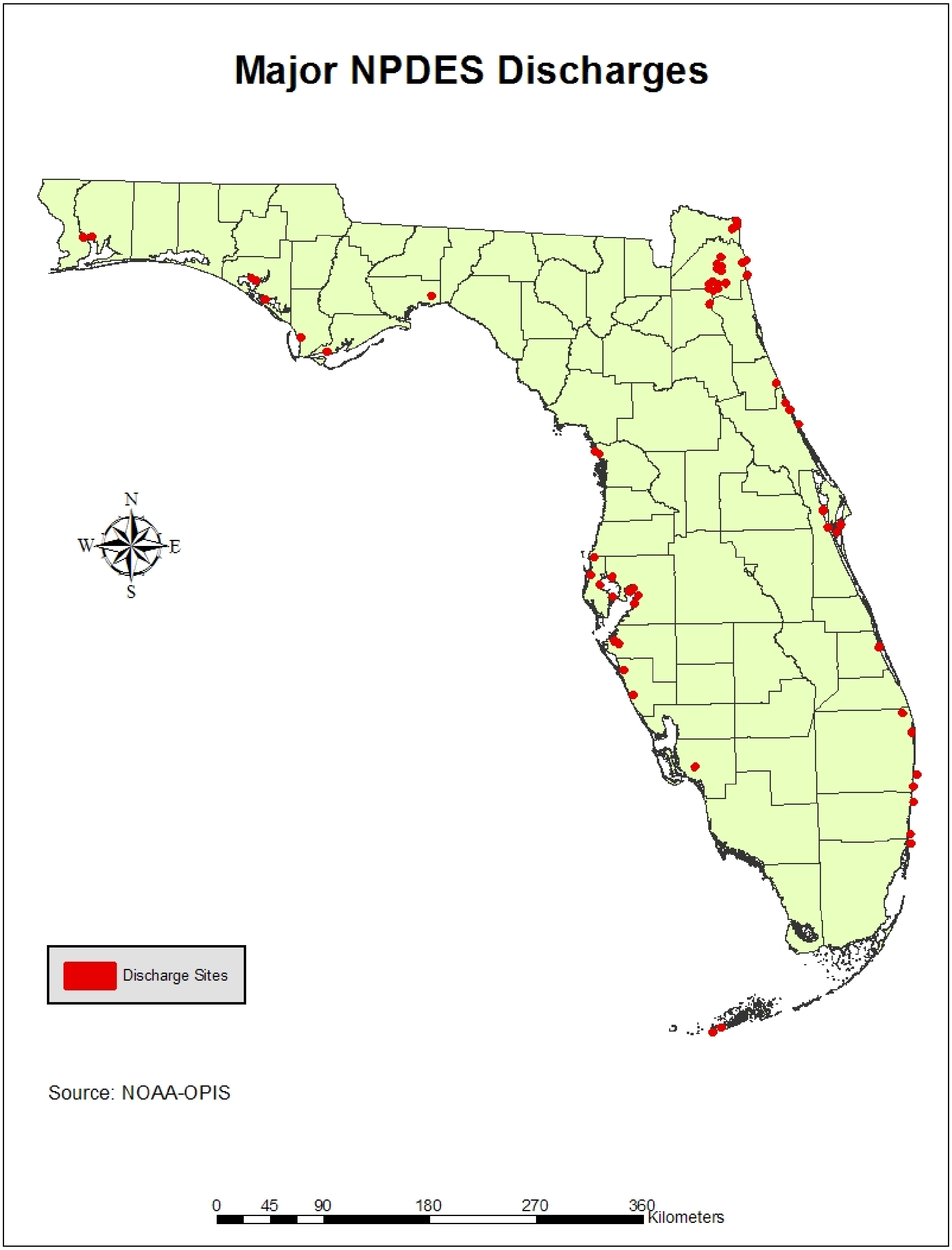


**Figure 30. Threat Index Component – Superfund Sites, statewide.**

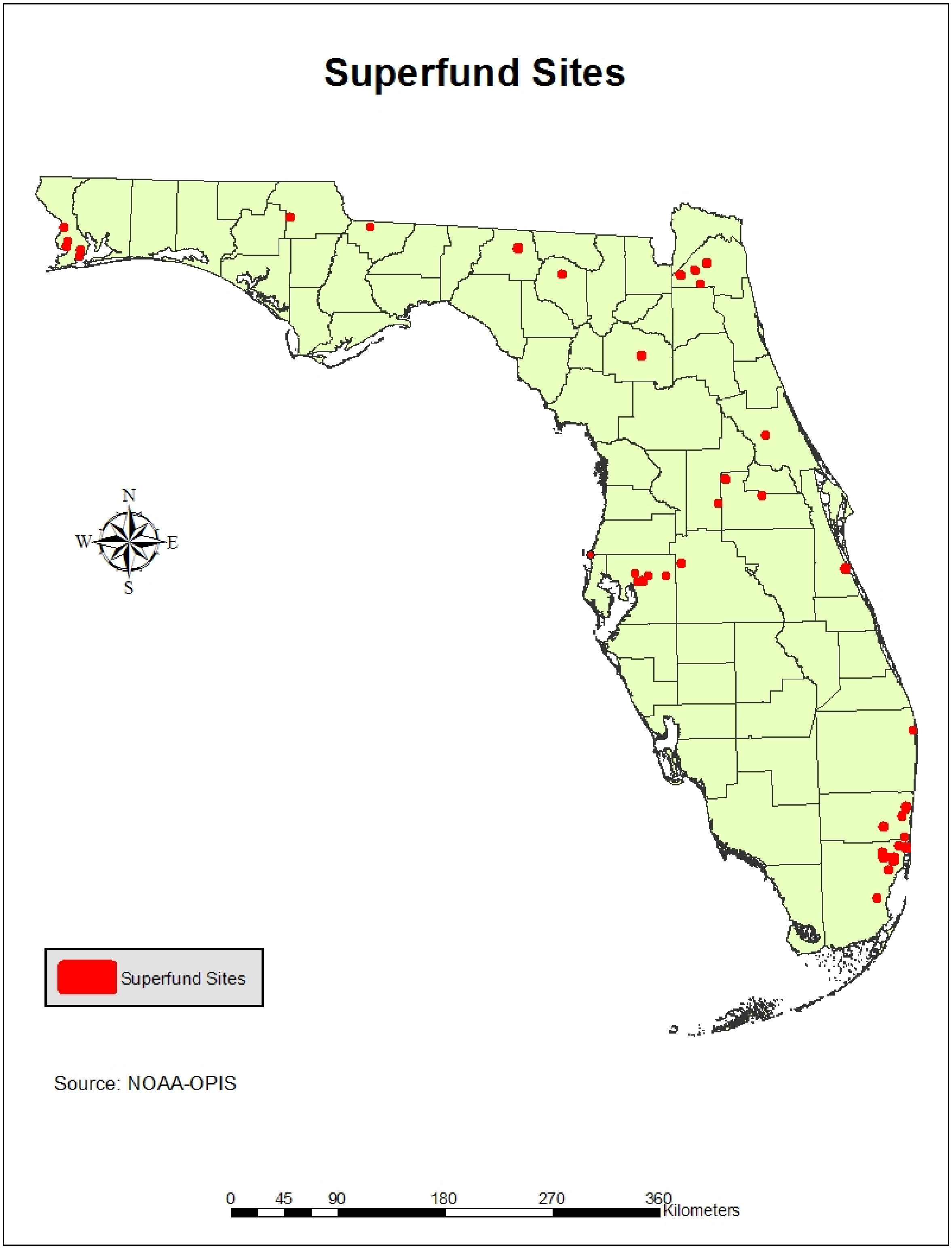


**Figure 31. Threat Index Component - Hardened Shorelines, marine/estuarine planning area only.**

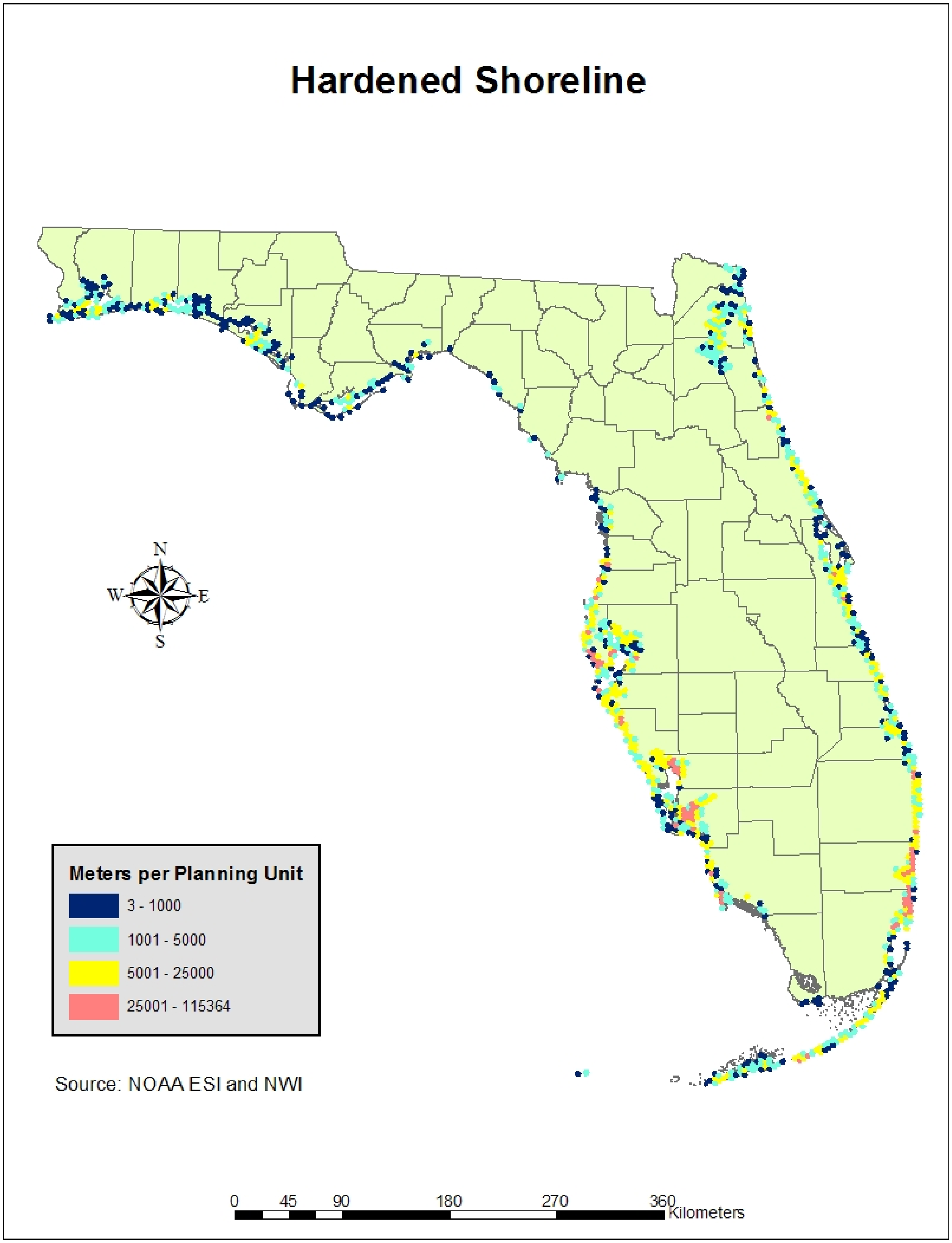


**Figure 32. Threat Index Component - Offshore EPA permitted dredged material disposal sites.**

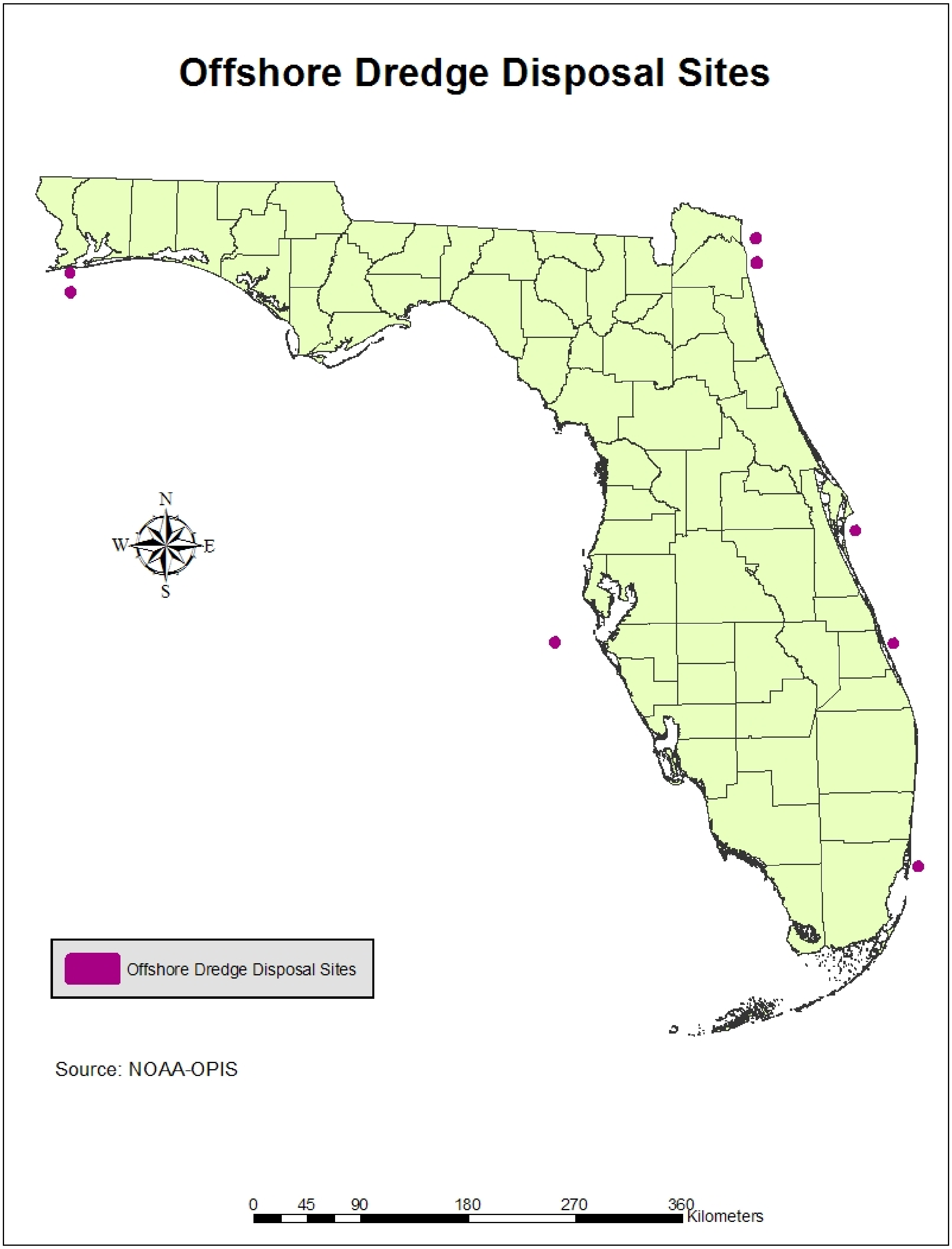


**Figure 33. Threat Assessment Component, Major Shipping Lanes.**

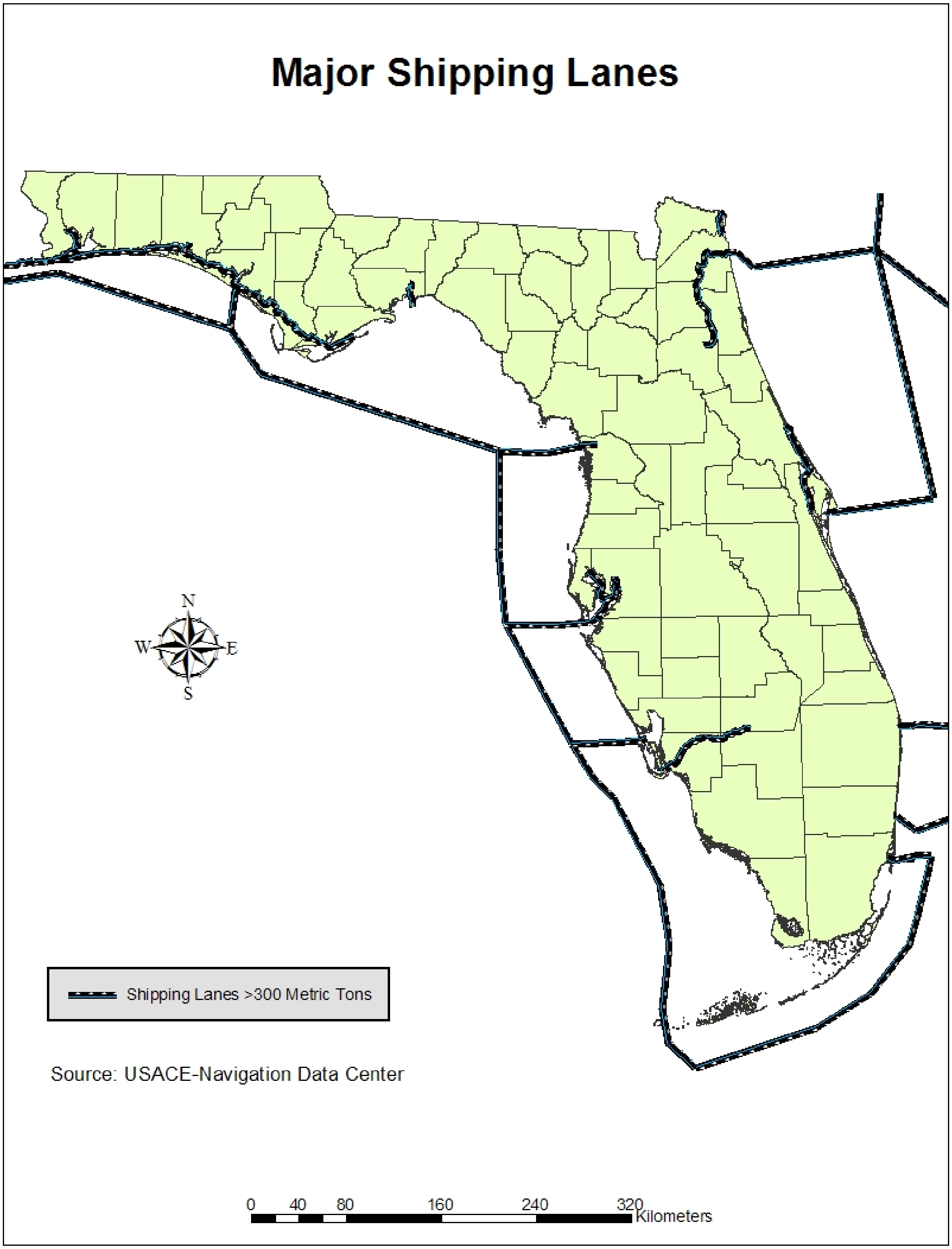


**Figure 34. Threat Index Component - Marine Facilities and Boat Ramps, marine/estuarine planning area only.**

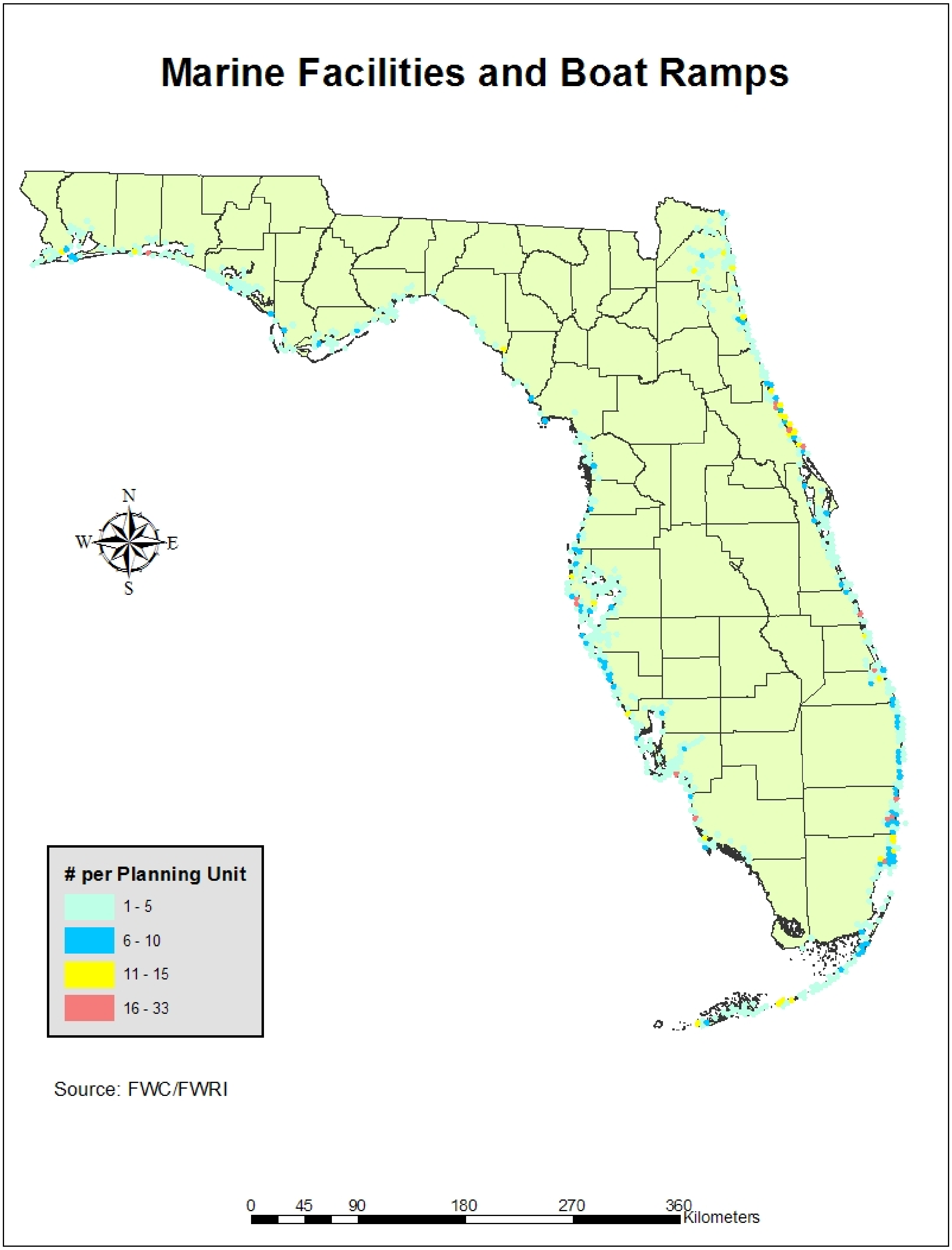
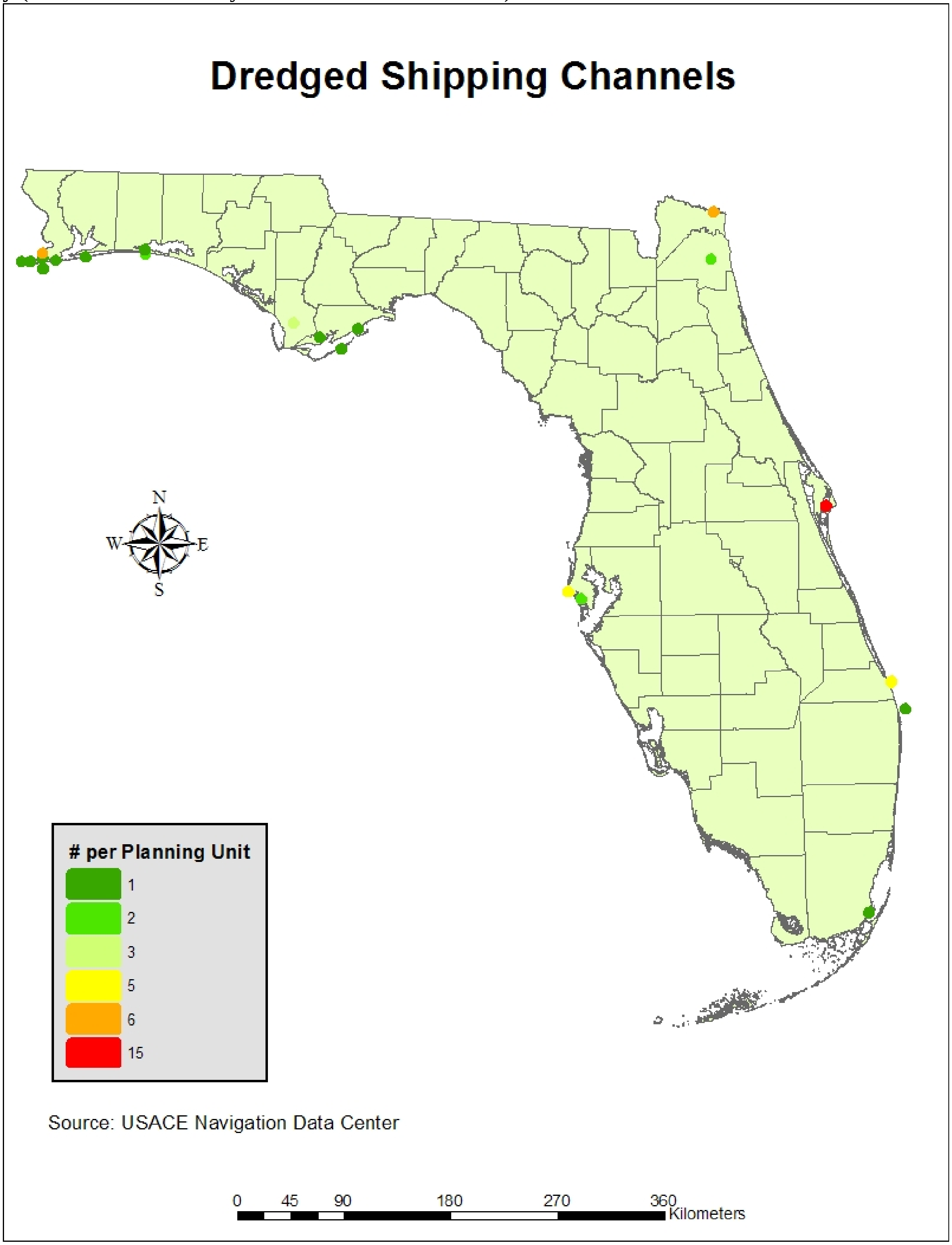


**Figure 35. Threat Index Component – Dredged Shipping Channels, marine/estuarine planning area only** (Intracoastal Waterway information is not included).



## Conclusions

The site prioritization framework presented in this document is a flexible tool that can be utilized to inform marine/estuarine resource management and conservation activities in Florida. The framework can assist with answering a number of resource management and conservation questions on a statewide level. We have presented some draft results in this document that can be utilized as a starting point to help resource managers and conservation practitioners identify priority marine and estuarine areas in the state for focusing additional resource management and conservation activities. The framework is based on an expert-derived set of criteria that we have applied as objectively as possible. All of the criteria selected and the decisions made to derive them have been made as explicit as possible in this report. Review of the geodatabase that accompanies this report will further elucidate the inputs and assumptions used in conducting the sample analyses contained in this report. The availability of the site prioritization framework will enable interested persons to conduct analyses of their own using variations of the input parameters and assumptions. Framework availability will also facilitate updates and upgrades. When used in conjunction with the other components of the Florida Comprehensive Wildlife Conservation Strategy, such as the expert-derived threat assessment and conservation actions, resource managers and conservation practitioners will have a powerful suite of tools and information for informing what actions should be pursued and where.

## Some Framework Refinements for the Future

Additional coarse filter (habitat) targets to include/improve:
- Hardbottom and live bottom, especially for the Gulf Coast
- Oceanographic/biogeophysical information for offshore areas
- Subterranean springs
- Sargasum
- Algal reefs
- Rocky intertidal areas

For framework analyses utilizing fine filter targets:
- Include more fish/fisheries data (for example, fisheries independent monitoring data especially with regard to important nursery areas),
- Include more invertebrate data,
- Include neotropical migratory bird stopover locations.

Spatial threat index:
- Utilize coastal watersheds rather than just the coastal NWI marine and estuarine boundary,
- Identify areas vulnerable to sea level rise,
- Include power plants, desalination plants and Intracoastal Waterway dredged shipping channels.

## References

Airame, S., J. E. Dugan, K. D. Lafferty, H. Leslie, D. A. McArdle, and R. R. Warner. 2003. Applying ecological criteria to marine reserve design: A case study from the California Channel Islands. Ecological Applications 13:S170-S184.

Ball, I. R. (2000) Mathematical applications for conservation ecology: the dynamics of tree hollows and the design of nature reserves. PhD Thesis, The University of Adelaide.

Beck, M. 2003. The sea around: marine regional planning. In Groves, C.R. Drafting a conservation blueprint: a practitioners' guide to planning for biodiversity. Island Press.

Chatwin, Anthony. 2004. The Nature Conservancy, personal communication.

Davis, R., Jr. Geology of the Florida Coast. In Randazzo, A. and D. Jones. 1997. The Geology of Florida. University of Florida Press.

Day, J., and J. C. Roff 2000. Planning for representative marine protected areas. World Wildlife Fund Canada, Toronto.

Duke University Marine Geospatial Ecology Laboratory. 2005. Marine Ecoregional Assessments of the Southeast Atlantic Coast: A Summary Document of Assessment Procedures and Results for the Mid & South Atlantic and Central and South Florida Ecoregions.135pp.

Geselbracht, L. and R. Torres. May 2005. Florida Marine Assessment: Prioritization of Marine/Estuarine Sites and Problems Adversely Affecting Marine/estuarine Habitats and Associated Species of Greatest Conservation Need. Interim Report for FWC Contract No. 04122. The Nature Conservancy, Gainesville, Florida.

Gillliam, David. 2004. National Coral Reef Institute, Nova Southeastern University, personal communication.

Gordon, D., D. Shaw, L. Geselbracht, E. Contreras and R. Torres. 2005. *Problem and conservation action identification - terrestrial, freshwater and marine - using The Nature Conservancy's planning process*. Final report. Florida Fish and Wildlife Conservation Commission Contract No. 04101 and 04122. The Nature Conservancy, Gainesville, Florida.

Kirtley, D. and W. Tanner. 1968. Sabellariid Worms: Builders of a major reef type. Journal of Sedimentary Petrology, Vol. 38, No. 1, pp. 73-38.

Leslie, H., M. Ruckelshaus, I. Ball, S. Andelman, and H. Possingham. 2002. Using siting algorithms in the design of marine reserve networks. Ecological Applications.

Margules, C. R., and R. L. Pressey. 2000. Systematic conservation planning. Nature (London) 405:243-253.

Lodge, T.1998. The Everglades Handbook – Understanding the Ecosystem. St. Lucie Press.

Madley, K.A., B. Sargent, and F.J. Sargent. 2002. Development of a System for Classification of Habitats in Estuarine and Marine Environments (SCHEME) for Florida. Unpublished report to the U.S. Environmental Protection Agency, Gulf of Mexico Program (Grant Assistance Agreement MX-97408100). Florida Marine Research Institute, Florida Fish and Wildlife Conservation Commission, St. Petersburg. 43pp.

McCarthy, D. 2004. Smithsonian Marine Station at Fort Pierce. Personal communication.

Peterson, G. D. 2000. Scaling ecological dynamics: self-organization, hierarchical structure and ecological resilience. Climatic Change **44**:291-309.

Poiani, K. A., B. D. Richter, M. G. Anderson, and H. E. Richter. 2000. Biodiversity conservation at multiple scales: functional sites, landscapes, and networks. BioScience **50**: 133-146.

Possingham, H. P., I. R. Ball and S. Andelman. 2000. Mathematical methods for identifying representative reserve networks. In: S. Ferson and M. Burgman (eds) Quantitative methods for conservation biology. Springer-Verlag, New York, pp. 291-305.

Randazzo, A. and R. Halley. Geology of the Florida Keys, In Randazzo, A. and D. Jones. 1997. The Geology of Florida. University of Florida Press.

Stauble, D. and D. McNeil. 1985. Coastal geology and the occurrence of beachrock: central Florida Atlantic coast. Field Guide for the Annual Meeting of the Geological Society of America, part 1. 27 p.

## Appendix A
## Participants in Expert Review Workshops, Florida Marine Assessment

### Northern Gulf Scoping Meeting, October 19, 2004

Partners/Stakeholders:

Chad Bedee, Crystal River Preserve State Park
Paul R. Carlson, Jr., Fish and Wildlife Research Institute
Rob Mattson, Suwannee River Water Management District
Jenna Wanat, Apalachicola National Estuarine Research Reserve/FDEP

TNC Staff & Contractors:

Jon Blanchard, Northwest Florida Program Manager
Rafael Calderon, Director Gulf of Mexico Initiative
Laura Geselbracht, Conservation Planner/Team Lead
Jody Thomas, Southern Region Conservation Director
Roberto Torres, Conservation Planning
Kate Eschelbach, Research Associate, Geospatial Analysis Program
Nicholas School of the Environment and Earth Sciences, Duke University

### Central Florida Site Prioritization and Threat Assessment Workshop – St. Petersburg, February 28 – March 1, 2005

Trish Adams, U.S. Fish and Wildlife Service (USFWS)
Bill Arnold, Fish & Wildlife Research Institute (FWC)
Anne Birch, The Nature Conservancy (TNC)
Frank Courtney, FWC
Elizabeth Fleming, Defenders of Wildlife
Bob Gasaway, USFWS
Laura Geselbracht, TNC, project staff
James Gragg, Florida Fish & Wildlife Conservation Commission (FWC)
Todd Hopkins, USFWS
Kevin Kemp, FWC
Sara McDonald, FWC
Kevin Madley, FWC
Ed Matheson, FWC
Ernst Peebles, USF
Peran Ross, University of Florida
Randy Runnels, Tampa Bay Aquatic Preserve
Heather Stafford, DEP – Coastal & Aquatic Managed Areas
Roberto Torres, TNC, project staff
Shannon Whaley FWC

### North Florida Site Prioritization and Threat Assessment Workshop – Tallahassee, March 3 – 4, 2005

Ron Brockmeyer, St. Johns River Water Management District
Laura Geselbracht, TNC, project staff
Steve Herrington, TNC
Ted Hoehn, FWC
Paul Johnson, Reef Relief
Christine Small, FWC
Hallie Stevens, TNC
Mark Thompson, NMFS
Roberto Torres, TNC, project staff
Jenna Wanat , Apalachicola NERR

**South Florida Site Prioritization and Threat Assessment Workshop – Dania Beach, March 7 – 8, 2005**

Jeff Beal, FWC
Chris Farrell, Audubon of Florida
Laura Geselbracht, TNC, project staff
Todd Kellison, Biscayne National Park, National Park Service
Tom Matthews, FWC
Doug Morrison, Everglades National Park, NPS
Brad Rosov, TNC
Tom Schmidt, Everglades National Park, NPS
Roberto Torres, TNC, project staff
Brian Walker, Nova Southeastern University, National Coral Reef Institute
Ricardo Zambrano, FWC

**Site Prioritization Expert Review Workshop, St. Petersburg, Florida , June 16, 2005**

| | |
|---|---|
| Bill Arnold, FWC | George Henderson, FWC |
| Katie Brill, FWC | Kevin Kemp, FWC |
| Ron Brockmeyer, St. Johns River Water Management District | Robin Lewis, Lewis Environmental |
| | Kevin Madley, FWC |
| Elena Contreras, The Nature Conservancy - project staff | Anne McMillen-Jackson, FWC |
| Catherine Corbett, Charlotte Harbor National Estuary Program | Frank Muller-Karger, University of South Florida |
| | Harry Norris, FWC |
| Frank Courtney, FWC | John Ogden, USF |
| Dan Dorfman, TNC – project staff | Roberto Torres, TNC |
| Elizabeth Fleming, Defenders of Wildlife | Ginny Vail, FWC |
| Anne Forstchen, FWC | Shannon Whaley, FWC |
| Laura Geselbracht, TNC – project staff | Jennifer Wheaton, FWC |
| Jimi Gragg, FWC | David White, Ocean Conservancy |

**Central & South Florida Marine Ecoregional Plan – Core Team Members* & Expert Workshop (June 14 & 15, 2004) Participants**

| | |
|---|---|
| Rick Alleman, South Florida Water Mgmt. District | John Hunt*, Florida Fish & Wildlife Research Institute |
| Mike Beck*, The Nature Conservancy, Marine Initiative | Libby Johns, Ph.D., NOAA/AMOL |
| | Brian Keller*, Florida Keys National Marine Sanctuary |
| Chris Bergh*, TNC | Phil Kramer, TNC |
| Anne Birch*, TNC | Robin Lewis, Lewis Environmental Services |
| Steven Bortone, Sanibel Captiva Conservation Fdn. | Ken Lindeman*, Environmental Defense |
| Georgina Bustamante, TNC | Chris Mankoff *, Duke Geospatial Analysis Center |
| Mark Butler, Old Dominion University | Doug Morrison, Ph.D., Everglades & Dry Tortugas National Parks |
| Mark Chiappone, Univ. of North Carolina, Wilmington | |
| Richard Curry, Biscayne National Park | John Ogden, Florida Institute of Oceanography |
| Steve Davidson*, TNC volunteer | Mark Perry, Florida Oceanographic Society |
| Jeff DeBlieu*, TNC | Andrea Povinelli*, TNC |
| Bob Day, Indian River Lagoon, National Estuary Program | John Reed, Harbor Branch Oceanographic Institute |
| | Bernhardt Reigl, Nova Southeastern University |
| Dan Dorfman*, TNC Marine Initiative | Brad Rosov*, TNC |
| Anne Marie Eklund, National Marine Fisheries Service | Doug Shaw, TNC |
| Laura Geselbracht*, project coordinator, TNC | Heather Stafford*, Florida DEP, Coastal & Aquatic Managed Areas |
| Grant Gilmore, Jr., ECOS | |
| Bob Glazer, Florida Fish & Wildlife Research Institute | Jody Thomas*, TNC |
| Patrick Halpin*, Duke Geospatial Analysis Center | Roberto Torres, TNC |
| Dennis Hanisak, Harbor Branch Oceanographic Institute | Robbin Trindell, FWC |
| Todd Hopkins, Ph.D., U.S. Fish & Wildlife Service | Jora Young*, TNC |
| Tim Huizing, TNC | Gabe Vargo, University of South Florida |

**Appendix B. Benthic Complexity and Marine Hardbottom Targets & Model Output**

**Figure B-1. Benthic complexity spatial distribution.**

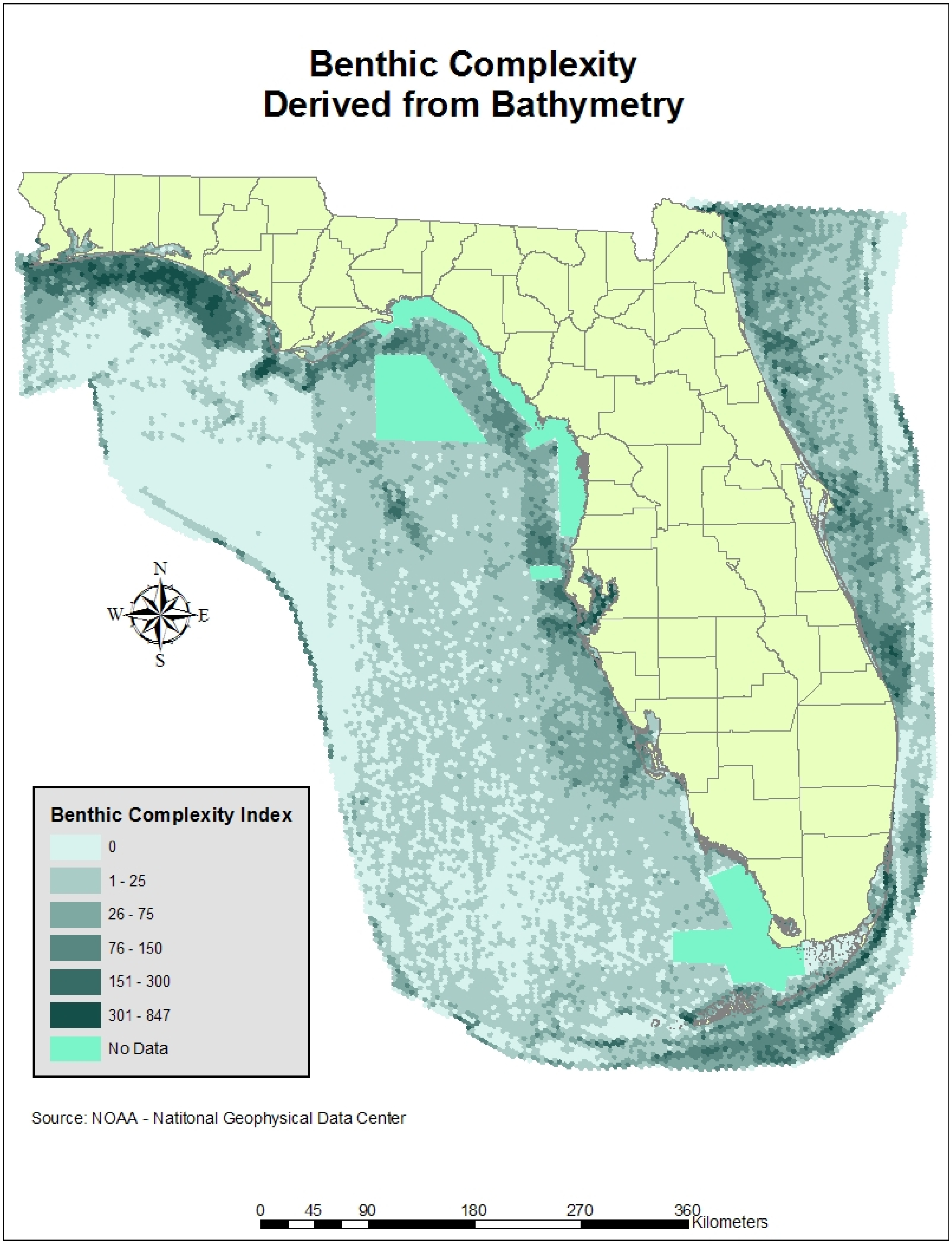


**Figure B-2 Bathymetry used to derive benthic complexity showing areas where digital bathymetry data was not available.**

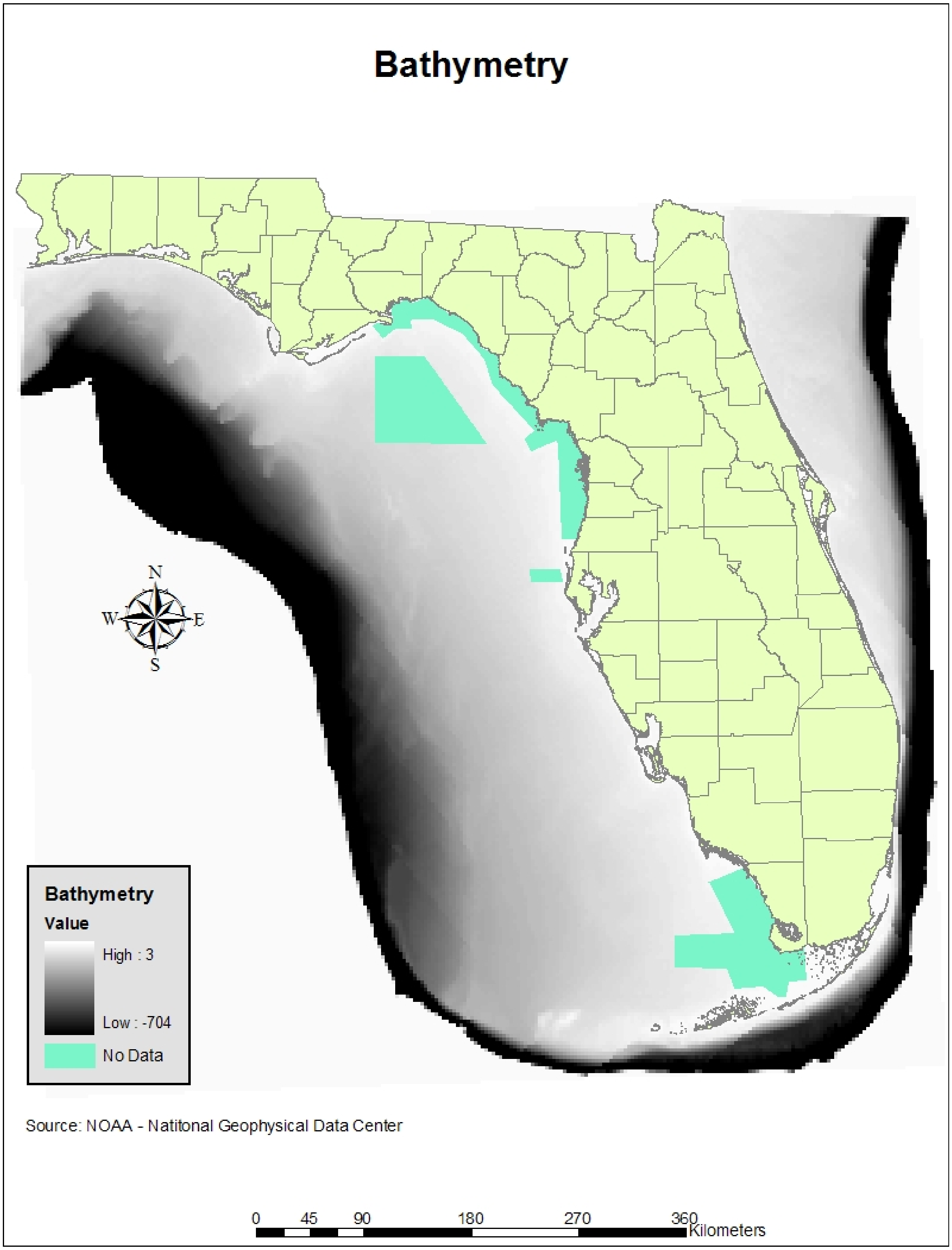
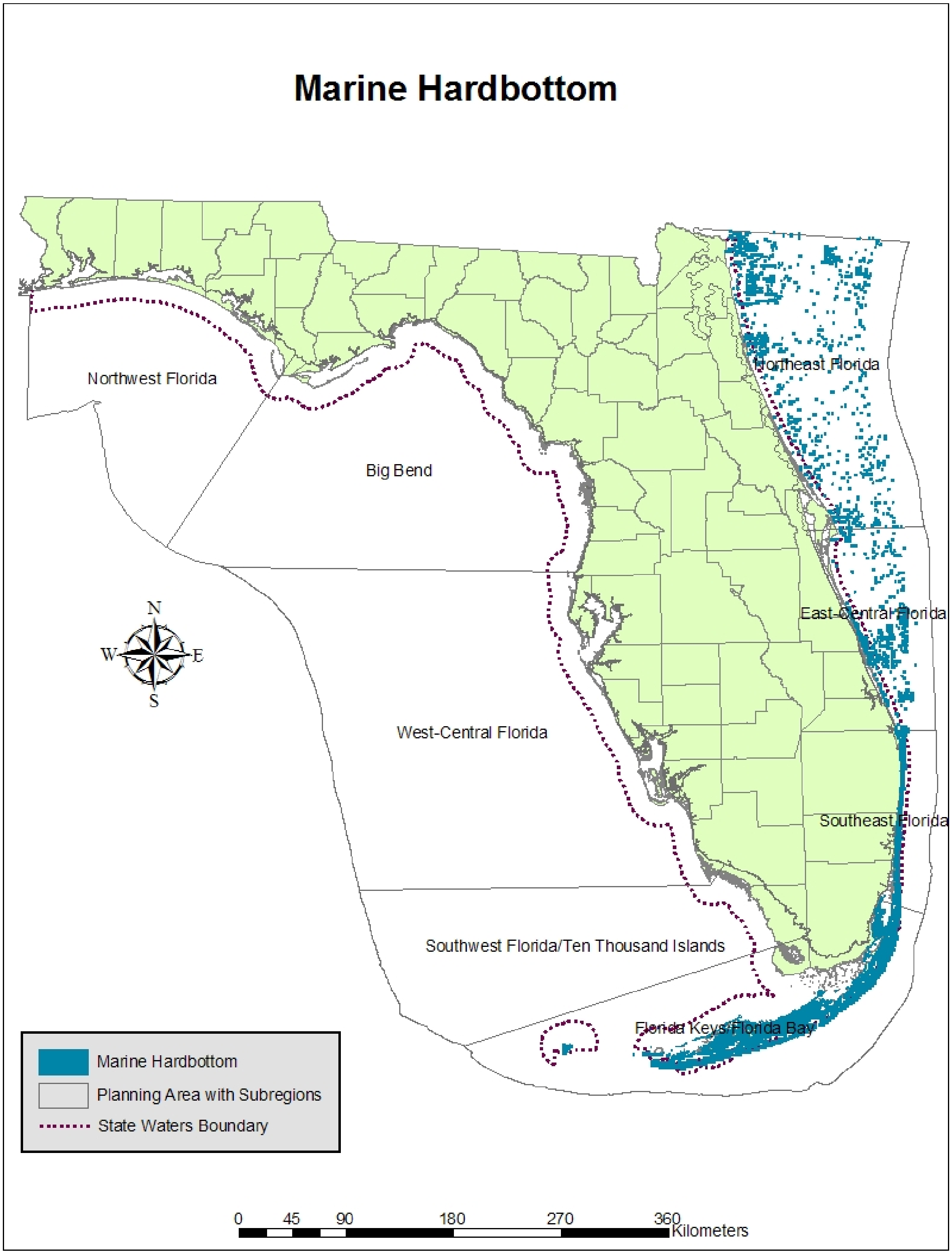


**Figure B-3. Marine hardbottom spatial distribution. Information only available for Florida Atlantic Coast through Dry Tortugas.**




**Dark blue areas are hardbottom or potential hardbottom (source: SEAMAP)**

**Figure B-4. Density of data used to derive results when benthic complexity and hardbottom targets are included.**

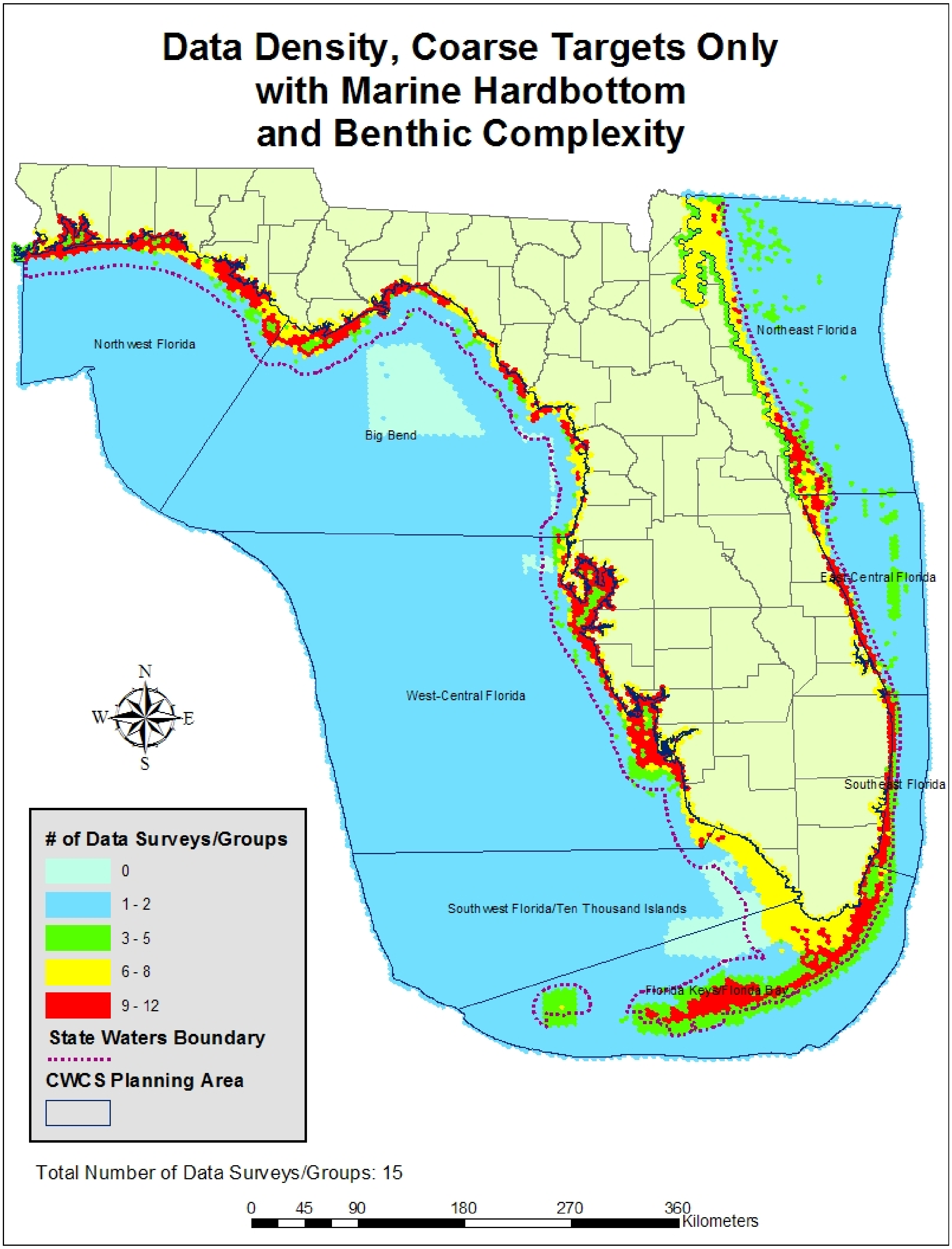


**Table B-1. Coarse filter data surveys used to determine data density. Benthic complexity and hardbottom targets are included.** Refer to Table 2 for additional information on the datasets/data groups listed below.

| | DATA SURVEY/GROUP NAME |
|---|---|
| 1 | Coral Reef, LADS surveys conducted for Miami-Dade, Broward and Palm Beach counties. |
| 2 | South Florida Benthic (sf_benthic_97.shp): Used for coral reef and hardbottom targets. |
| 3 | Coral Reef, Oculina (oculina.shp) |
| 4 | fl_veg03.shp (dataset includes the following targets: mangrove swamp, salt marsh and a portion of tidal flats and beaches) |
| 5 | Tidal Flats: FWRI dataset, tidefl.shp |
| 6 | beaches_wmd.shp (extracted from SFWMD Land Use 1995) |
| 7 | Submerged Aquatic Vegetation (seagrass_fl_187to1999_poly.shp) |
| 8 | Coastal Tidal Rivers or Stream (coastal_rivers2d.shp) |
| 9 | Bivalve reef, oysters (includes the 7 sources of data listed in Table 1). |
| 10 | National Wetlands Inventory |
| 11 | Aerial photos, digital orthoquads: Used for ocean inlets and passes target. |
| 12 | Environmental Sensitivity Index: Used for artificial structure, hardened shoreline target |
| 13 | Annelid worm reefs (wormreefs.shp): Surveys conducted by several individuals; May overlap, but only counted as one data survey/group. |
| 14 | Artificial Structure, artificial reef (artreef_new.shp) |
| 15 | Bathymetry |
| 16 | SEAMAP hardbottom |

**Figure B-4. Sample model output, optimal solution – Coarse & fine filter targets including benthic complexity and marine hardbottom, variable target representation, managed areas given no special preference.**

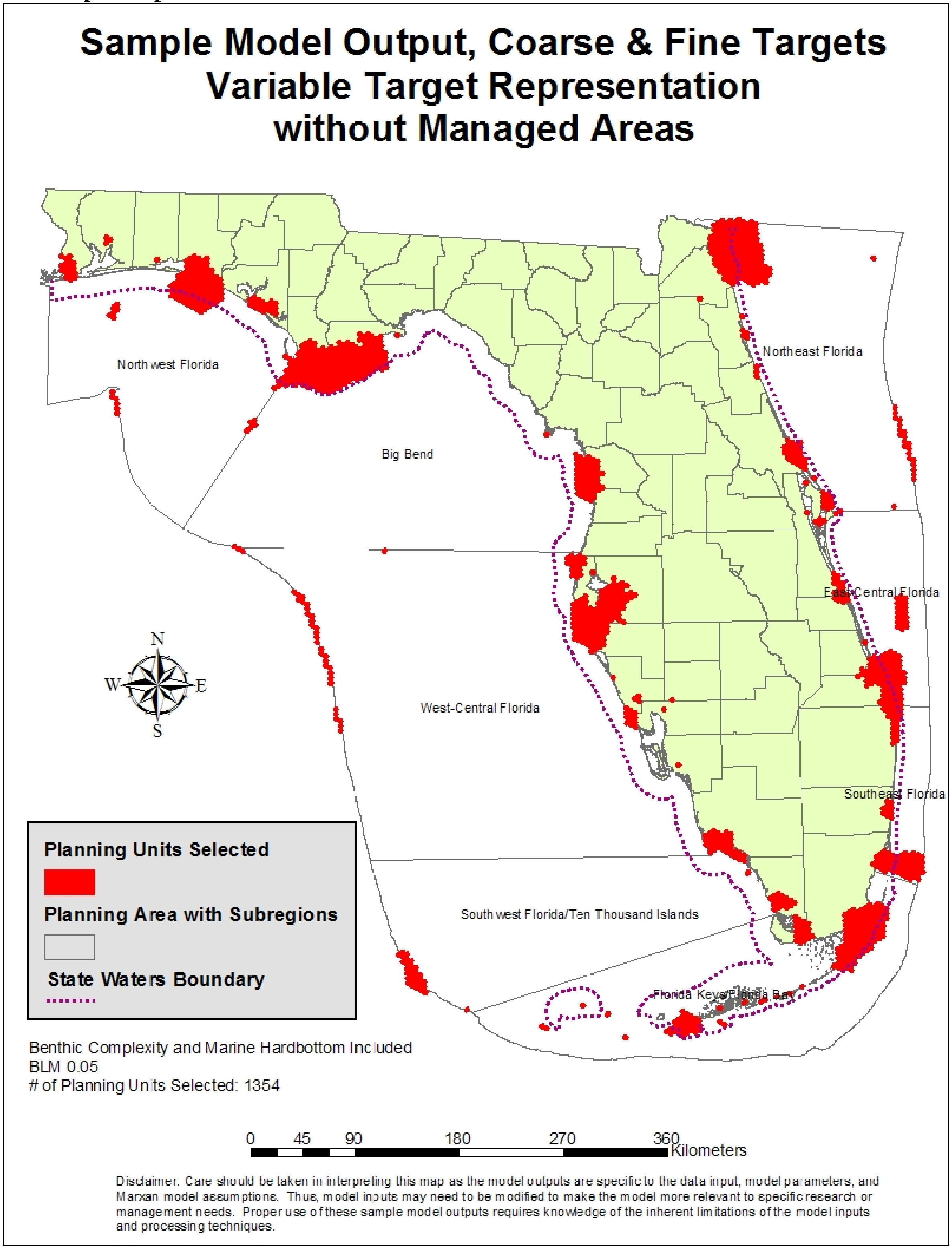


**Figure B-5. Sample model output, optimal solution – Coarse & fine filter targets including benthic complexity and marine hardbottom, 40% target representation, managed areas given no special preference.**

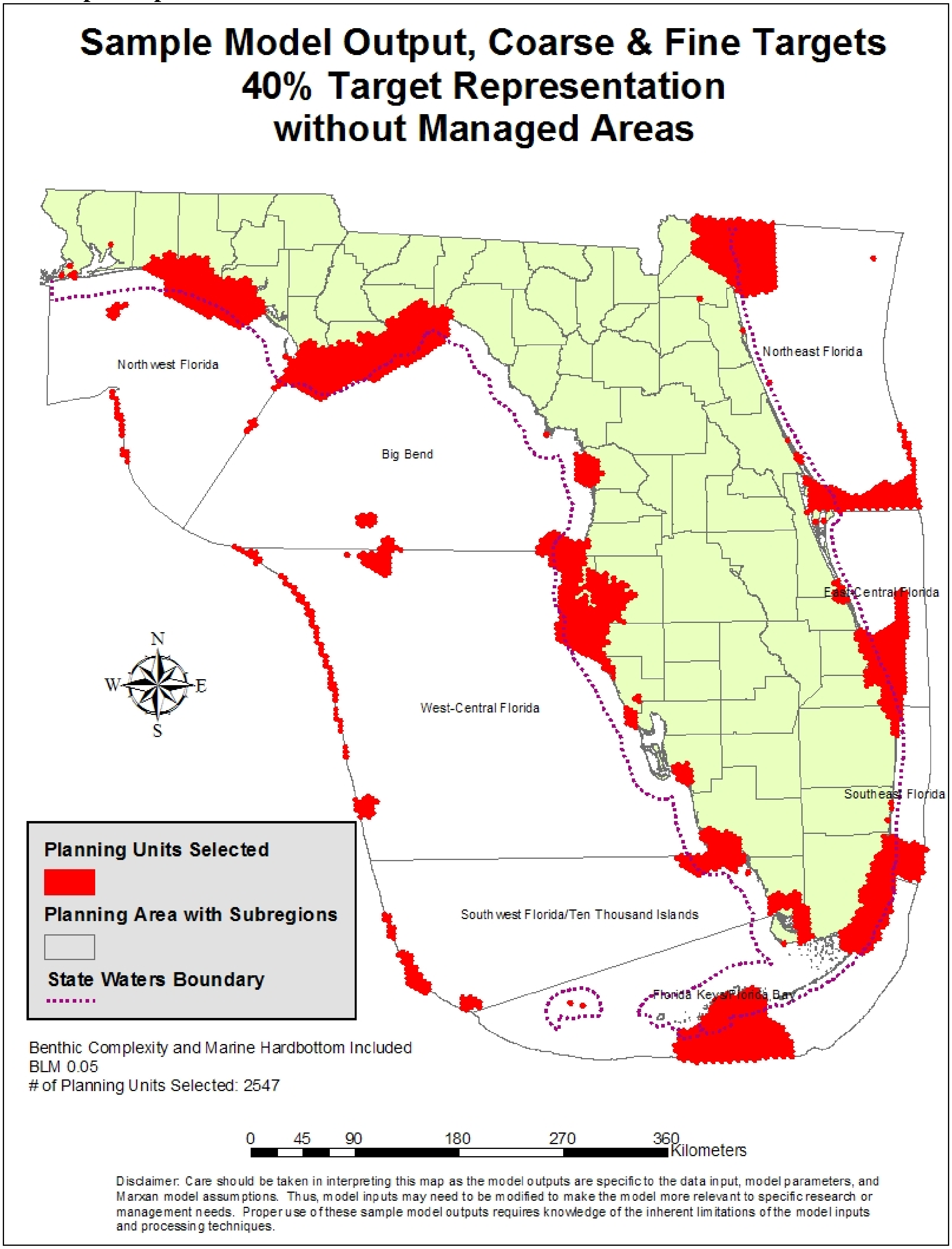


**Figure B-6. Sample model output, optimal solution – Coarse & fine filter targets including benthic complexity and marine hardbottom, 20% target representation, managed areas given no special preference.**

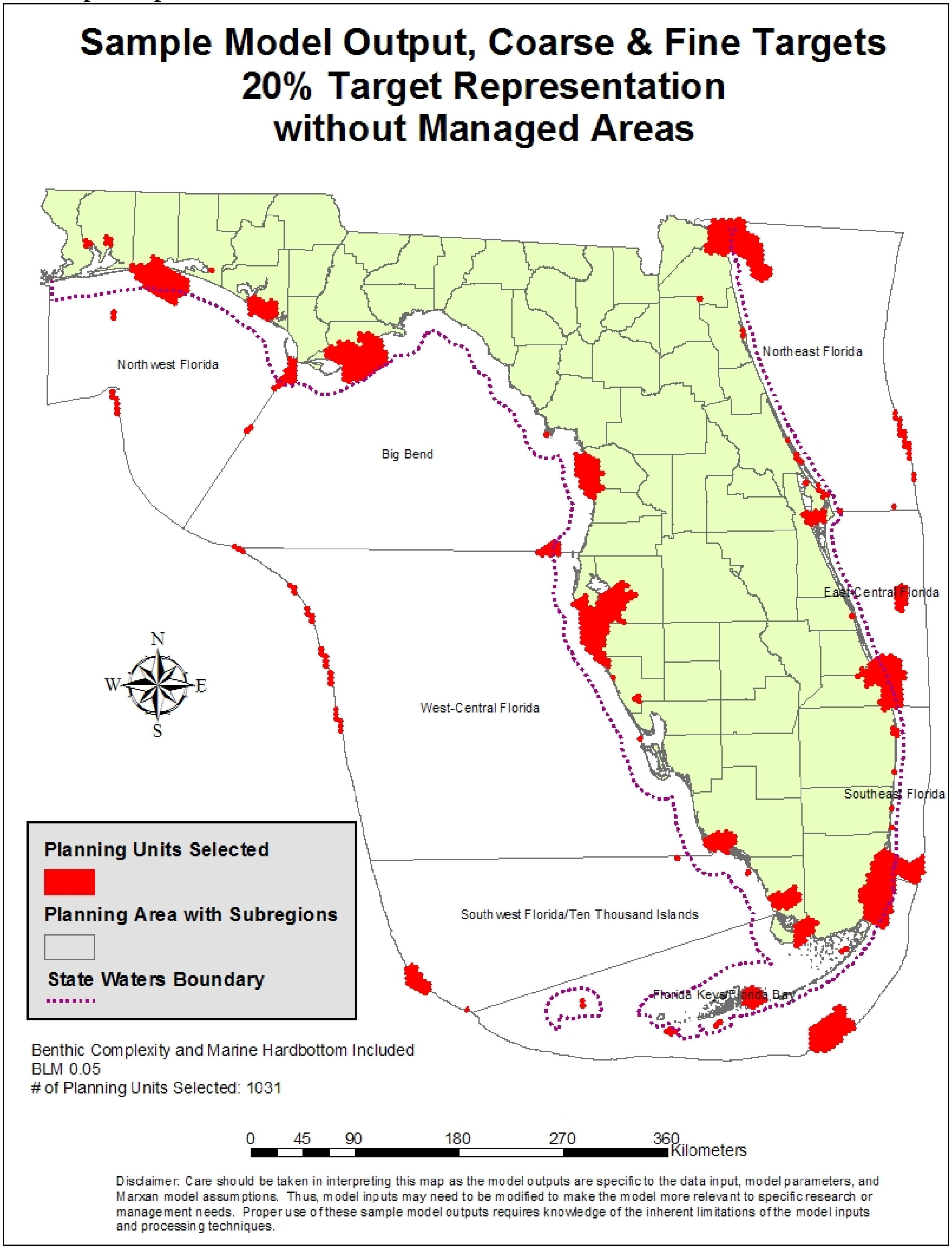


**Figure B-7. Sample model output, summed solution – Coarse & fine filter targets including benthic complexity and marine hardbottom, variable target representation, managed areas given no special preference.**

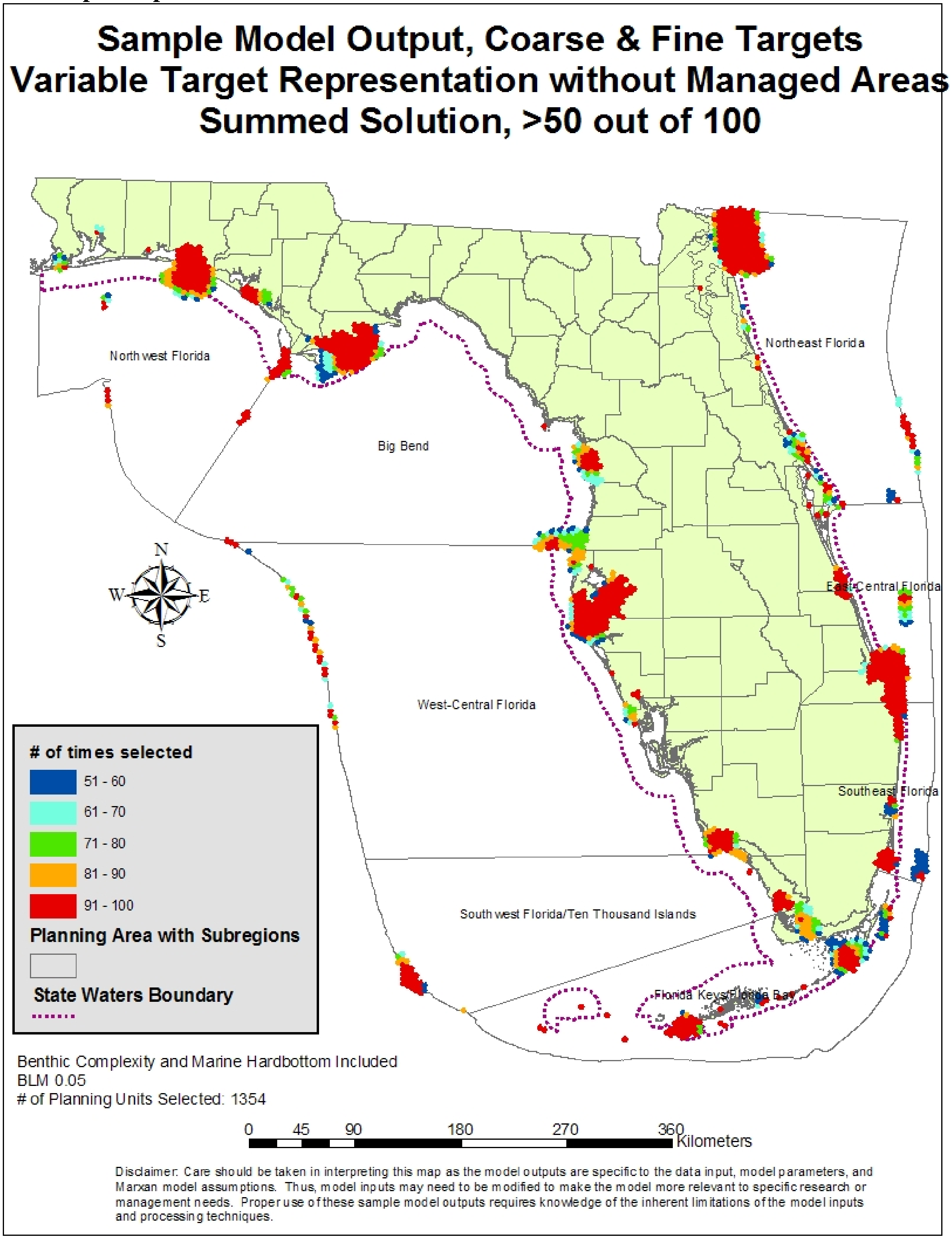


**Figure B-8. Sample model output, summed solution – Coarse & fine filter targets including benthic complexity and marine hardbottom, 40% target representation, managed areas given no special preference.**

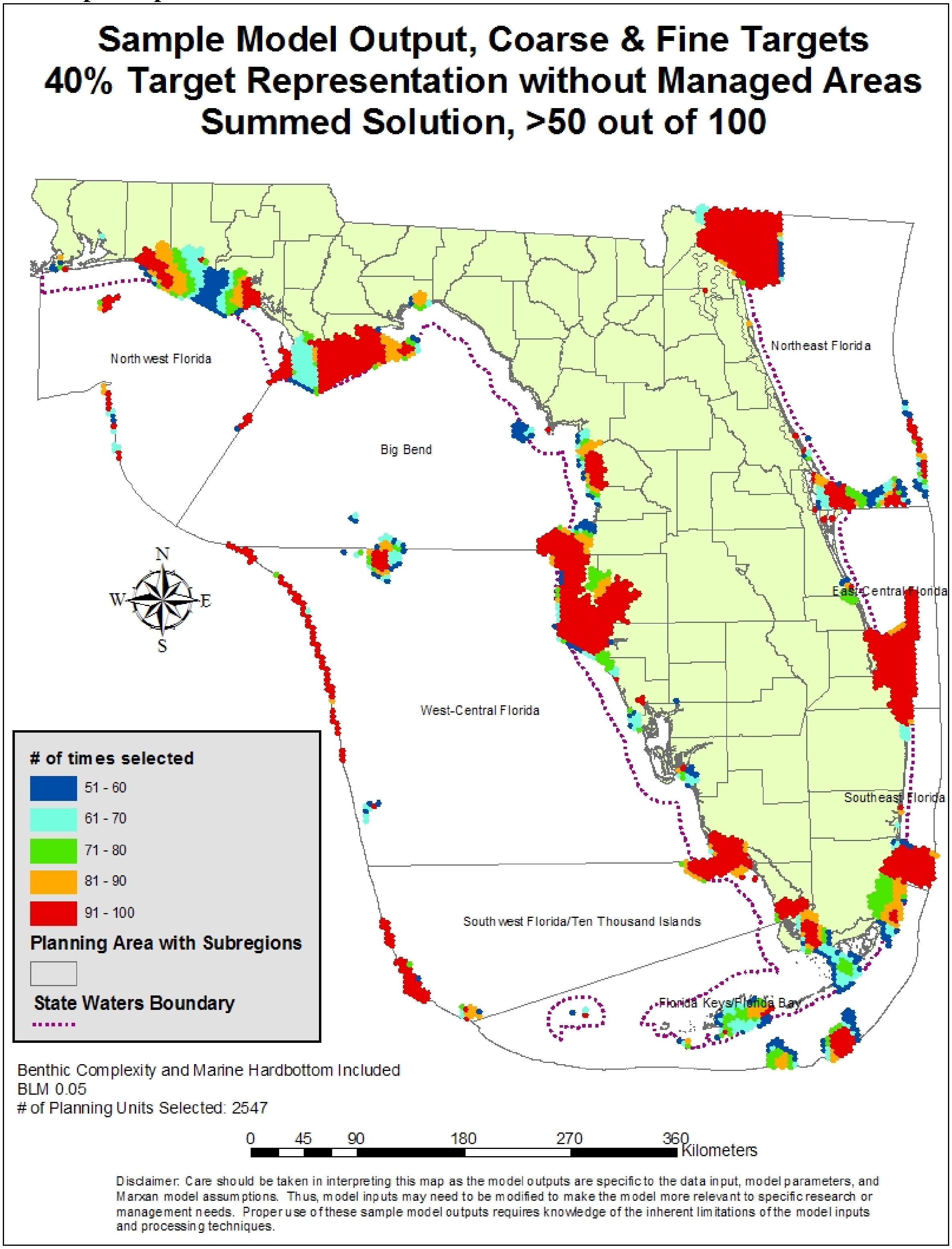


**Figure B-9. Sample model output, summed solution – Coarse & fine filter targets including benthic complexity and marine hardbottom, 20% target representation, managed areas given no special preference.**

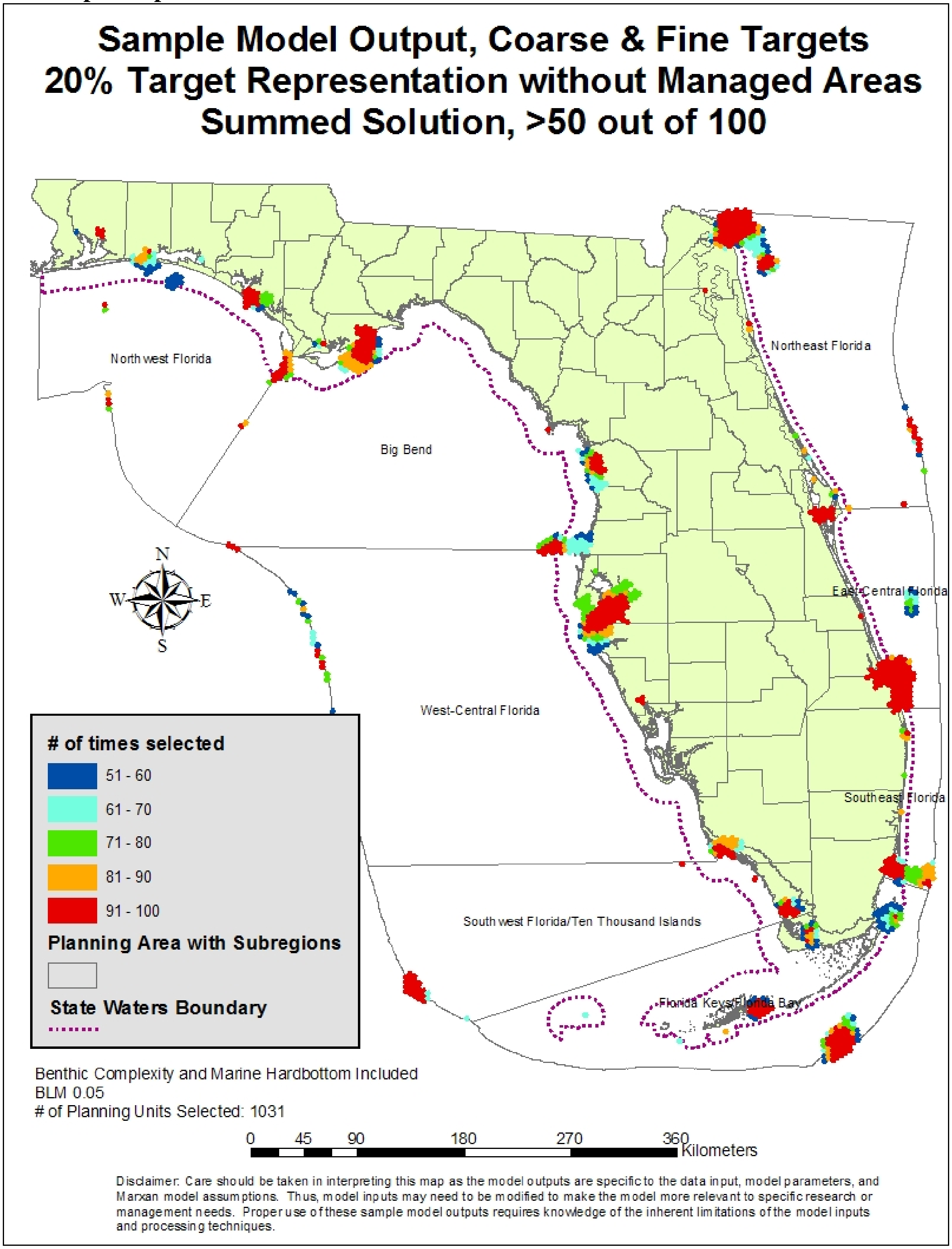


**Table B-2. Efficiency of Meeting the Model Run Target Representation Factors. Runs include coarse and fine filter targets and BLM = 0.05. Hardbottom and benthic complexity targets are included.**

| SUBREGION→<br><br>Percent of Targets with Goals Exceeding 130% of the Target Representation Factor | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | Entire Planning Area |
|---|---|---|---|---|---|---|---|---|---|
| Variable Target Representation, managed areas given no special attention | 48% | 68% | 71% | 25% | 59% | 43% | 50% | 33% | 50% |
| 20% Target Representation, managed areas given no special attention | 56% | 59% | 78% | 39% | 70% | 48% | 75% | 56% | 60% |
| 40% Target Representation, managed areas given no special attention | 47% | 54% | 75% | 42% | 70% | 48% | 68% | 32% | 54% |

**Table B-3. Percent Planning Area Selected by Model Run. Coarse and fine filter targets included. BLM = 0.05. Hardbottom and benthic complexity targets are included.**

| Model Run | # Planning Units Selected | % Planning Area Selected* |
|---|---|---|
| Variable Target Representation, managed areas given no special attention | 1354 | 7.1% |
| Target Representation = 20%, managed areas given no special attention | 1031 | 5.4% |
| Target Representation = 40%, managed areas given no special attention | 2547 | 13.4% |

*Total number of planning units = 18,943.

## Appendix C
## Fine Filter (Species) Targets Included in the Florida Marine Site Prioritization Framework

Our selection of fine filter (species) targets for development of this framework analysis differed from the Florida Comprehensive Wildlife Conservation Strategy (CWCS) process to identify species of greatest conservation need (SGCN). In general for MARXAN-based site prioritization analyses, fine filter targets are limited to species and ecological phenomena that are not likely to be adequately represented by coarse filter targets alone. Selection is typically reserved for the most imperiled and/or rare species so as not to allow the fine filter information to "overwhelm" the coarse filter data in the MARXAN analysis.

We used the following criteria to select fine filter targets for the Florida marine/estuarine site prioritization analysis:

- Globally, regionally or state imperiled species (G1-G2/G3, S1-S3, State Species of Special Concern - SSC), IUCN red-listed, federally listed/candidate species and American Fisheries Society threatened or endangered distinct population segments); and
- Species aggregations, such as breeding concentrations and important nursery areas.

Some fine filter targets present in the planning area and meeting the above criteria were not included in this site prioritization analysis due to lack of sufficient distribution information. Furthermore, exceptions were made for the 3 subspecies of diamondback terrapin, *Malaclemys terrapin* subsp. *macrospilota, M. t. pileata* and *M. t. centrata*, to accommodate a recommendation made at one of the several expert workshops held to review this process.

In all, 36 fine filter targets were included in the framework. Specific fine filter targets were only included in subregions where they are known to occur, and where data on their distribution was uniformly collected for most if not all of the subregion, or data has been collected over a long enough period that the discovery of a significant number of additional occurrence sites is not anticipated. The exception to this is the oyster reef distribution data. The distribution of this coarse filter target has not been systematically collected in any of the subregions. However, we deemed this target to be of sufficient importance to warrant the inclusion of the best available data in the framework.

| Table C-1. Fine Filter Targets included in Florida Marine Site Prioritization Framework* | | | | | | |
|---|---|---|---|---|---|---|
| **TARGET** | **DATA TYPE** | **DATA SOURCE(s)** | **SOURCE DATASET NAME(s)** | **PROJECT DATA PROCESSING** | **DATASET EXTENT** | **PROJECT DATASET NAME(s)** |
| Florida Manatee *Trichechus manatus latirostris,* aerial counts | Point | FWC/FWRI | FWRI_manatee_survey_1999-04.shp | Used as is | Statewide | FWRI_manatee_survey_1999-04.shp |
| Northern Right Whale *Eubalaena glacialis,* critical habitat | Polygon | NOAA Coastal Services Center | right_whale_critical_habitat.shp | Used as is | Statewide | right_whale_critical_habitat.shp |
| American Oystercatcher *Haematopus palliatus,* element occurrence | Point | FNAI | FLEO_052903.shp | Isolated species from FNAI element occurrence dataset | Statewide | am_oystercatchFLEO.shp |
| Black Skimmer *Rynchops niger,* element occurrence | Point | FNAI | FLEO_052903.shp | Isolated species from FNAI element occurrence dataset | Statewide | black_skimmerFLEO.shp |
| Brown Pelican, *Pelecanus occidentalis* rookery | Point | FWC | BPELROOK.shp | Used as is | Statewide | BPELROOK.shp |
| Least Tern *Sterna antillarum,* element occurrence | Point | FNAI | LEASTERN.shp | Used as is | Statewide | LEASTERN_FNAI.shp |
| Piping Plover *Charadrius melodus,* element occurrence | Point | FNAI | FLEO_052903.shp | Isolated species from FNAI element occurrence dataset | Statewide | piping_ploverFLEO.shp |
| Reddish Egret *Egretta rufescens,* element occurrence | Point | FNAI | FLEO_052903.shp | Isolated species from FNAI element occurrence dataset | Statewide | reddish_egretFLEO.shp |
| Roseate Spoonbill *Ajaia ajaia,* element occurrence | Point | FNAI | FLEO_052903.shp | Isolated species from FNAI element occurrence dataset | Statewide | roseate_spoonbillFLEO.shp |
| Roseate Tern *Sterna dougallii, nesting sites and other sightings.* | Polygon | FWC | ROSETERN.shp | Used as is | | ROSETERN_FWC.shp |

* Table 2 in this report contains similar information on the coarse filter targets.

| Table C-1. Fine Filter Targets included in Florida Marine Site Prioritization Framework, continued | | | | | | |
|---|---|---|---|---|---|---|
| **TARGET** | **DATA TYPE** | **DATA SOURCE(s)** | **SOURCE DATASET NAME(s)** | **PROJECT DATA PROCESSING** | **DATASET EXTENT** | **PROJECT DATASET NAME(s)** |
| Snowy Egret, *Egretta thula,* element occurrence | Point | FNAI | FLEO_052903.shp | Isolated species from FNAI element occurrence dataset | Statewide | snowy_egretFLEO.shp |
| Snowy Plover, *Charadrius alexandrinus tenuirostris,* element occurrence | Point | FNAI | FLEO_052903.shp | Isolated species from FNAI element occurrence dataset | Statewide | snowy_ploverFLEO.shp |
| Waterbird nesting sites | Point | FWC | waterbird99_active90survey.shp | Isolated large colonies (>50 breeding pairs). | Statewide | waterbird_99_large_colonies |
| American Crocodile *Crocodylus acutus,* habitat | Polygon | FWC/FWRI | ESI.shp | Isolated crocodile attribute (high, medium and low; Did not include transient) | Statewide | Am_crocodile_esi.shp |
| Sea Turtle nesting, 2003 | Line | FWC/FWRI | 64.shp | Determined number of nests by species for beach segments occurring within planning units. | Statewide | seaturtle_nests.shp |
| Sea Turtles, in water surveys | Point | NOAA | turtles_swim.shp | Used as is | EC, SE & FL Keys | turtles_swim.shp |
| Diamondback Terrapin (Ornate), *Malaclemys terrapin macrospilota,* potential habitat model | Polygon | FWC | ornterp.shp | Used as is | Statewide | ornate_terp.shp |
| Diamondback Terrapin (Mississippi), M*alaclemys terrapin pileata,* potential habitat model | Polygon | FWC | missterp.shp | Used as is | Statewide | miss_terp.shp |
| Diamondback Terrapin (Carolina), *Malaclemys terrapin centrata,* potential habitat model | Polygon | FWC | caroterp.shp | Used as is | Statewide | carolina_terp.shp |

| Table C-1. Fine Filter Targets included in Florida Marine Site Prioritization Framework, continued | | | | | | |
|---|---|---|---|---|---|---|
| **TARGET** | **DATA TYPE** | **DATA SOURCE(s)** | **SOURCE DATASET NAME(s)** | **PROJECT DATA PROCESSING** | **DATASET EXTENT** | **PROJECT DATASET NAME(s)** |
| Smalltooth Sawfish *Pristis pectinata,* sightings | Point | C. Simpendorfer | st_sawfish.shp. | Used as is | Statewide | st_sawfish.shp. |
| Slashcheek Goby *Ctenogobius pseudofasciatus,* element occurrence | Point | FNAI<br><br>G. Gilmore, 1992 | FLEO_052903.shp | Isolated species from EO dataset;<br>Added spatial reference points based on species accounts contained in "Rare and Endangered Biota of Florida, vol. II Fish" | Statewide | FLEO_rare_little_fish.shp |
| River Goby *Awaous banana,* element occurrence | Point | FNAI<br><br>G. Gilmore, 1992 | FLEO_052903.shp | Isolated species from EO dataset;<br>Added spatial reference points based on species accounts contained in "Rare and Endangered Biota of Florida, vol. II Fish" | Statewide | FLEO_rare_little_fish.shp |
| Bigmouth Sleeper, *Gobiomorus dormitor*, element occurrence | Point | FNAI<br><br>G. Gilmore, 1992 | FLEO_052903.shp | Isolated species from EO dataset;<br>Added spatial reference points based on species accounts contained in "Rare and Endangered Biota of Florida, vol. II Fish" | Statewide | FLEO_rare_little_fish.shp |
| Mangrove Rivulus *Rivulus marmoratus,* element occurrence | Point | FNAI<br><br>G. Gilmore, 1992 | FLEO_052903.shp | Isolated species from EO dataset;<br>Added spatial reference points based on species accounts contained in "Rare and Endangered Biota of Florida, vol. II Fish" | Statewide | FLEO_rare_little_fish.shp |

| Table C-1. Fine Filter Targets included in Florida Marine Site Prioritization Framework, continued | | | | | | |
|---|---|---|---|---|---|---|
| **TARGET** | **DATA TYPE** | **DATA SOURCE(s)** | **SOURCE DATASET NAME(s)** | **PROJECT DATA PROCESSING** | **DATASET EXTENT** | **PROJECT DATASET NAME(s)** |
| Opossum pipefish *Microphis brachyurus lineatus,* element occurrence | Point | FNAI<br><br>FWC/ Tulane University Museum<br><br>G. Gilmore, 1992 | FLEO_052903.shp<br><br>opipefish.shp | Isolated species from EO dataset;<br>Used as is;<br><br>Added spatial reference points based on species accounts contained in "Rare and Endangered Biota of Florida, vol. II Fish" | Statewide | FLEO_rare_little_fish.shp<br><br>opipefish.shp<br><br>FLEO_rare_little_fish.shp |
| Striped croaker *Bairdiella sanctaeluciae,* element occurrence | Point | FNAI | FLEO_052903.shp | Isolated species from EO dataset | Statewide | FLEO_rare_little_fish.shp |
| Gulf Sturgeon *Acipenser oxyrhynchus desotoi,* element occurrence | Point | FNAI | FLEO_052903.shp | Isolated species from EO dataset | Statewide | gulf_sturgeonFLEO.shp |
| Atlantic Sturgeon, *Acipenser oxyrhynchus oxyrhynchus,* element occurrence | Point | FNAI | FLEO_052903.shp | Isolated species from EO dataset | Statewide | atlantic_sturgeon.shp |
| Shortnose Sturgeon *Acipenser brevirostrum,* element occurrence | Point | FNAI | FLEO_052903.shp | Isolated species from EO dataset | Statewide | shortnose_sturgeon.shp |
| Saltmarsh Topminnow, *Fundulus jenkinsi,* element occurrence | Point | FNAI<br><br>FWC | FLEO_052903.shp<br><br>Saltmarsh_Top.shp | Isolated species from EO dataset;<br>Used as is. | Statewide | saltmarsh_topminnow.shp<br><br>Saltmarsh_Top.shp |

| Table C-1. Fine Filter Targets included in Florida Marine Site Prioritization Framework, continued | | | | | | |
|---|---|---|---|---|---|---|
| **TARGET** | **DATA TYPE** | **DATA SOURCE(s)** | **SOURCE DATASET NAME(s)** | **PROJECT DATA PROCESSING** | **DATASET EXTENT** | **PROJECT DATASET NAME(s)** |
| Alabama Shad<br>*Alosa alabamae* | Point | FWC/<br>Tulane University Museum/<br>G. Bass | ala shad.shp | Used as is. | Statewide | ala shad.shp |
| Key Silverside<br>*Menidia conchorum* | Point | FNAI | FLEO_052903.shp | Used as is. | Statewide | key_silverside.shp |
| Queen Conch,<br>*Strombus gigas,*<br>spawning aggregations | Point | B. Glazer, FWC | conch_aggregations.shp | Created polygons around conch spawning aggregation points based on advise from Bob Glazer. | Florida Keys | conch_2003_poly.shp |
| Elkhorn Coral<br>*Acropora palmata,*<br>colony locations | Point | Chiappone – NURC<br><br>NMFS-SEFSC<br><br>Vargas, NSU | Supplied coordinates for *A. palmata* colonies in Florida Keys<br><br>acropora_colonies_BMP.shp (Biscayne National Park)<br><br>acropora_broward.shp (Broward County) | Combined with Broward County and Biscayne National Park *A. palmata* only colonies & created new shapefile.<br><br>Isolated the colonies with *A. palmata* from dataset and combined as noted above; Isolated colonies with *A. palmata and A. cervicornis* and created shapefile.<br><br>Isolated the *A. palmata* colonies and combined with Florida Keys and Broward County data to create new shapefile as described above. | Broward County to Dry Tortugas | acropora_palmata.shp<br><br>acropora_BNP_palmata_cervi.shp |
| Johnson's Seagrass,<br>*Halophila johnsonii,*<br>locations | Point | NOAA<br><br>G. Gilmore | johnsons_seagrass_critical_habitat_FL_2003_poly.shp | Created shapefile from dataset;<br><br>Added expert input. | Statewide | johnsons_seagrass_dissolve |

| Table C-1. Fine Filter Targets included in Florida Marine Site Prioritization Framework, continued | | | | | | |
|---|---|---|---|---|---|---|
| TARGET | DATA TYPE | DATA SOURCE(s) | SOURCE DATASET NAME(s) | PROJECT DATA PROCESSING | DATASET EXTENT | PROJECT DATASET NAME(s) |
| Spawning aggregations, harvested fish species | Point | K. Lindeman (ED) 2000 and pers. com;<br><br>R. Torres, TNC | Provided locations/coordinates based on interviews with fishermen.<br><br>Personal knowledge | Developed a shapefile based on source information | Florida Keys to Miami-Dade County | spags.shp |

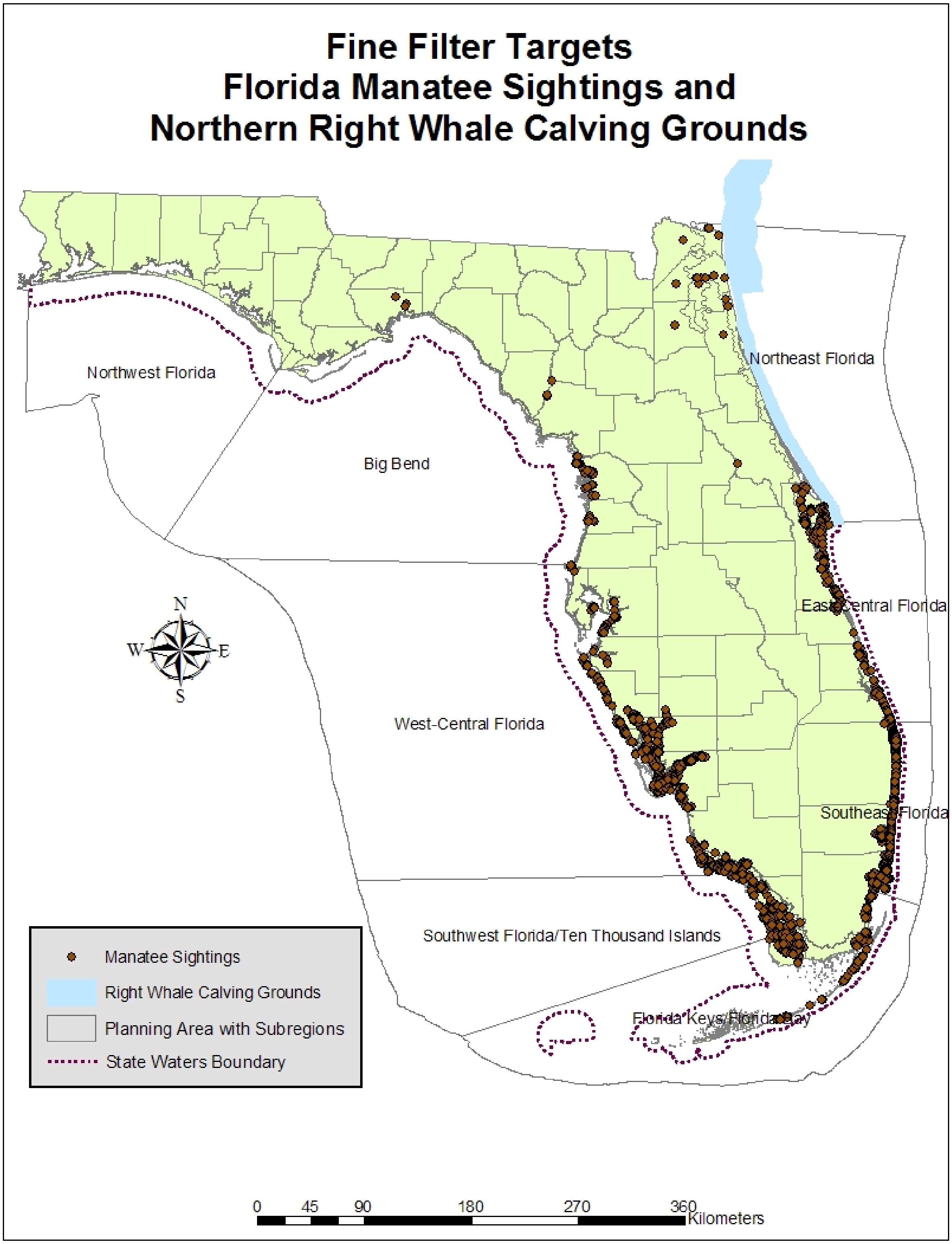
## Appendix C. References

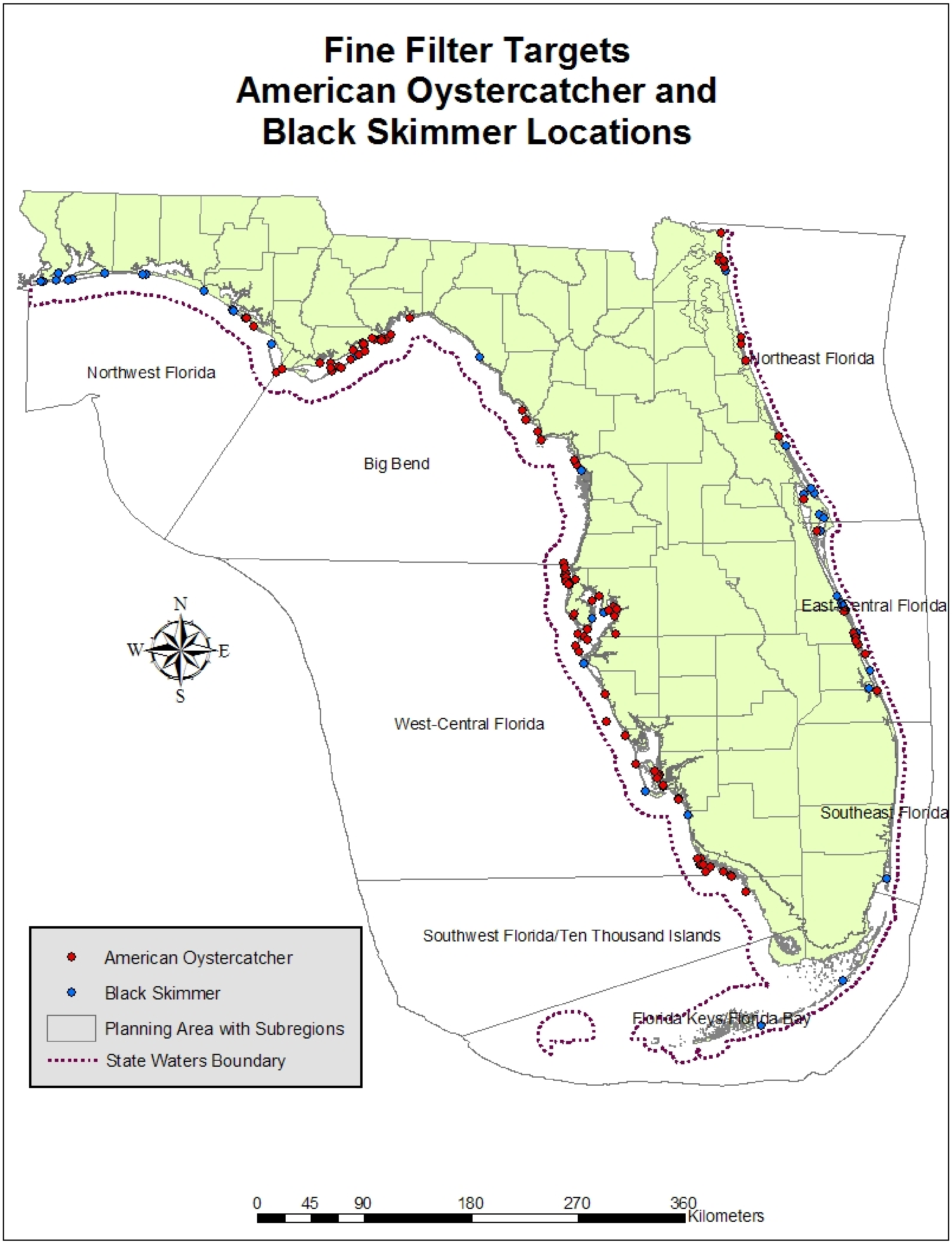

Lindeman, K., R. Pugliese, G. Waugh and J. Ault. 2000. Developmental patterns within a multispecies reef fishery: Management applications for essential fish habitats and protected areas. Bulletin of Marine Science, 66(3): 929-956.

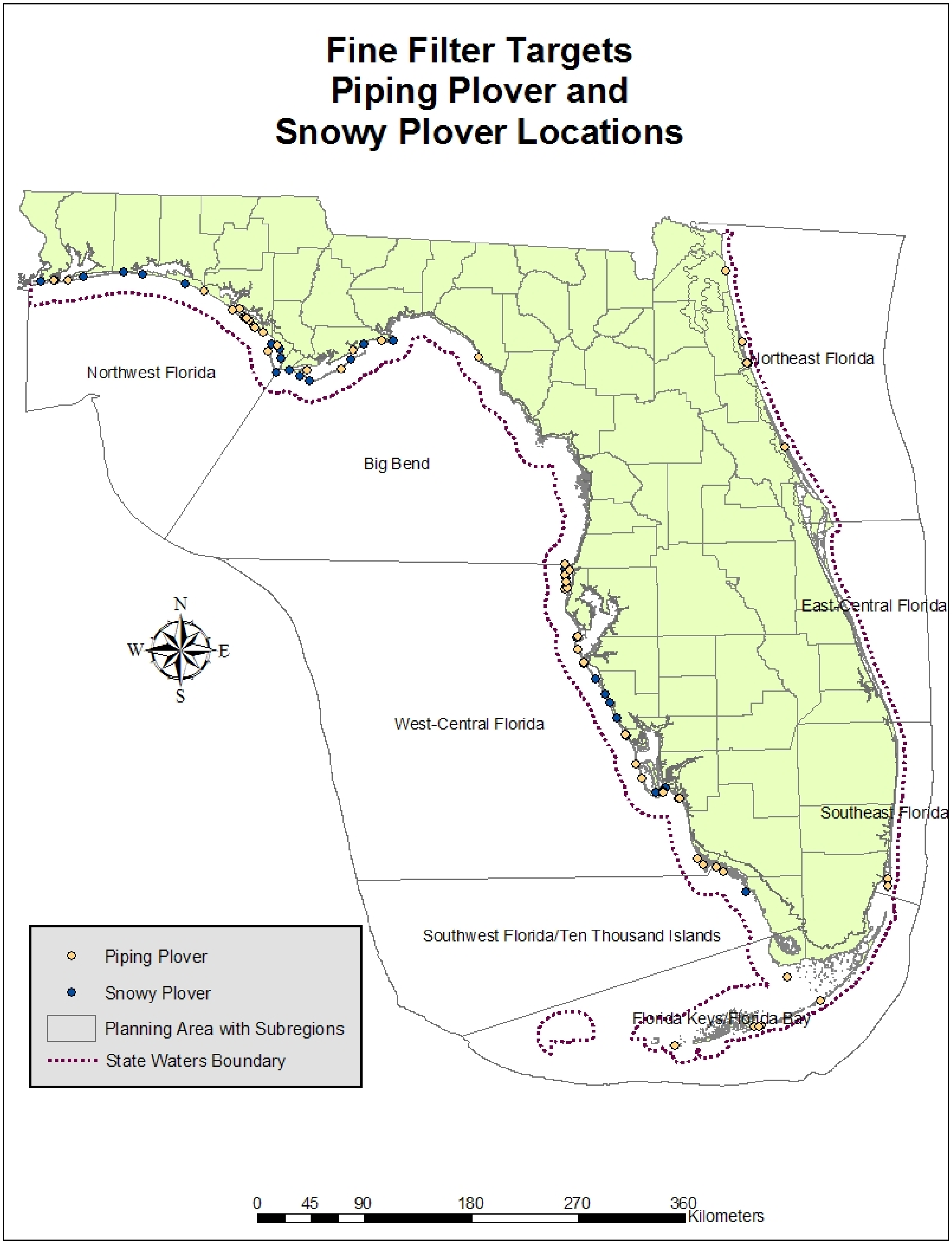
**Table C-2. Subregions with Fine Filter Datasets Included in Report Analysis***

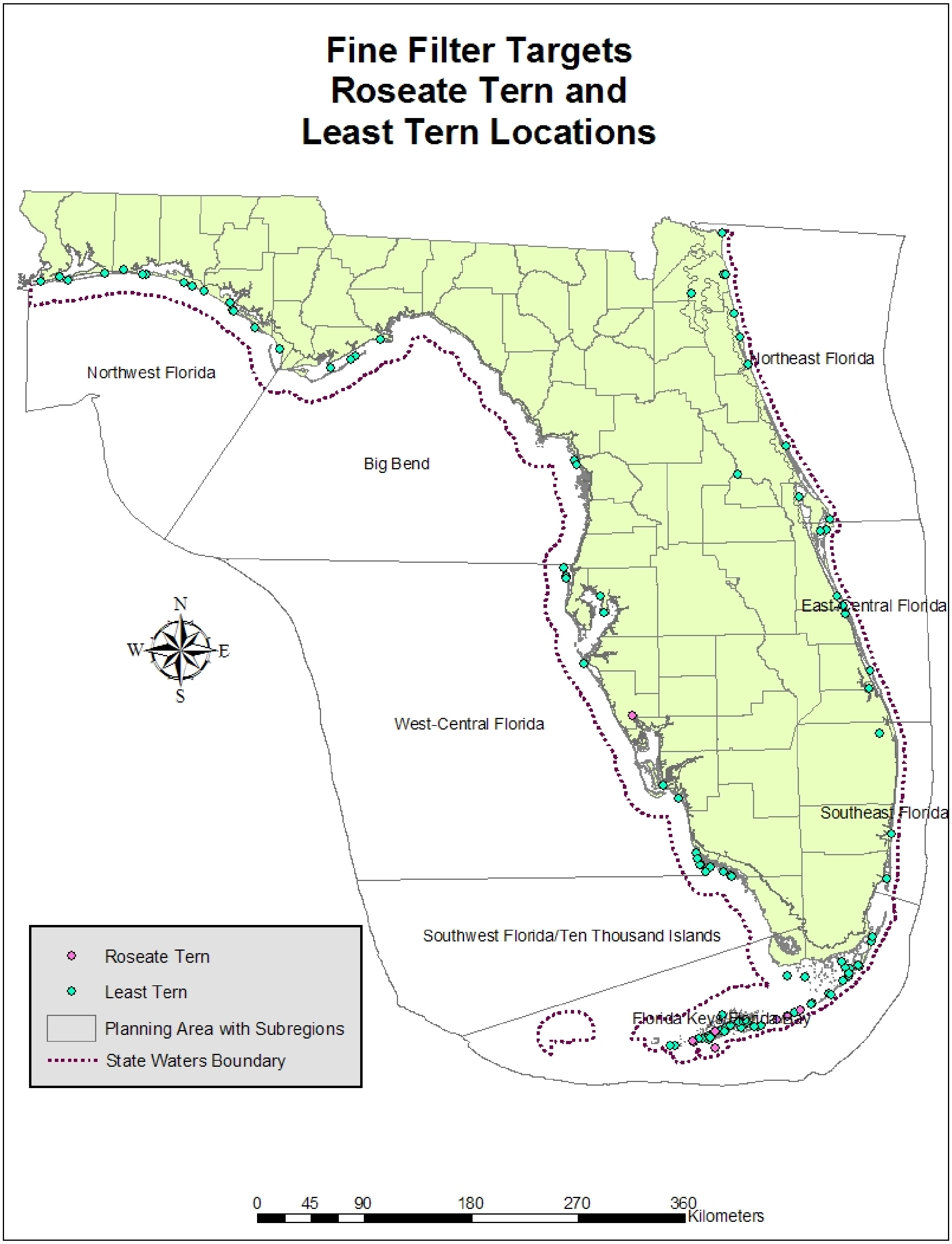
| Fine Filter Targets | Subregions with dataset 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Florida Manatee | x | x | x | x | x | x | x | x |
| Northern Right Whale | x | | | | | | | |
| American Oystercatcher | x | x | | x | x | x | x | x |
| Black Skimmer | x | x | x | x | x | x | x | x |
| Brown Pelican | x | x | | x | x | x | x | x |
| Least Tern | x | x | x | x | x | x | x | x |
| Piping Plover | x | | x | x | x | x | x | x |
| Reddish Egret | x | x | x | x | | x | x | x |
| Roseate Spoonbill | x | x | x | x | | x | | |
| Roseate Tern | | | | x | | x | | |
| Snowy Egret | x | x | x | x | x | x | x | x |
| Snowy Plover | | | | x | x | x | x | x |
| Waterbird nesting sites | x | x | x | x | x | x | x | |
| American Crocodile | | | x | x | | x | | |
| Sea Turtle nesting beaches | x | x | x | x | x | x | x | x |
| Sea Turtles, in water surveys | | x | x | x | | | | |
| Diamondback Terrapin (Ornate) | | | | x | x | x | x | x |
| Diamondback Terrapin (Mississippi) | | | | | | | | x |
| Diamondback Terrapin (Carolina) | x | | | | | | | |
| Smalltooth Sawfish | x | x | x | x | x | x | x | x |
| Slashcheek Goby | | x | | | | | | |
| River Goby | | x | | | | | | x |
| Bigmouth Sleeper | | x | x | | | | | |
| Mangrove Rivulus | | x | x | x | | x | | |
| Opossum Pipefish | x | x | | | | x | | |
| Striped croaker | | x | | | | | | |
| Gulf Sturgeon | | | | | | x | x | x |
| Atlantic Sturgeon | x | x | | | | | | |
| Shortnose Sturgeon | x | | | | | | | |
| Saltmarsh Topminnow | | | | | | | | x |
| Alabama Shad | | | | | | | x | x |
| Key Silverside | | | | x | | | | |
| Queen conch spawning aggregations | | | | x | | | | |
| Elkhorn Coral | | | x | x | | | | |
| Johnson's Seagrass | | x | x | | | | | |
| Spawning aggregations, harvested fish species | | | | | x | x | | |

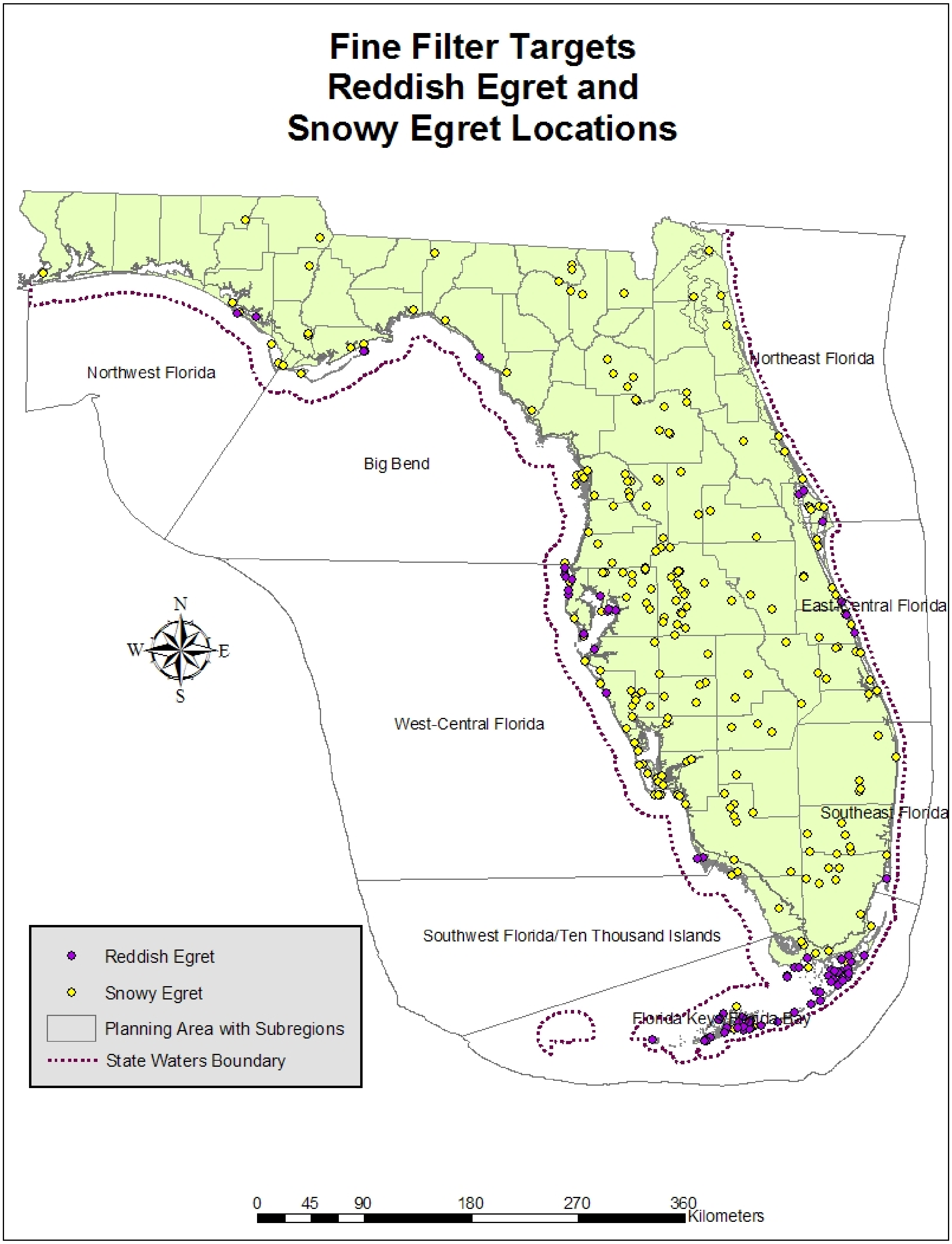
** Subregions with coarse filter target datasets included in report analysis is presented in Table 2 of this report.*

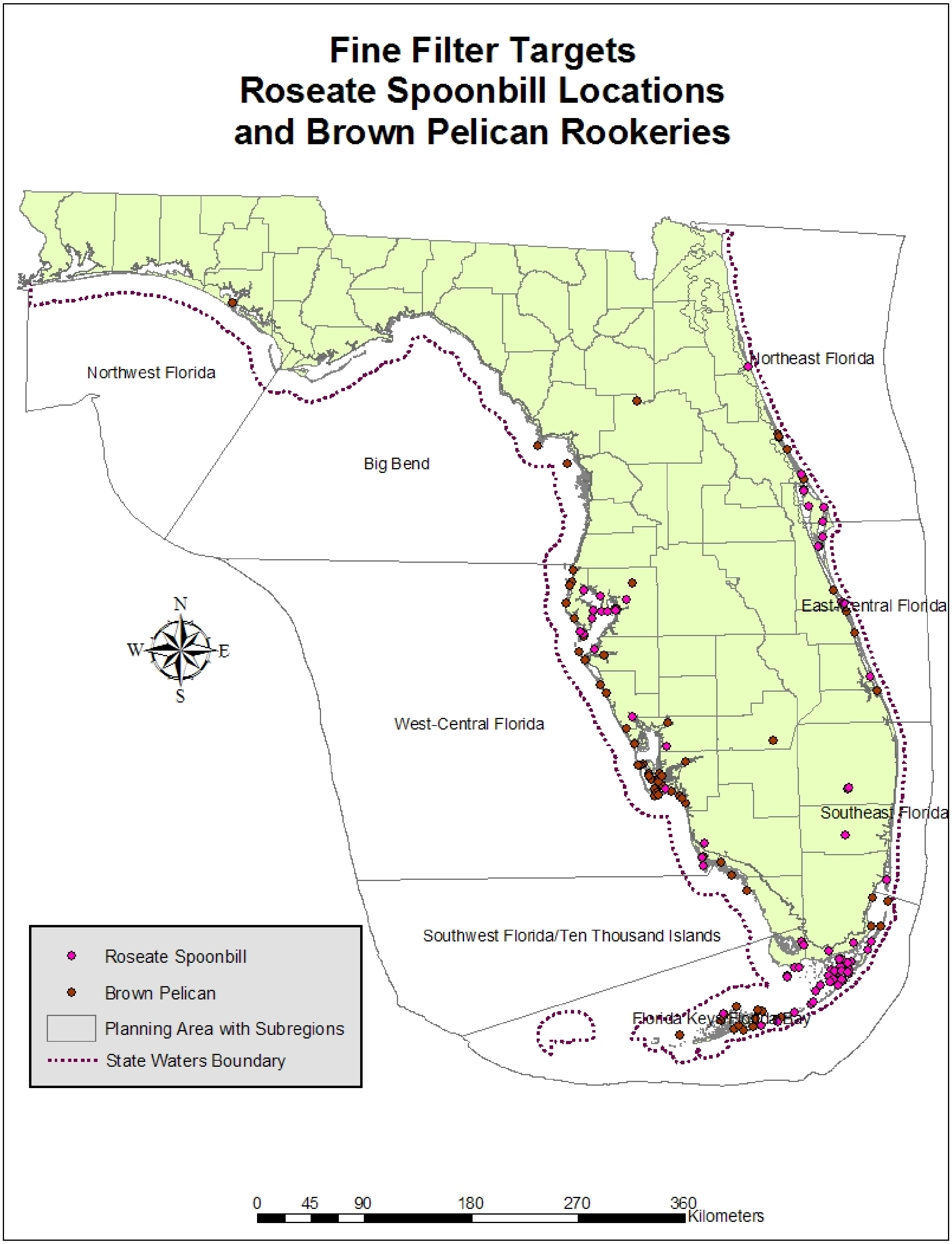

Fine Filter Targets
Florida Manatee Sightings and
Northern Right Whale Calving Grounds
Northeast Florida
Northwest Florida
Big Bend
East Central Florida
West-Central Florida
Southeast Florida
Southwest Florida/Ten Thousand Islands
Florida Keys/Florida Bay
N
W
E
S
Manatee Sightings
Right Whale Calving Grounds
Planning Area with Subregions
State Waters Boundary
0 45 90 180 270 360
Kilometers

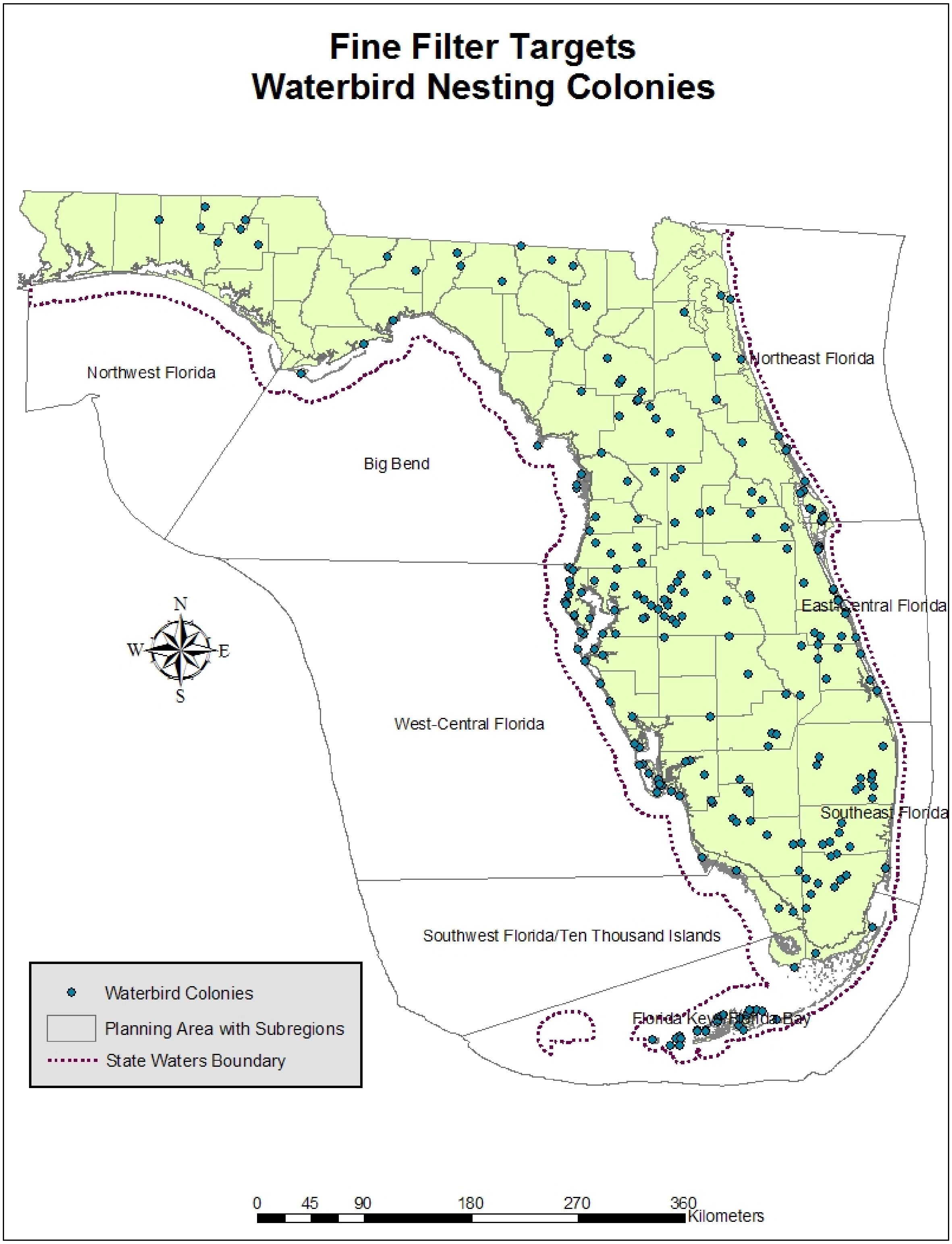

Fine Filter Targets
American Oystercatcher and
Black Skimmer Locations
Northwest Florida
Big Bend
Northeast Florida
East-Central Florida
West-Central Florida
Southeast Florida
Southwest Florida/Ten Thousand Islands
Florida Keys/Florida Bay
N
S
E
W
American Oystercatcher
Black Skimmer
Planning Area with Subregions
State Waters Boundary
0
45
90
180
270
360
Kilometers

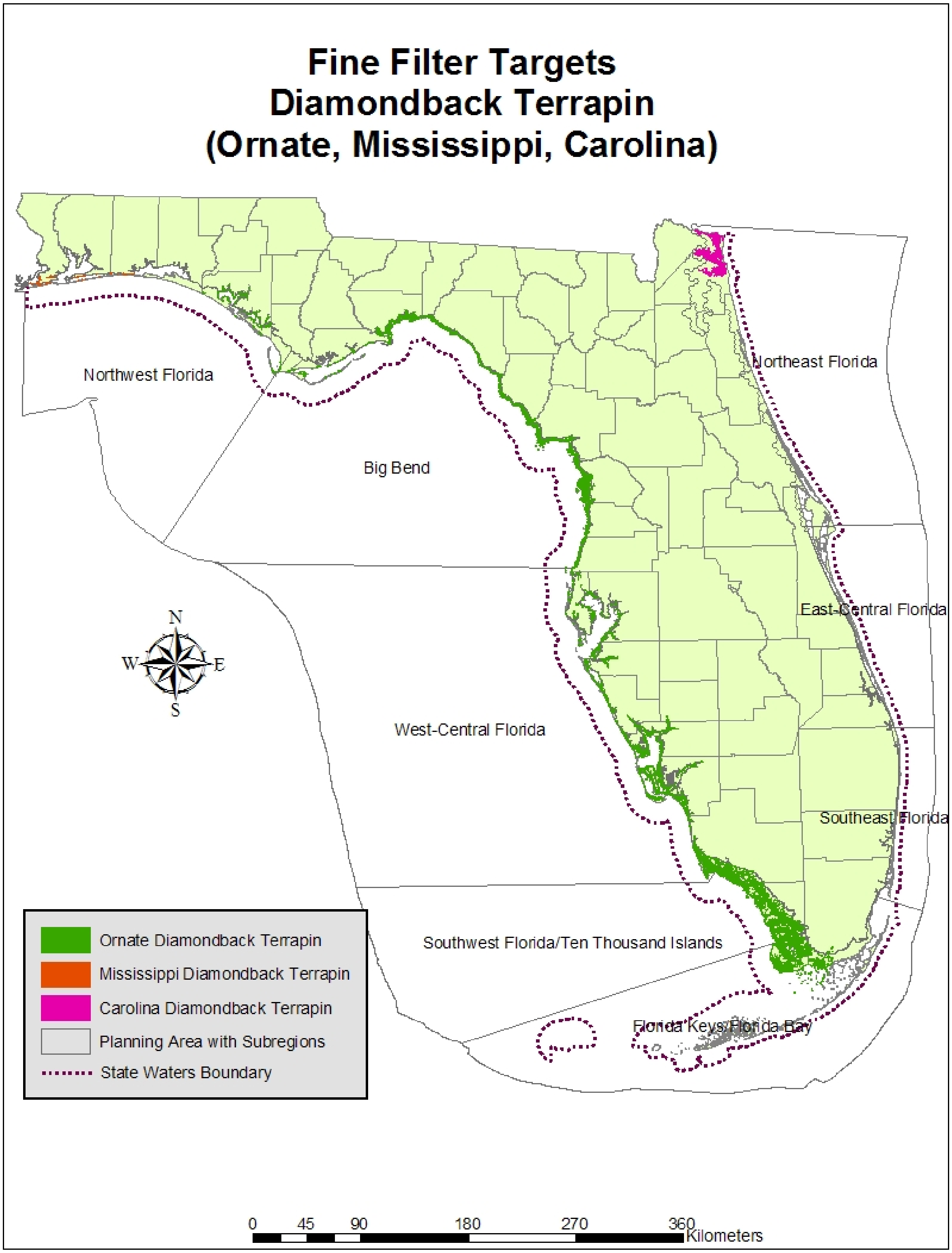

Fine Filter Targets
Piping Plover and
Snowy Plover Locations
Northwest Florida
Big Bend
Northeast Florida
East-Central Florida
West-Central Florida
Southeast Florida
Southwest Florida/Ten Thousand Islands
Florida Keys/Florida Bay
N
S
W
E
Piping Plover
Snowy Plover
Planning Area with Subregions
State Waters Boundary
0 45 90 180 270 360
Kilometers

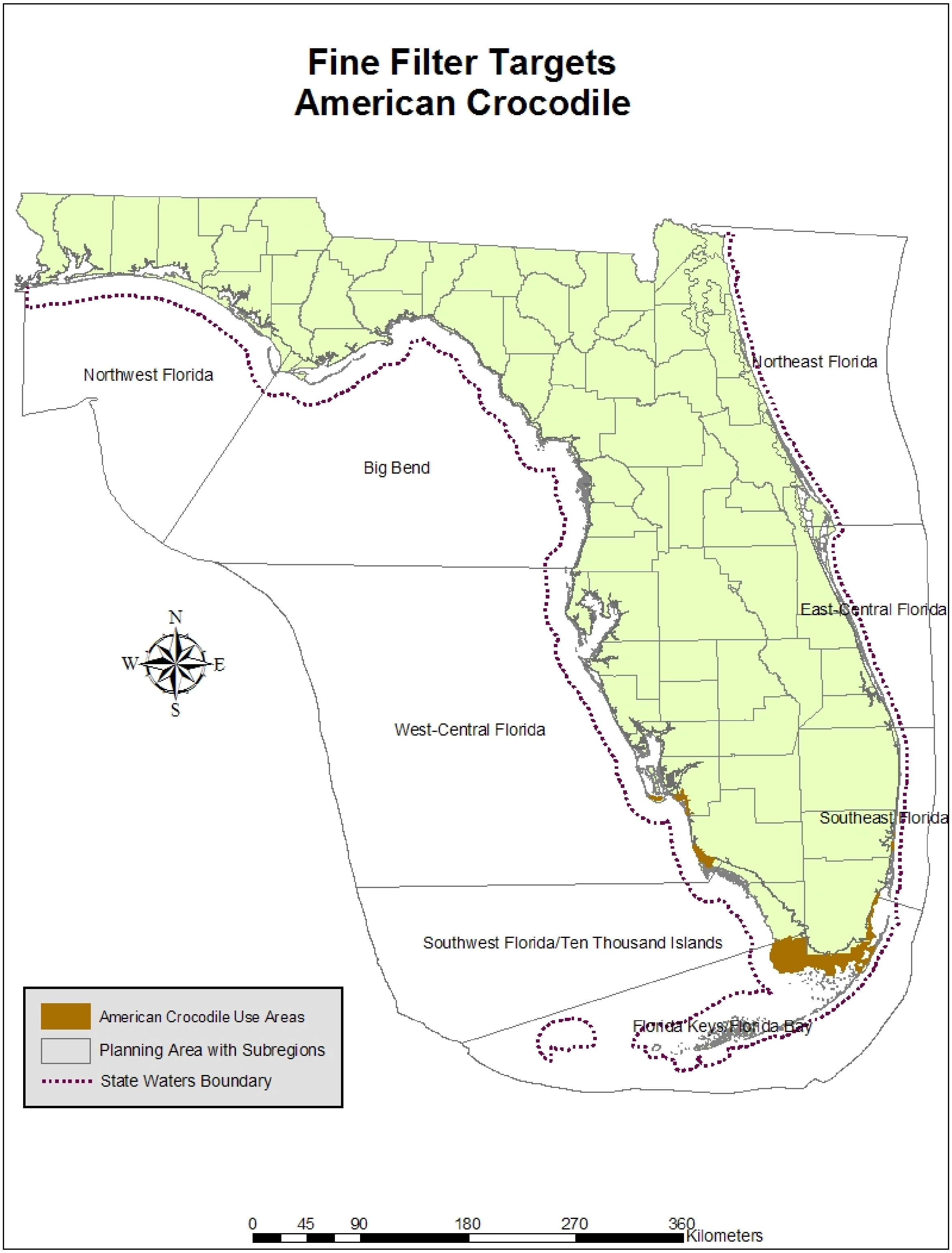

Fine Filter Targets
Roseate Tern and
Least Tern Locations
Northwest Florida
Big Bend
Northeast Florida
East-Central Florida
West-Central Florida
Southeast Florida
Southwest Florida/Ten Thousand Islands
Florida Keys/Florida Bay
N
S
E
W
Roseate Tern
Least Tern
Planning Area with Subregions
State Waters Boundary
0
45
90
180
270
360
Kilometers

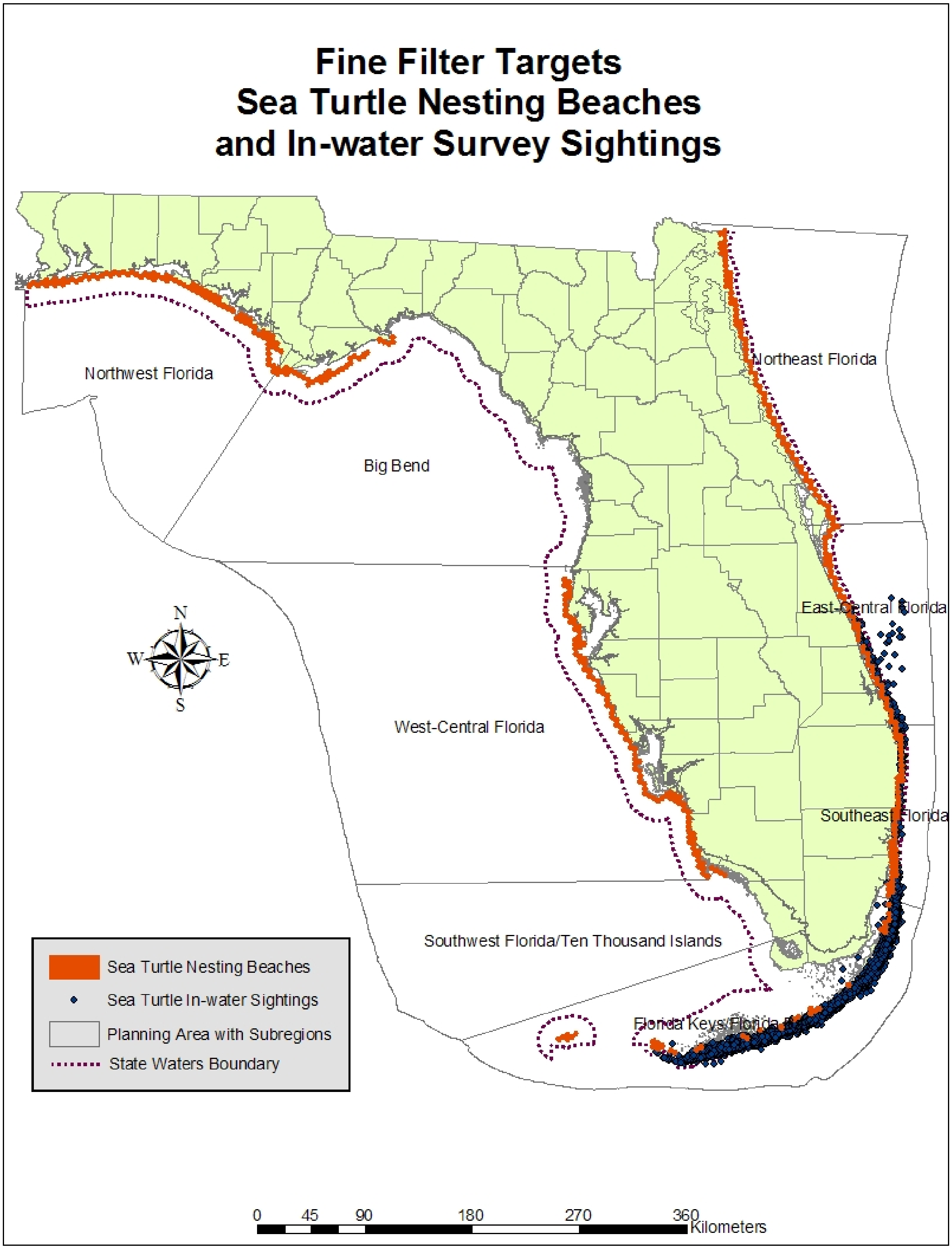

Fine Filter Targets
Reddish Egret and
Snowy Egret Locations
Northwest Florida
Big Bend
Northeast Florida
East-Central Florida
West-Central Florida
Southeast Florida
Southwest Florida/Ten Thousand Islands
Florida Keys
Florida Bay
N
S
E
W
Reddish Egret
Snowy Egret
Planning Area with Subregions
State Waters Boundary
0 45 90 180 270 360
Kilometers

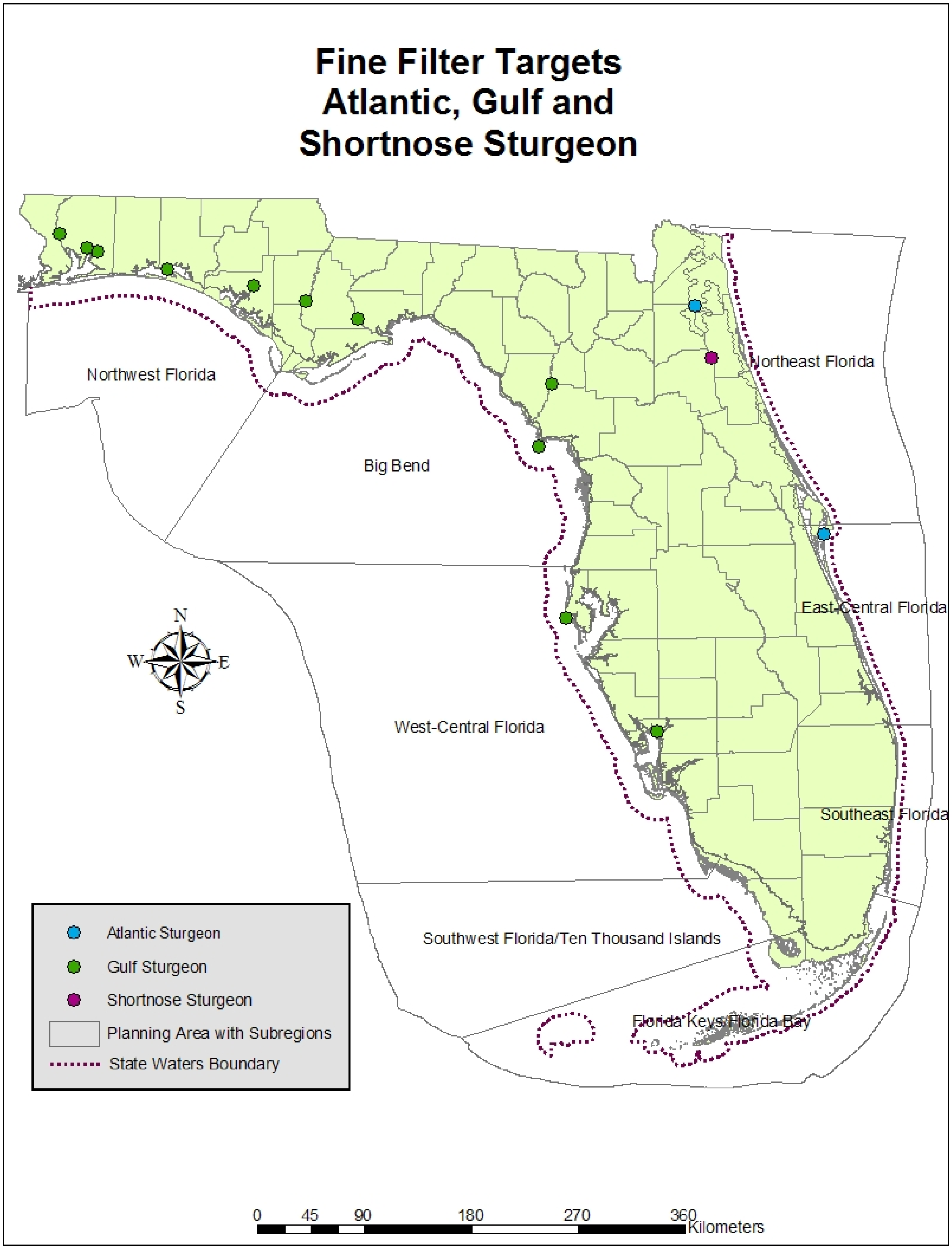

Fine Filter Targets
Roseate Spoonbill Locations
and Brown Pelican Rookeries
Northwest Florida
Big Bend
Northeast Florida
East-Central Florida
West-Central Florida
Southeast Florida
Southwest Florida/Ten Thousand Islands
Florida Keys/Florida Bay
N
W
E
S
Roseate Spoonbill
Brown Pelican
Planning Area with Subregions
State Waters Boundary
0
45
90
180
270
360
Kilometers

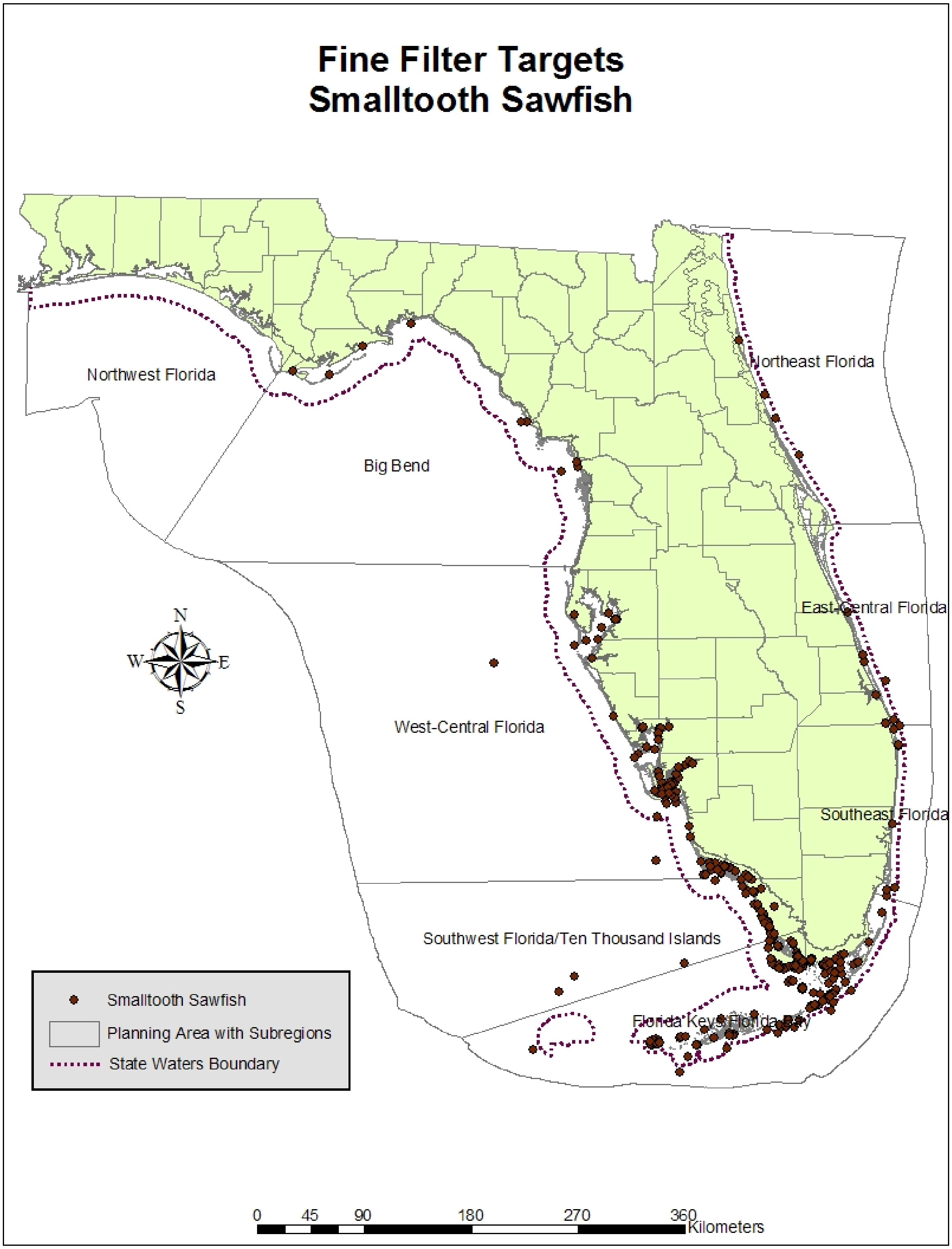

Fine Filter Targets
Waterbird Nesting Colonies
Northwest Florida
Big Bend
Northeast Florida
East-Central Florida
West-Central Florida
Southeast Florida
Southwest Florida/Ten Thousand Islands
Florida Keys/Florida Bay
N
S
E
W
Waterbird Colonies
Planning Area with Subregions
State Waters Boundary
0
45
90
180
270
360
Kilometers


Fine Filter Targets
Diamondback Terrapin
(Ornate, Mississippi, Carolina)
Northwest Florida
Big Bend
Northeast Florida
East-Central Florida
West-Central Florida
Southeast Florida
Southwest Florida/Ten Thousand Islands
Florida Keys/Florida Bay
N
S
E
W
Ornate Diamondback Terrapin
Mississippi Diamondback Terrapin
Carolina Diamondback Terrapin
Planning Area with Subregions
State Waters Boundary
0 45 90 180 270 360
Kilometers


Fine Filter Targets
American Crocodile
Northwest Florida
Big Bend
Northeast Florida
East-Central Florida
West-Central Florida
Southeast Florida
Southwest Florida/Ten Thousand Islands
Florida Keys/Florida Bay
N
S
E
W
American Crocodile Use Areas
Planning Area with Subregions
State Waters Boundary
0
45
90
180
270
360
Kilometers


Fine Filter Targets
Sea Turtle Nesting Beaches
and In-water Survey Sightings
Northwest Florida
Big Bend
Northeast Florida
East-Central Florida
West-Central Florida
Southeast Florida
Southwest Florida/Ten Thousand Islands
Florida Keys/Florida Bay
N
S
E
W
Sea Turtle Nesting Beaches
Sea Turtle In-water Sightings
Planning Area with Subregions
State Waters Boundary
0 45 90 180 270 360
Kilometers


Fine Filter Targets
Atlantic, Gulf and
Shortnose Sturgeon
Northwest Florida
Big Bend
Northeast Florida
East-Central Florida
West-Central Florida
Southeast Florida
Southwest Florida/Ten Thousand Islands
Florida Keys/Florida Bay
N
W
E
S
Atlantic Sturgeon
Gulf Sturgeon
Shortnose Sturgeon
Planning Area with Subregions
State Waters Boundary
0
45
90
180
270
360
Kilometers


Fine Filter Targets
Smalltooth Sawfish
Northwest Florida
Big Bend
Northeast Florida
East-Central Florida
West-Central Florida
Southeast Florida
Southwest Florida/Ten Thousand Islands
Florida Keys/Florida Bay
N
S
E
W
Smalltooth Sawfish
Planning Area with Subregions
State Waters Boundary
0
45
90
180
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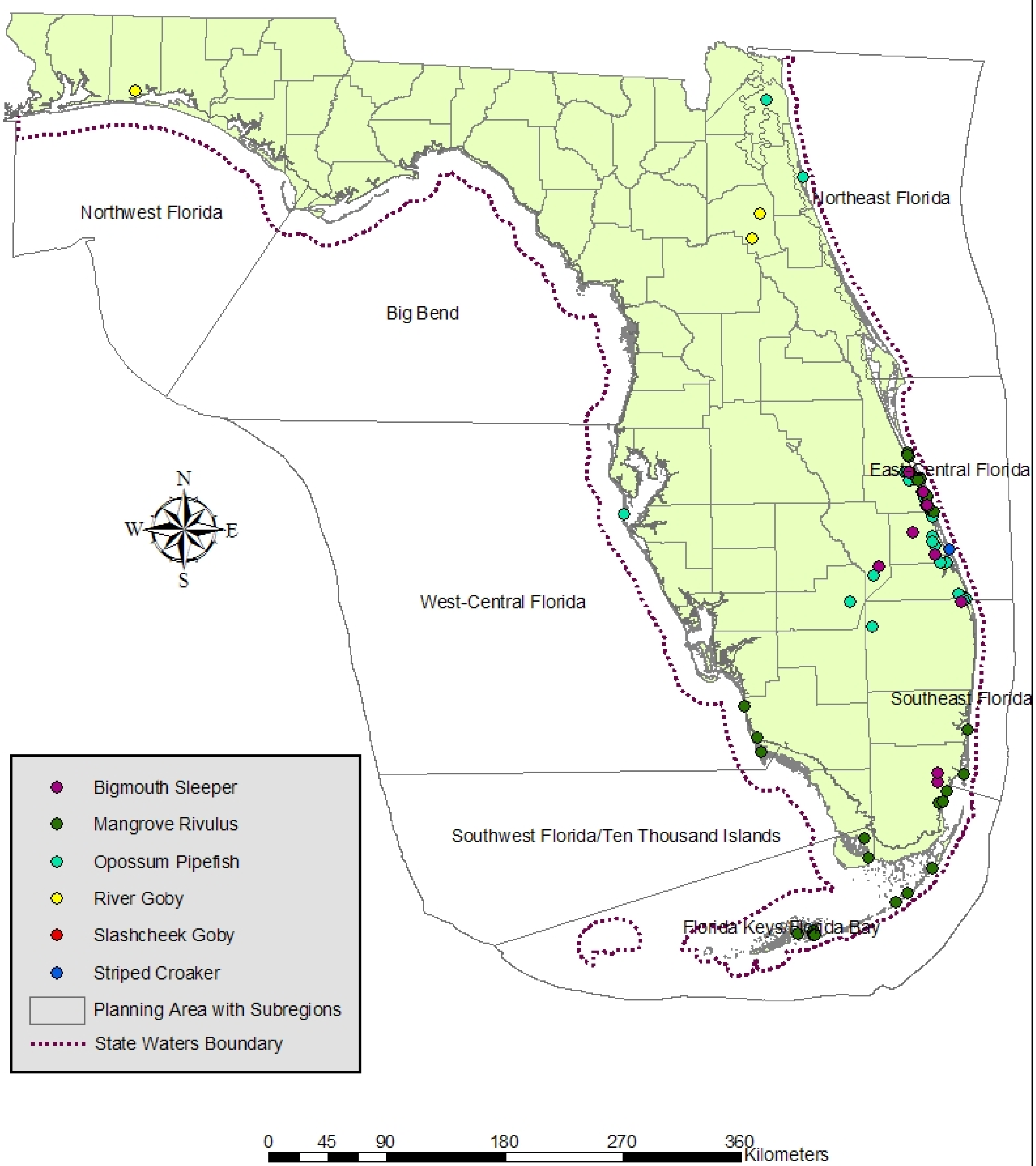
360
Kilometers

# Fine Filter Targets
# Tropical Peripheral Fish



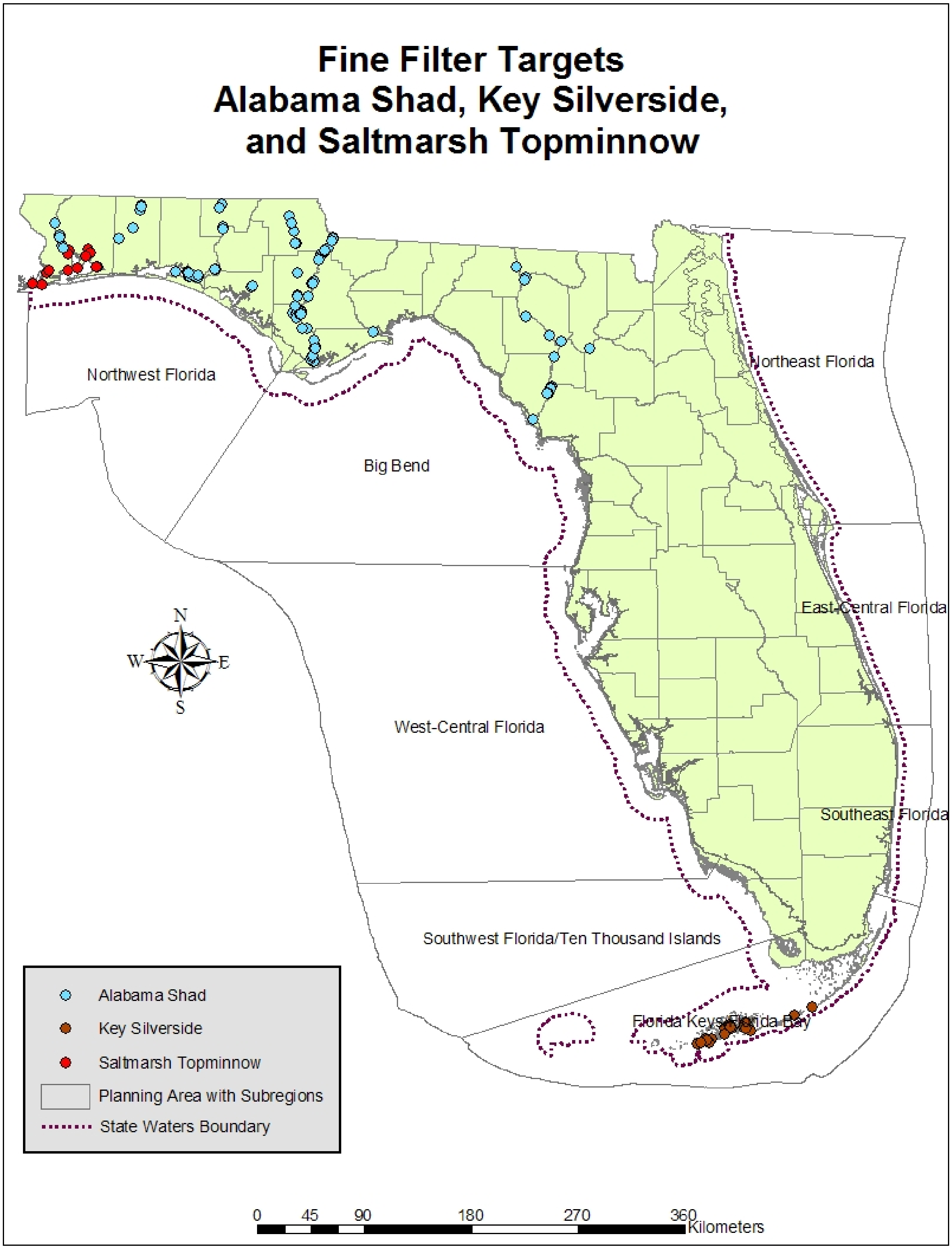

Fine Filter Targets
Alabama Shad, Key Silverside,
and Saltmarsh Topminnow
Northwest Florida
Big Bend
Northeast Florida
East-Central Florida
West-Central Florida
Southeast Florida
Southwest Florida/Ten Thousand Islands
Florida Keys/Florida Bay
N
W
E
S
Alabama Shad
Key Silverside
Saltmarsh Topminnow
Planning Area with Subregions
State Waters Boundary
0
45
90
180
270
360
Kilometers

**Table C-3. Efficiency of Meeting the Model Run Target Representation Factors. Runs include coarse and fine filter targets and BLM = 0.05. Hardbottom and benthic complexity targets omitted.**

| SUBREGION→<br><br>**Percent of Targets with Goals Exceeding 130% of the Target Representation Factor** | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | Entire Planning Area |
|---|---|---|---|---|---|---|---|---|---|
| Variable Target Representation, managed areas given no special attention | 61% | 66% | 69% | 38% | 45% | 32% | 54% | 41% | 51% |
| Variable Target Representation with managed areas given lower cost | 71% | 63% | 69% | 42% | 60% | 39% | 58% | 41% | 55% |
| 20% Target Representation, managed areas given no special attention | 61% | 63% | 81% | 47% | 70% | 46% | 56% | 68% | 62% |
| 20% Target Representation with managed areas given lower cost | 54% | 63% | 81% | 53% | 75% | 46% | 56% | 55% | 60% |
| 40% Target Representation, managed areas given no special attention | 46% | 54% | 63% | 38% | 55% | 21% | 48% | 45% | 46% |
| 40% Target Representation with managed areas given lower cost | 46% | 54% | 63% | 50% | 50% | 29% | 48% | 45% | 48% |

**Table C-4. Percent Planning Area Selected by Model Run. Coarse and fine filter targets included. BLM = 0.05. Hardbottom and benthic complexity targets omitted.**

| Model Run | # Planning Units Selected | % Planning Area Selected* |
|---|---|---|
| Variable Target Representation, managed areas given no special attention | 941 | 5.0% |
| Variable Target Representation with managed areas given lower cost | 901 | 4.8% |
| Target Representation = 20%, managed areas given no special attention | 540 | 2.9% |
| Target Representation = 20% with managed areas given lower cost | 533 | 2.8% |
| Target Representation = 40%, managed areas given no special attention | 1063 | 5.6% |
| Target Representation = 40% with managed areas given lower cost | 1075 | 5.7% |

*Total number of planning units = 18,943.

**Figure C-1. Sample model output, optimal solution - Coarse & fine filter targets, variable target representation with managed areas given a greater probability of being included in the final result.**

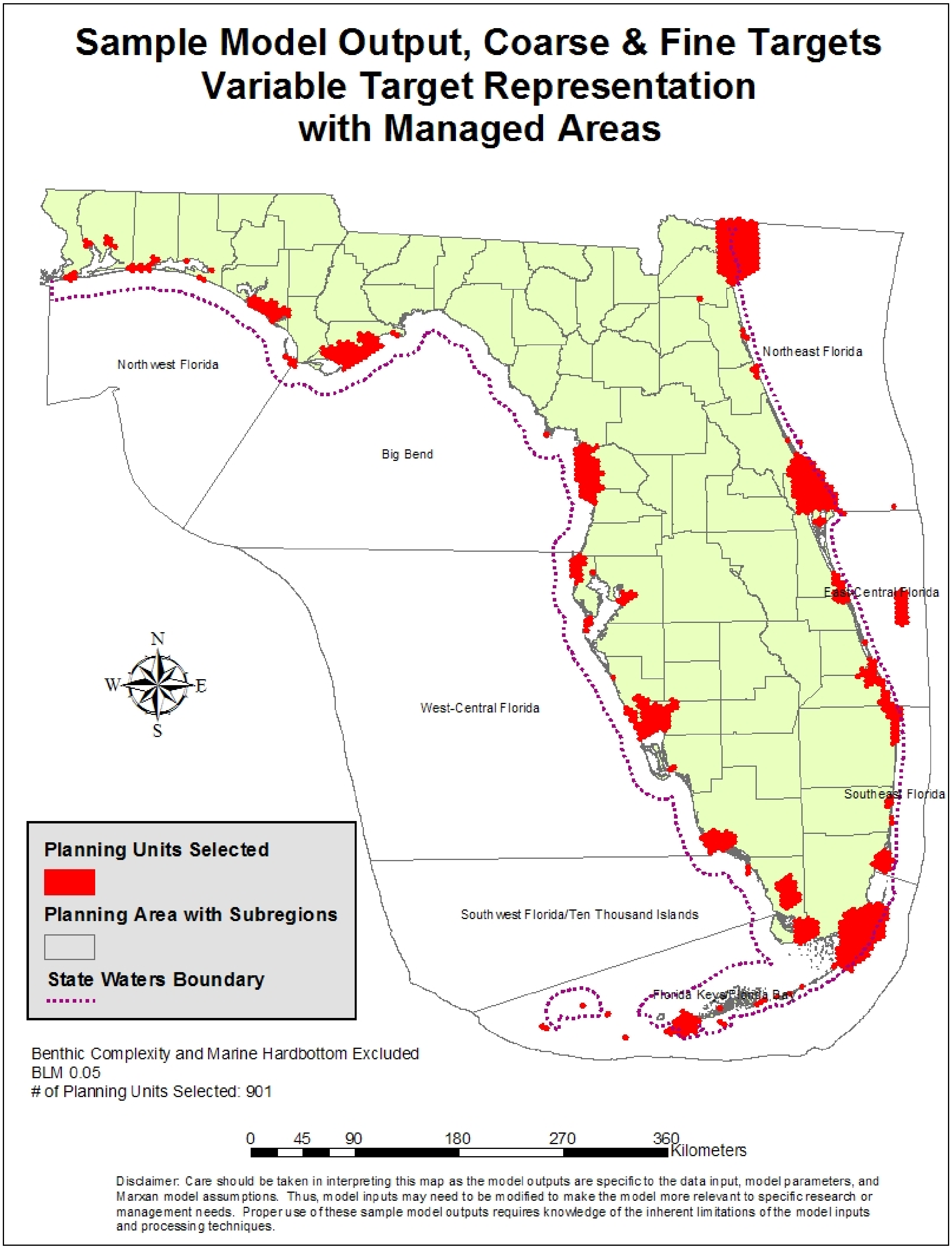


**Figure C-2**. **Sample model output, optimal solution – Coarse & fine filter targets, variable target representation, managed areas given no special preference.**

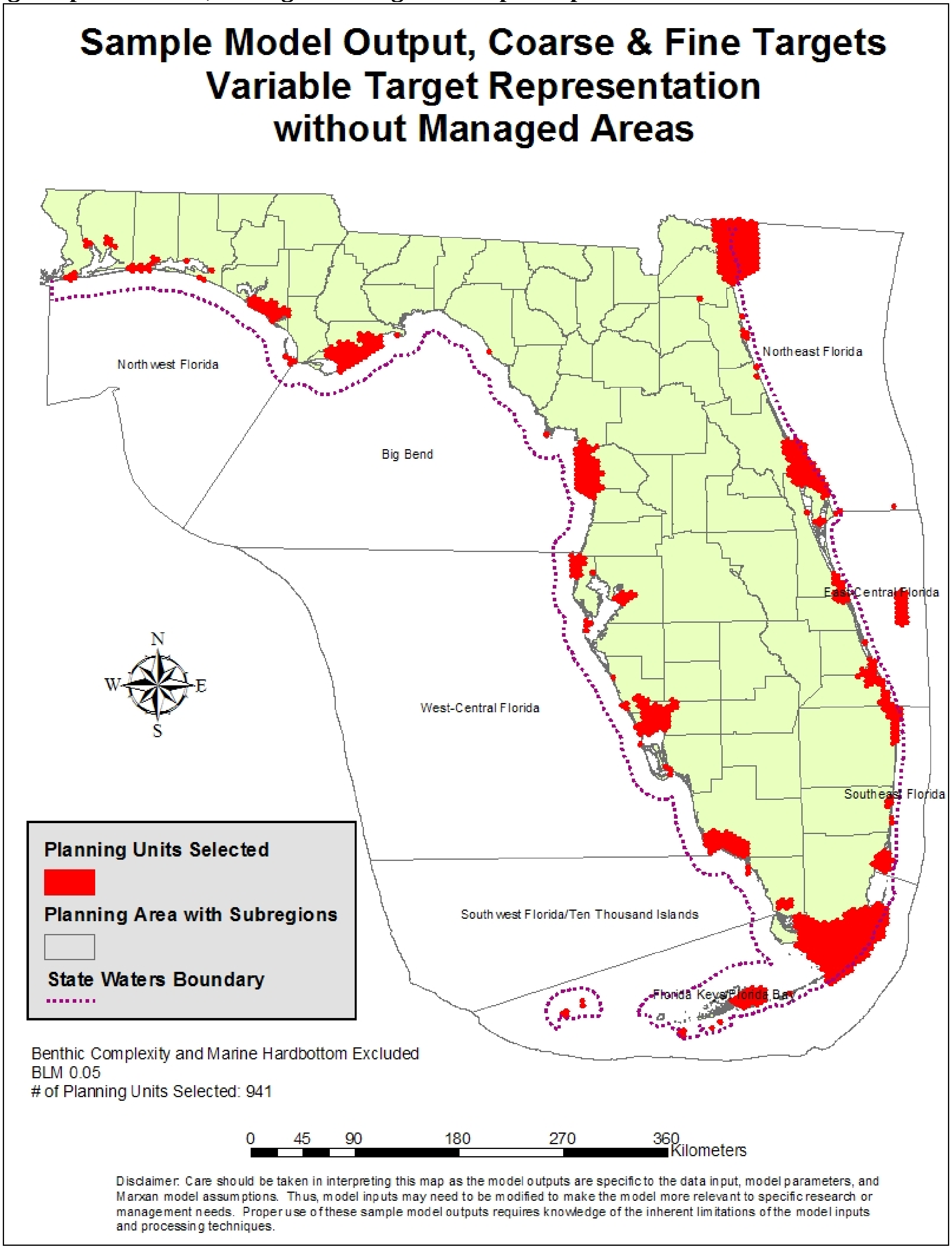


**Figure C-3. Sample model output, optimal solution - Coarse & fine filter targets, 20% target representation with managed areas given a greater probability of being included in the final result.**

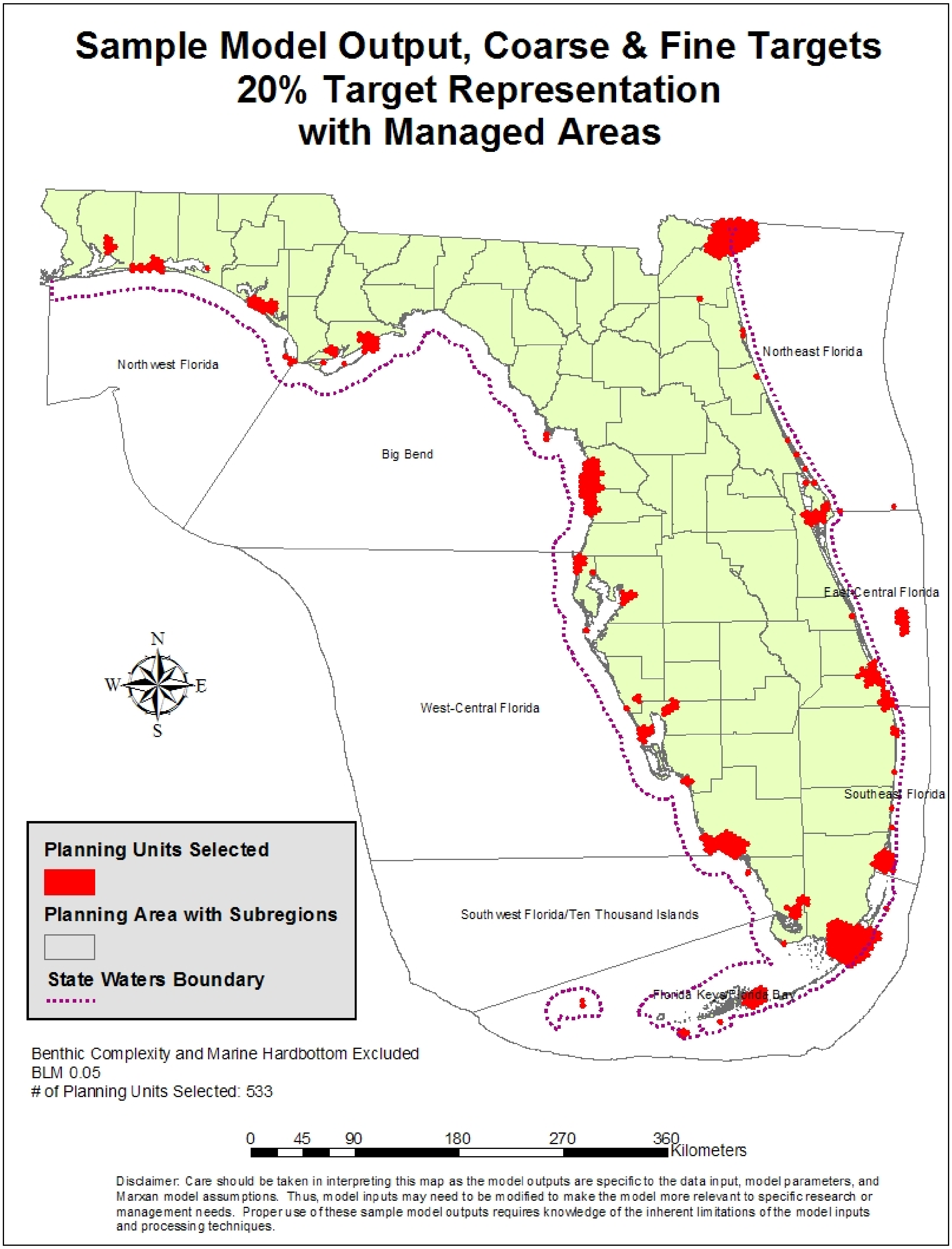


**Figure C-4. Sample model output, optimal solution - Coarse & fine filter targets, 20% target representation, existing managed areas given no special preference.**

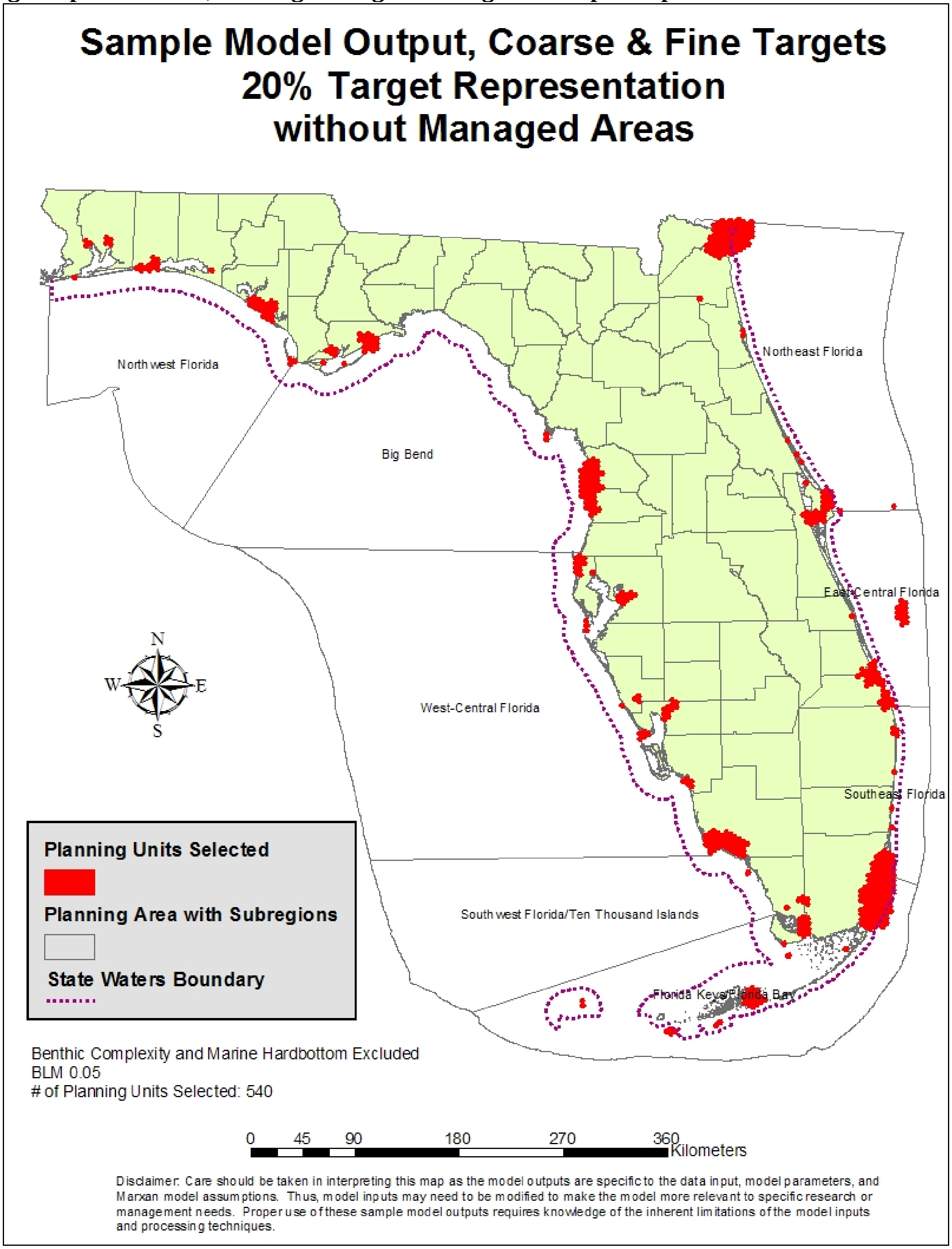


**Figure C-5. Sample model output, optimal solution – Coarse & fine filter targets, 40% target representation with managed areas given a greater probability of being included in the final result.**

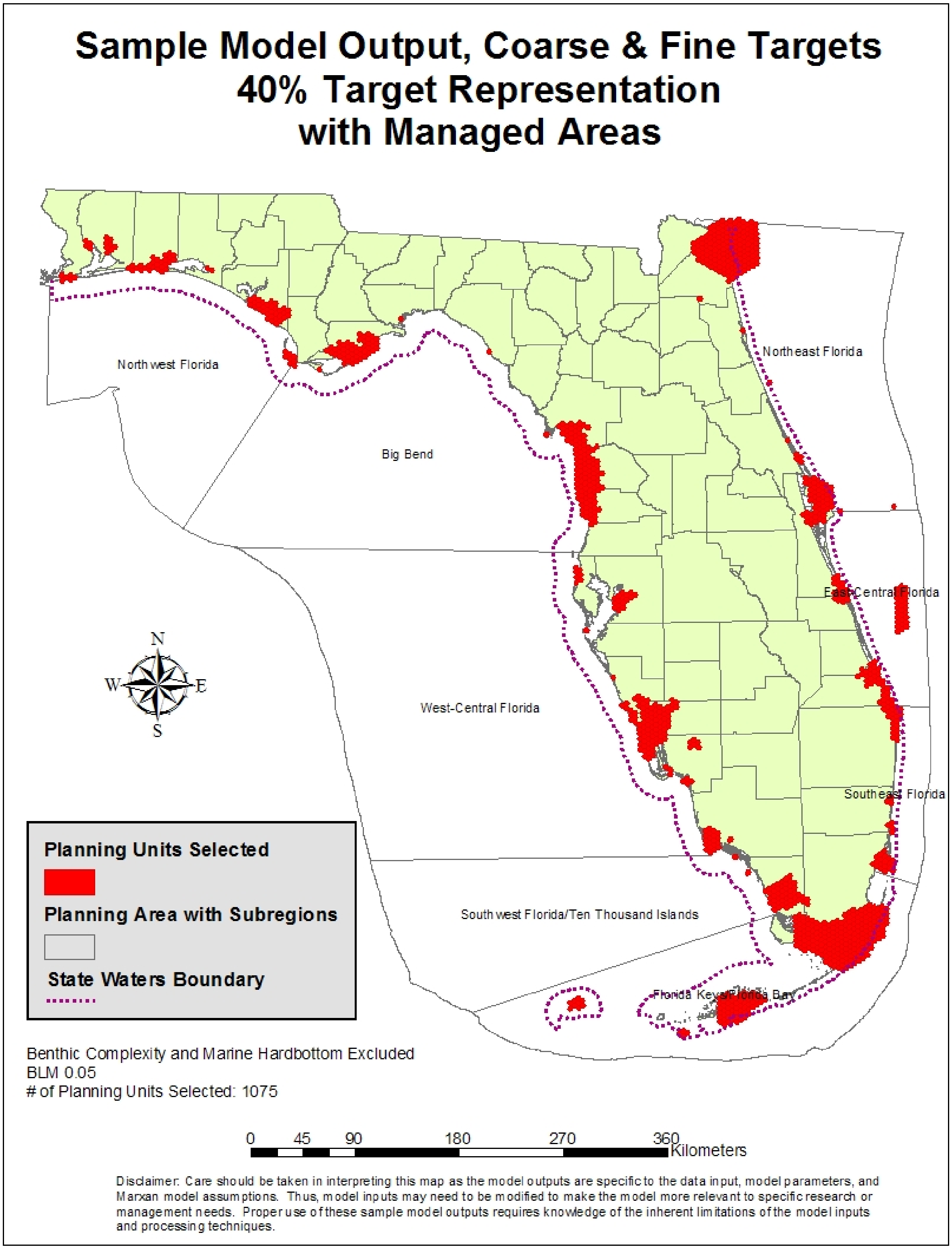


**Figure C-6. Sample model output, optimal solution – Coarse and fine filter targets, 40% target representation, existing managed areas given no special preference.**

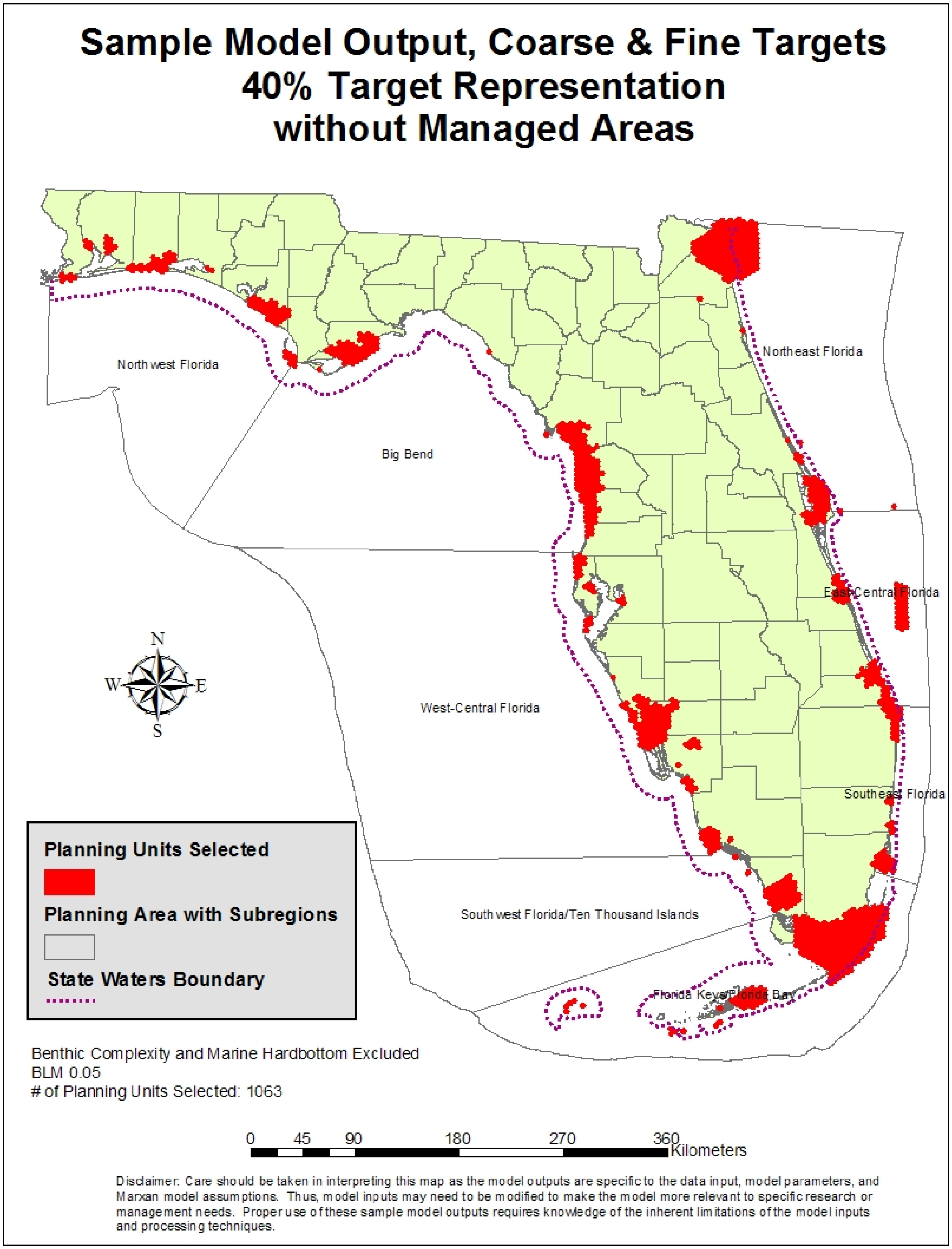


**Figure C-7. Sample model output, summed solution – Coarse and fine filter targets, variable target representation, existing managed areas given no special preference.**

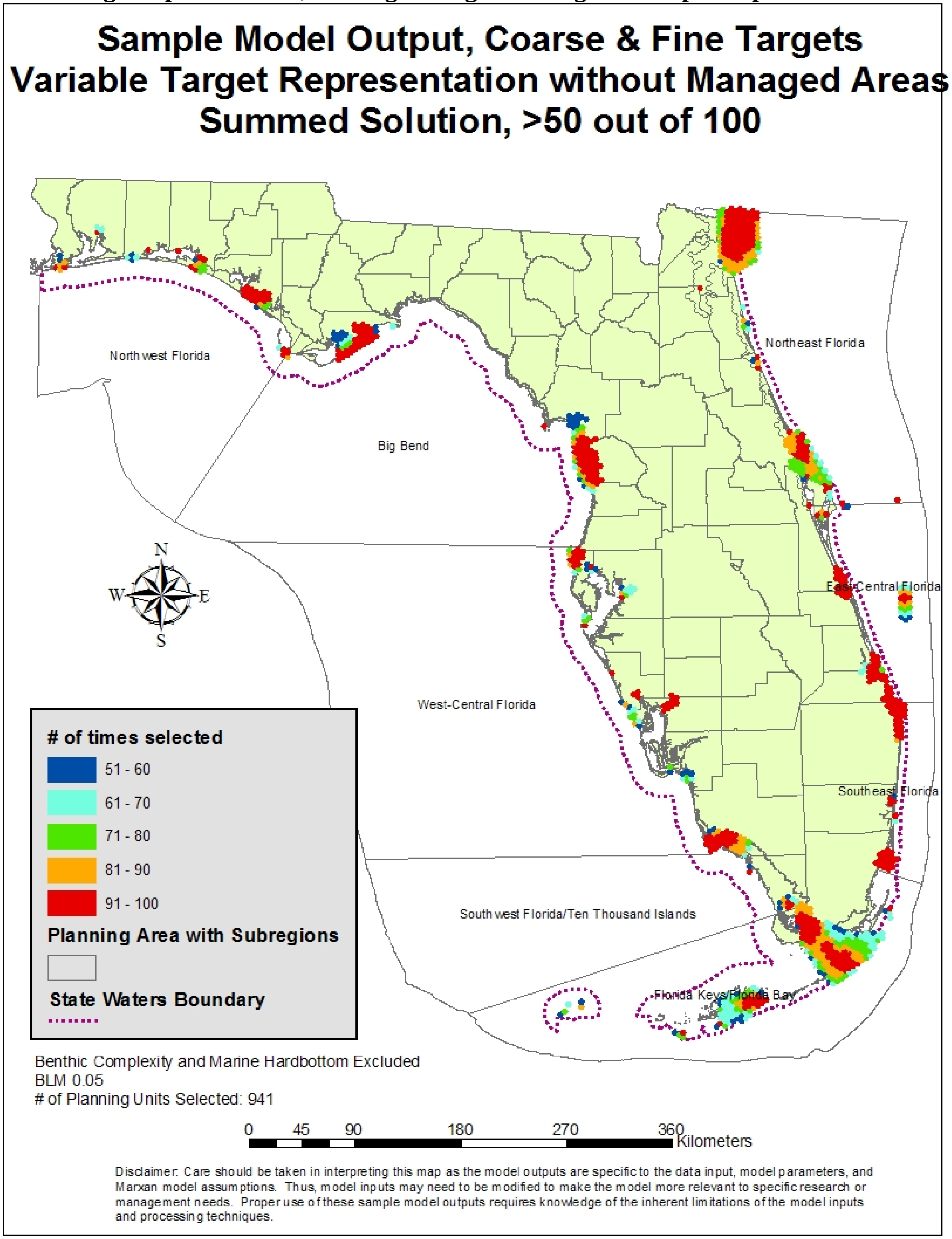


**Figure C-8. Sample model output, summed solution – Coarse and fine filter targets, 40% target representation, existing managed areas given no special preference.**

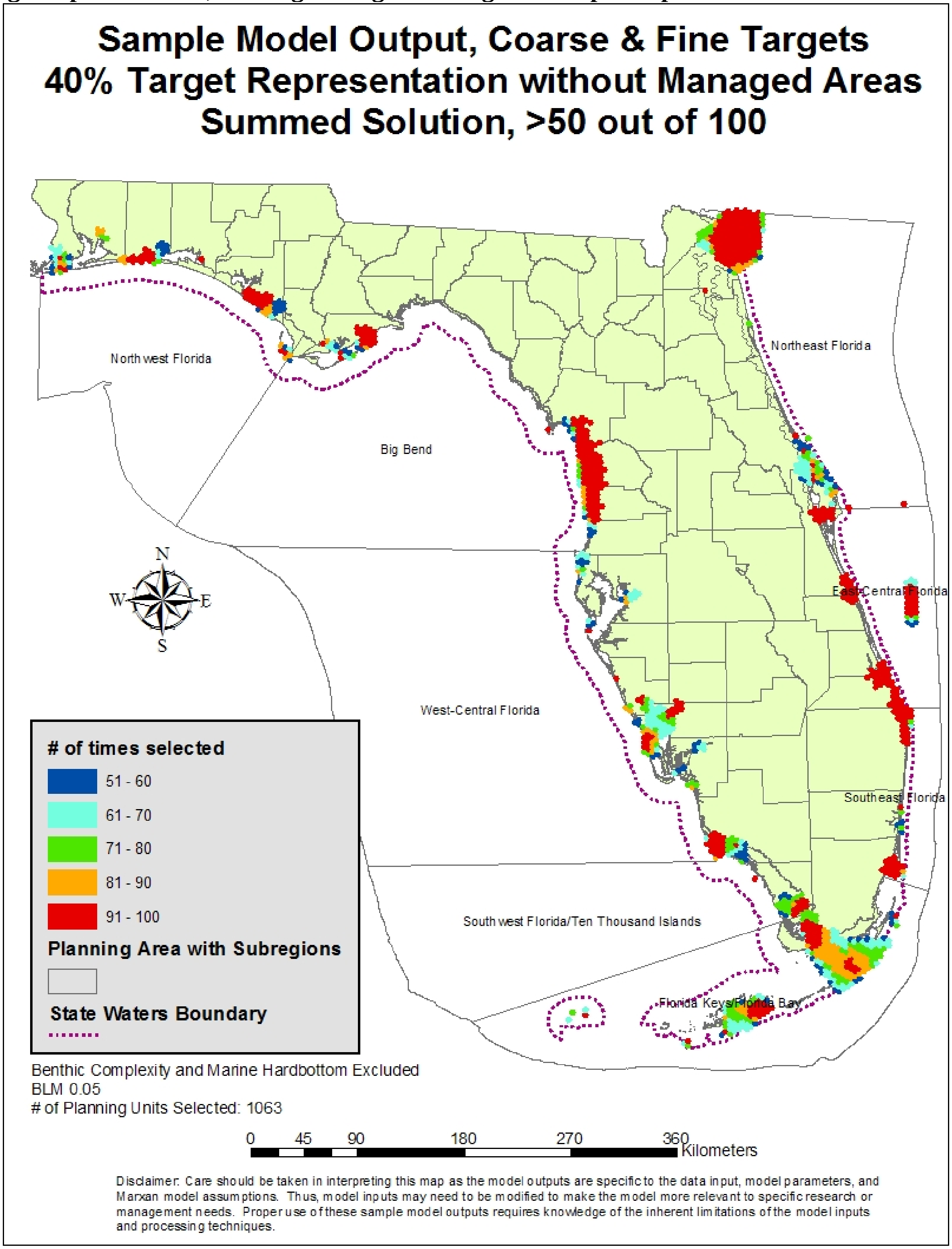
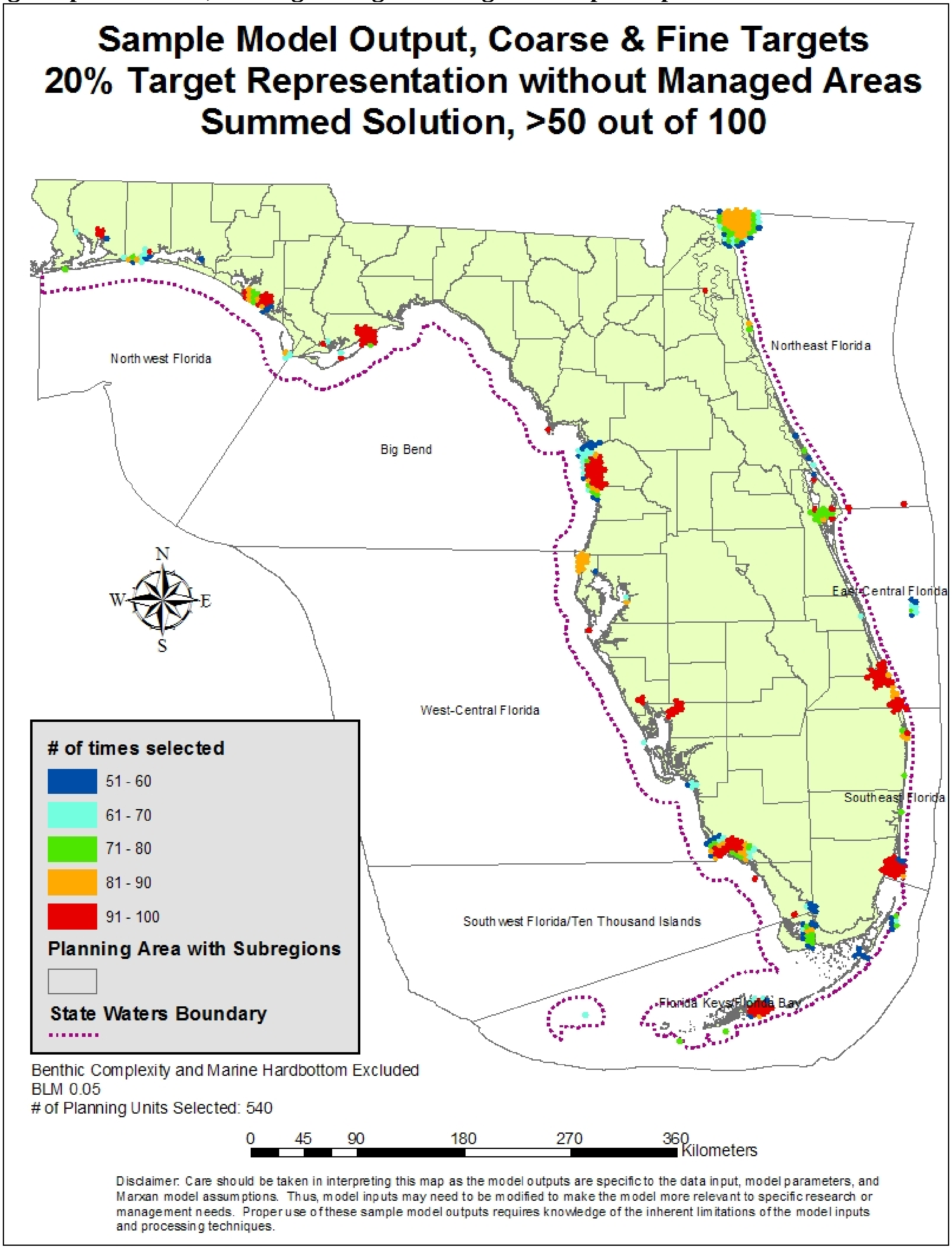


**Figure C-9. Sample model output, summed solution – Coarse and fine filter targets, 20% target representation, existing managed areas given no special preference.**



# Appendix D
## Method for Deriving Target Representation Using an Objective Approach
### (referred to in the report as the Variable Target Representation Method)

The method described below for assigning target representation factors to coarse and fine filter targets is one of three presented in the body of this report. The other methods presented utilized an across-the-board target representation factor (e.g., 20% or 40%) regardless of the target's current status, vulnerability, rarity or reproductive status. Four factors (rarity, whether the target represented a reproductive aggregation/source area, vulnerability and current status) were scored by Conservancy project staff on a scale from 1 to 3 to derive a total score for each target in each subregion. Score selection was based on information available in published scientific literature. From this total score, a representation percentage was derived as described in the text of this report.

**Scoring:** The scoring system used for each attribute is described below. For some attributes, scoring for coarse versus fine filter targets was handled differently.

<u>Rarity</u>
For coarse filter targets, rarity was based on the percent of area covered by the target as compared to the total subregional area.
Score =1, common; Where coarse filter target covers more than 50% of a subregion's area.
Score = 2, intermediate score; Where coarse filter target covers between 10% and 49% of a subregion's area.
Score = 3, rare; Where coarse filter target covers less than 10% of a subregion's area.

For fine filter targets, rarity was based on the range of the target distribution being evaluated rather than the rarity of the species in general. For example, while Leatherback sea turtles are rare, the beaches they utilize for nesting are fairly broadly distributed along Florida's East Coast. The same scoring values were used as for coarse filter targets above, however, the scores were assigned by Conservancy staff based on literature review and discussions with experts rather than on percent of subregional habitat occupied by fine filter target distribution.

<u>Source area/reproductive aggregation</u>
This factor is only relevant to fine filter targets and so, all coarse filter targets were automatically given a score of 1. Fine filter targets were given a score of 3 if the target represented a reproductive aggregation. For example, targets representing bird nesting sites or marine mammal calving areas were given a score of 3. Scores of 2 were not utilized for this factor.

<u>Vulnerability</u>
This factor rates how vulnerable the target is to human activities. The level of human uses were evaluated in each subregion for this factor as they may vary considerably. The scoring system used for this factor is as follows: Score = 1, less vulnerable; Score = 2, moderately vulnerable; Score = 3, very vulnerable. Scores were assigned by Conservancy staff based on literature review and discussions with resource experts.

<u>Current Status</u>
This factor rates how compromised the target is from historic levels of distribution in the subregion under consideration. The scoring system used for this attribute is as follows: Score = 3, substantially compromised; Score = 2, compromised = 2; Score =1, good shape. Scores were assigned by Conservancy staff based on literature review and discussions with resource experts.

The rationales used for selecting particular scores and reference information are contained in spreadsheets that are supplemental to this report. Those interested in reviewing this information may request these spreadsheets directly from Laura Geselbracht (phone: 954/564-6144 or email: lgeselbracht@tnc.org).

Table D-1. Scoring of the 4 attributes used to derive the variable target representation scores.

| COARSE FILTER TARGETS | Subregion | Rare/ Common? | Source Area? | Vulnerability | Current Status | Total Score | Representation Percentage |
|---|---|---|---|---|---|---|---|
| Patch Coral Reefs | | | | | | | |
| | 3 - Southeast Florida | 3 | 1 | 3 | 3 | 10 | 0.5 |
| | 4 - Florida Keys/Florida Bay | 2 | 1 | 3 | 3 | 9 | 0.3 |
| Shallow Bank Coral Reefs (aka "Platform Margin Reef" at depths from 0 to 10 meters) | | | | | | | |
| | 2 - East Central Florida | 3 | 1 | 3 | 3 | 10 | 0.5 |
| | 3 - Southeast Florida | 1 | 1 | 3 | 3 | 8 | 0.3 |
| | 4 - Florida Keys/Florida Bay | 2 | 1 | 3 | 3 | 9 | 0.3 |
| Deep Bank Coral Reefs (aka "Platform Margin Reef" at depths from 10 to 30 meters) | | | | | | | |
| | 2 - East Central Florida | 2 | 1 | 2 | 3 | 8 | 0.3 |
| | 3 - Southeast Florida | 2 | 1 | 2 | 3 | 8 | 0.3 |
| | 4 - Florida Keys/Florida Bay | 2 | 1 | 2 | 3 | 8 | 0.3 |
| Deep Reef Resources (aka "Platform Margin Reef" at depths greater than 30 meters) | | | | | | | |
| | 2 - East Central Florida | 3 | 1 | 2 | 3 | 9 | 0.3 |
| | 3 - Southeast Florida | 3 | 1 | 2 | 3 | 9 | 0.3 |
| | 4 - Florida Keys/Florida Bay | 3 | 1 | 2 | 3 | 9 | 0.3 |
| Mangrove Forest | | | | | | | |
| | 1 - Northeast Florida | 3 | 1 | 3 | 3 | 10 | 0.5 |
| | 2 - East Central Florida | 2 | 1 | 3 | 3 | 9 | 0.3 |
| | 3 - Southeast Florida | 2 | 1 | 3 | 3 | 9 | 0.3 |
| | 4 - Florida Keys/Florida Bay | 1 | 1 | 1 | 1 | 4 | 0.2 |
| | 5 - SW Florida/Ten Thousand Islands | 1 | 1 | 1 | 1 | 4 | 0.2 |
| | 6 - West-Central Florida | 2 | 1 | 3 | 2 | 8 | 0.3 |
| | 7 - Big Bend | 3 | 1 | 1 | 1 | 6 | 0.25 |
| Beach/Surf Zone | | | | | | | |
| | 1 - Northeast Florida | 1 | 1 | 2 | 1 | 5 | 0.25 |
| | 2 - East Central Florida | 1 | 1 | 3 | 3 | 8 | 0.3 |
| | 3 - Southeast Florida | 1 | 1 | 3 | 3 | 8 | 0.3 |
| | 4 - Florida Keys/Florida Bay | 3 | 1 | 1 | 1 | 6 | 0.25 |
| | 5 – SW Florida/Ten Thousand Islands | 3 | 1 | 1 | 1 | 6 | 0.25 |
| | 6 - West-Central Florida | 1 | 1 | 1 | 1 | 4 | 0.2 |
| | 7 - Big Bend | 3 | 1 | 1 | 1 | 6 | 0.25 |
| | 8 - Northwest Florida | 1 | 1 | 1 | 1 | 4 | 0.2 |

| COARSE FILTER TARGETS | Subregion | Rare/ Common? | Source Area? | Vulnerability | Current Status | Total Score | Representation Percentage |
|---|---|---|---|---|---|---|---|
| Salt Marsh | | | | | | | |
| | 1 - Northeast Florida | 1 | 1 | 2 | 1 | 5 | 0.25 |
| | 2 - East Central Florida | 2 | 1 | 2 | 3 | 8 | 0.3 |
| | 3 - Southeast Florida | 3 | 1 | 3 | 3 | 10 | 0.5 |
| | 4 - Florida Keys/Florida Bay | 3 | 1 | 1 | 3 | 8 | 0.3 |
| | 5 – SW Florida/Ten Thousand Islands | 3 | 1 | 1 | 3 | 8 | 0.3 |
| | 6 – West-Central Florida | 1 | 1 | 2 | 2 | 6 | 0.25 |
| | 7 – Big Bend | 1 | 1 | 1 | 1 | 4 | 0.2 |
| | 8 – Northwest Florida | 2 | 1 | 2 | 2 | 7 | 0.3 |
| Submerged Aquatic Vegetation | | | | | | | |
| | 1 – Northeast Florida | 3 | 1 | 1 | 1 | 6 | 0.25 |
| | 2 – East Central Florida | 2 | 1 | 2 | 2 | 7 | 0.3 |
| | 3 – Southeast Florida | 3 | 1 | 2 | 2 | 8 | 0.25 |
| | 4 – Florida Keys/Florida Bay | 1 | 1 | 2 | 1 | 5 | 0.25 |
| | 5 – SW Florida/Ten Thousand Islands | 1 | 1 | 2 | 1 | 5 | 0.25 |
| | 6 – West-Central Florida | 1 | 1 | 2 | 2 | 6 | 0.3 |
| | 7 - Big Bend | 1 | 1 | 2 | 1 | 5 | 0.25 |
| | 8 – Northwest Florida | 2 | 1 | 2 | 1 | 6 | 0.25 |
| Coastal Tidal River or Stream | | | | | | | |
| | 1 – Northeast Florida | 1 | 1 | 3 | 2 | 7 | 0.3 |
| | 2 – East Central Florida | 1 | 1 | 3 | 3 | 8 | 0.3 |
| | 3 – Southeast Florida | 3 | 1 | 3 | 3 | 10 | 0.5 |
| | 4 – Florida Keys/Florida Bay | 1 | 1 | 3 | 2 | 7 | 0.3 |
| | 5 – SW Florida/Ten Thousand Islands | 1 | 1 | 3 | 2 | 7 | 0.3 |
| | 6 – West-Central Florida | 1 | 1 | 3 | 3 | 8 | 0.3 |
| | 7 - Big Bend | 1 | 1 | 3 | 2 | 7 | 0.3 |
| | 8 – Northwest Florida | 1 | 1 | 3 | 2 | 7 | 0.3 |
| Tidal Flats | | | | | | | |
| | 1 – Northeast Florida | 2 | 1 | 2 | 2 | 7 | 0.3 |
| | 2 – East Central Florida | 3 | 1 | 3 | 3 | 10 | 0.5 |
| | 3 – Southeast Florida | 2 | 1 | 1 | 3 | 7 | 0.3 |
| | 4 – Florida Keys/Florida Bay | 1 | 1 | 1 | 1 | 4 | 0.2 |
| | 5 – SW Florida/Ten Thousand Islands | 2 | 1 | 1 | 1 | 5 | 0.25 |
| | 6 – West-Central Florida | 2 | 1 | 2 | 2 | 7 | 0.3 |
| | 7 - Big Bend | 2 | 1 | 1 | 1 | 5 | 0.25 |
| | 8 – Northwest Florida | 2 | 1 | 2 | 1 | 6 | 0.25 |

| COARSE FILTER TARGETS | Subregion | Rare/ Common? | Source Area? | Vulnerability | Current Status | Total Score | Representation Percentage |
|---|---|---|---|---|---|---|---|
| Bivalve Reef (Oyster) | | | | | | | |
| | 1 – Northeast Florida | 3 | 1 | 2 | 2 | 8 | 0.5 |
| | 2 – East Central Florida | 3 | 1 | 3 | 2 | 9 | 0.75 |
| | 4 – Florida Keys/Florida Bay | 3 | 1 | 2 | 2 | 8 | 0.75 |
| | 5 – SW Florida/Ten Thousand Islands | 3 | 1 | 2 | 2 | 8 | 0.75 |
| | 6 – West-Central Florida | 3 | 1 | 2 | 2 | 8 | 0.75 |
| | 7 - Big Bend | 1 | 1 | 2 | 2 | 6 | 0.3 |
| | 8 – Northwest Florida | 3 | 1 | 3 | 2 | 9 | 0.75 |
| Annelid Worm Reef (Sabellariidae) | | | | | | | |
| | 2 – East Central Florida | 3 | 1 | 1 | 2 | 7 | 0.3 |
| | 3 – Southeast Florida | 3 | 1 | 1 | 3 | 8 | 0.3 |
| Marine Hardbottom | | | | | | | |
| | 1 – Northeast Florida | 1 | 1 | 2 | 2 | 6 | 0.25 |
| | 2 – East Central Florida | 1 | 1 | 2 | 2 | 6 | 0.25 |
| | 3 – Southeast Florida | 1 | 1 | 2 | 2 | 6 | 0 |
| | 4 – Florida Keys/Florida Bay | 1 | 1 | 3 | 2 | 7 | 0.3 |
| Ocean Inlets and Passes | | | | | | | |
| | 1 – Northeast Florida | 2 | 1 | 3 | 1 | 7 | 0.3 |
| | 2 – East Central Florida | 2 | 1 | 3 | 1 | 7 | 0.3 |
| | 3 – Southeast Florida | 1 | 1 | 3 | 1 | 6 | 0.25 |
| | 4 – Florida Keys/Florida Bay | 1 | 1 | 3 | 1 | 6 | 0.25 |
| | 6 – West-Central Florida | 1 | 1 | 3 | 1 | 6 | 0.25 |
| | 7 - Big Bend | 2 | 1 | 3 | 1 | 7 | 0.3 |
| | 8 – Northwest Florida | 2 | 1 | 3 | 1 | 7 | 0.3 |
| Benthic Complexity | | | | | | | |
| | 1 – Northeast Florida | 2 | 1 | 1 | 1 | 5 | 0.25 |
| | 2 – East Central Florida | 2 | 1 | 1 | 1 | 5 | 0.25 |
| | 3 – Southeast Florida | 2 | 1 | 1 | 1 | 5 | 0.25 |
| | 4 – Florida Keys/Florida Bay | 2 | 1 | 1 | 1 | 5 | 0.25 |
| | 5 – SW Florida/Ten Thousand Islands | 2 | 1 | 1 | 1 | 5 | 0.25 |
| | 6 – West-Central Florida | 3 | 1 | 1 | 1 | 6 | 0.25 |
| | 7 - Big Bend | 3 | 1 | 1 | 1 | 6 | 0.25 |
| | 8 – Northwest Florida | 3 | 1 | 1 | 1 | 6 | 0.25 |

| FINE FILTER TARGETS | Subregion | Rare/ Common?* | Source Area? | Vulner-ability | Current Status | Total Score | Representation Percentage |
|---|---|---|---|---|---|---|---|
| Florida Manatee, *Trichechus manatus latirostris* | | | | | | | |
| | 1 - Northeast Florida | 2 | 1 | 3 | 2 | 8 | 0.3 |
| | 2 - East Central Florida | 2 | 1 | 3 | 2 | 8 | 0.3 |
| | 3 - Southeast Florida | 2 | 1 | 3 | 2 | 8 | 0.3 |
| | 4 - Florida Keys/Florida Bay | 2 | 1 | 3 | 2 | 8 | 0.3 |
| | 5 - SW Florida/Ten Thousand Islands | 2 | 1 | 3 | 2 | 8 | 0.3 |
| | 6 - West-Central Florida | 2 | 1 | 3 | 2 | 8 | 0.3 |
| | 7 - Big Bend | 2 | 1 | 3 | 2 | 8 | 0.3 |
| | 8 - Northwest Florida | 2 | 1 | 3 | 2 | 8 | 0.3 |
| Northern Right Whale, *Eubalaena glacialis* | | | | | | | |
| | 1 - Northeast Florida | 3 | 3 | 3 | 3 | 12 | 1 |
| American Oystercatcher, *Haematopus palliatus* | | | | | | | |
| | 1 - Northeast Florida | 3 | 1 | 3 | 3 | 10 | 0.5 |
| | 2 - East Central Florida | 3 | 1 | 3 | 3 | 10 | 0.5 |
| | 4 - Florida Keys/Florida Bay | 3 | 1 | 3 | 3 | 10 | 0.5 |
| | 5 - SW Florida/Ten Thousand Islands | 3 | 1 | 3 | 3 | 10 | 0.5 |
| | 6 - West-Central Florida | 3 | 1 | 3 | 3 | 10 | 0.5 |
| | 7 - Big Bend | 3 | 1 | 3 | 3 | 10 | 0.5 |
| | 8 - Northwest Florida | 3 | 1 | 3 | 3 | 10 | 0.5 |
| Black Skimmer, *Rynchops niger* | | | | | | | |
| | 1 - Northeast Florida | 2 | 1 | 3 | 3 | 9 | 0.3 |
| | 2 - East Central Florida | 2 | 1 | 3 | 3 | 9 | 0.3 |
| | 3 - Southeast Florida | 3 | 1 | 3 | 3 | 10 | 0.5 |
| | 4 - Florida Keys/Florida Bay | 3 | 1 | 3 | 3 | 10 | 0.5 |
| | 5 – SW Florida/Ten Thousand Islands | 3 | 1 | 3 | 3 | 10 | 0.5 |
| | 6 - West-Central Florida | 2 | 1 | 3 | 3 | 9 | 0.3 |
| | 7 - Big Bend | 3 | 1 | 3 | 3 | 10 | 0.5 |
| | 8 - Northwest Florida | 2 | 1 | 3 | 3 | 9 | 0.3 |
| Brown Pelican, *Pelecanus occidenrtalis* | | | | | | | |
| | 1 - Northeast Florida | 2 | 3 | 1 | 1 | 7 | 0.3 |
| | 2 - East Central Florida | 1 | 3 | 1 | 1 | 6 | 0.25 |
| | 4 - Florida Keys/Florida Bay | 1 | 3 | 1 | 1 | 6 | 0.25 |
| | 5 - SW Florida/Ten Thousand Islands | 1 | 3 | 1 | 1 | 6 | 0.25 |
| | 6 - West-Central Florida | 1 | 3 | 1 | 1 | 6 | 0.25 |
| | 7 - Big Bend | 2 | 3 | 1 | 1 | 7 | 0.3 |
| | 8 - Northwest Florida | 2 | 3 | 1 | 1 | 7 | 0.3 |

| FINE FILTER TARGETS | Subregion | Rare/ Common?* | Source Area? | Vulner-ability | Current Status | Total Score | Representation Percentage |
|---|---|---|---|---|---|---|---|
| Least Tern, *Sterna antillarum* | | | | | | | |
| | 1 - Northeast Florida | 2 | 1 | 2 | 1 | 6 | 0.25 |
| | 2 - East Central Florida | 2 | 1 | 2 | 1 | 6 | 0.25 |
| | 3 - Southeast Florida | 2 | 1 | 2 | 1 | 6 | 0.25 |
| | 4 - Florida Keys/Florida Bay | 2 | 1 | 2 | 1 | 6 | 0.25 |
| | 5 - SW Florida/Ten Thousand Islands | 2 | 1 | 2 | 1 | 6 | 0.25 |
| | 6 - West-Central Florida | 2 | 1 | 2 | 1 | 6 | 0.25 |
| | 7 - Big Bend | 2 | 1 | 2 | 1 | 6 | 0.25 |
| | 8 - Northwest Florida | 2 | 1 | 2 | 1 | 6 | 0.25 |
| Piping Plover, *Charadrius melodus* | | | | | | | |
| | 1 - Northeast Florida | 3 | 1 | 3 | 3 | 10 | 0.5 |
| | 3 - Southeast Florida | 3 | 1 | 3 | 3 | 10 | 0.5 |
| | 4 - Florida Keys/Florida Bay | 3 | 1 | 3 | 3 | 10 | 0.5 |
| | 5 - SW Florida/Ten Thousand Islands | 3 | 1 | 3 | 3 | 10 | 0.5 |
| | 6 - West-Central Florida | 3 | 1 | 3 | 3 | 10 | 0.5 |
| | 7 - Big Bend | 3 | 1 | 3 | 3 | 10 | 0.5 |
| | 8 - Northwest Florida | 3 | 1 | 3 | 3 | 10 | 0.5 |
| Reddish Egret, *Egretta rufescens* | | | | | | | |
| | 1 - Northeast Florida | 3 | 1 | 2 | 2 | 8 | 0.3 |
| | 2 - East Central Florida | 2 | 1 | 2 | 2 | 7 | 0.3 |
| | 3 - Southeast Florida | 2 | 1 | 2 | 2 | 7 | 0.3 |
| | 4 - Florida Keys/Florida Bay | 2 | 1 | 2 | 2 | 7 | 0.3 |
| | 6 - West-Central Florida | 2 | 1 | 2 | 2 | 7 | 0.3 |
| | 7 - Big Bend | 2 | 1 | 2 | 2 | 7 | 0.3 |
| | 8 - Northwest Florida | 2 | 1 | 2 | 2 | 7 | 0.3 |
| Roseate Spoonbill, *Ajaia ajaia* | | | | | | | |
| | 1 - Northeast Florida | 3 | 1 | 2 | 3 | 9 | 0.3 |
| | 2 - East Central Florida | 3 | 1 | 3 | 3 | 10 | 0.5 |
| | 3 - Southeast Florida | 3 | 1 | 3 | 3 | 10 | 0.5 |
| | 4 - Florida Keys/Florida Bay | 2 | 1 | 3 | 3 | 9 | 0.5 |
| | 6 - West-Central Florida | 3 | 1 | 3 | 3 | 10 | 0.5 |
| Roseate Tern, *Sterna dougallii* | | | | | | | |
| | 4 - Florida Keys/Florida Bay | 3 | 3 | 3 | 3 | 12 | 1 |
| | 6 - West-Central Florida | 3 | 1 | 2 | 3 | 9 | 0.3 |

| FINE FILTER TARGETS | Subregion | Rare/ Common?* | Source Area? | Vulner-ability | Current Status | Total Score | Representation Percentage |
|---|---|---|---|---|---|---|---|
| Snowy Egret, *Egretta thula* | | | | | | | |
| | 1 - Northeast Florida | 1 | 1 | 3 | 2 | 7 | 0.3 |
| | 2 - East Central Florida | 1 | 1 | 3 | 2 | 7 | 0.3 |
| | 3 - Southeast Florida | 1 | 1 | 3 | 2 | 7 | 0.3 |
| | 4 - Florida Keys/Florida Bay | 1 | 1 | 3 | 2 | 7 | 0.3 |
| | 5 – SW Florida/Ten Thousand Islands | 1 | 1 | 3 | 2 | 7 | 0.3 |
| | 6 - West-Central Florida | 1 | 1 | 3 | 2 | 7 | 0.3 |
| | 7 - Big Bend | 1 | 1 | 3 | 2 | 7 | 0.3 |
| | 8 - Northwest Florida | 1 | 1 | 3 | 2 | 7 | 0.3 |
| Snowy Plover, *Charadrius alexandrinus tenuirostris* | | | | | | | |
| | 4 - Florida Keys/Florida Bay | 3 | 1 | 3 | 3 | 10 | 0.5 |
| | 5 - SW Florida/Ten Thousand Islands | 3 | 1 | 3 | 3 | 10 | 0.5 |
| | 6 - West-Central Florida | 3 | 1 | 3 | 3 | 10 | 0.5 |
| | 7 - Big Bend | 3 | 1 | 2 | 3 | 9 | 0.3 |
| | 8 - Northwest Florida | 3 | 1 | 2 | 3 | 9 | 0.3 |
| Waterbird Nesting Sites | | | | | | | |
| | 1 - Northeast Florida | 3 | 3 | 1 | 2 | 9 | 0.3 |
| | 2 - East Central Florida | 3 | 3 | 1 | 2 | 9 | 0.3 |
| | 3 - Southeast Florida | 3 | 3 | 1 | 2 | 9 | 0.3 |
| | 4 - Florida Keys/Florida Bay | 2 | 3 | 1 | 2 | 8 | 0.3 |
| | 5 - SW Florida/Ten Thousand Islands | 2 | 3 | 1 | 2 | 8 | 0.3 |
| | 6 - West-Central Florida | 2 | 3 | 1 | 2 | 8 | 0.3 |
| | 7 - Big Bend | 3 | 3 | 1 | 2 | 9 | 0.3 |
| American Crocodile, *Crocodylus acutus* | | | | | | | |
| | 3 - Southeast Florida | 2 | 3 | 1 | 2 | 8 | 0.3 |
| | 4 - Florida Keys/Florida Bay | 2 | 3 | 1 | 2 | 8 | 0.3 |
| | 6 - West-Central Florida | 2 | 3 | 1 | 2 | 8 | 0.3 |
| Green Sea Turtle, *Chelonia mydas*, nesting beaches | | | | | | | |
| | 1 - Northeast Florida | 1 | 3 | 3 | 3 | 10 | 0.5 |
| | 2 - East Central Florida | 1 | 3 | 3 | 3 | 10 | 0.5 |
| | 3 - Southeast Florida | 1 | 3 | 3 | 3 | 10 | 0.5 |
| | 4 - Florida Keys/Florida Bay | 1 | 3 | 3 | 3 | 10 | 0.5 |
| | 5 - SW Florida/Ten Thousand Islands | 1 | 3 | 3 | 3 | 10 | 0.5 |
| | 6 - Big Bend | 2 | 3 | 3 | 3 | 11 | 0.75 |
| | 7 - Northwest Florida | 1 | 3 | 3 | 3 | 10 | 0.5 |

| FINE FILTER TARGETS | Subregion | Rare/ Common?* | Source Area? | Vulner-ability | Current Status | Total Score | Representation Percentage |
|---|---|---|---|---|---|---|---|
| Loggerhead Sea Turtle, *Caretta caretta*, nesting beaches | | | | | | | |
| | 1 - Northeast Florida | 1 | 3 | 2 | 2 | 8 | 0.3 |
| | 2 - East Central Florida | 1 | 3 | 2 | 2 | 8 | 0.3 |
| | 3 - Southeast Florida | 1 | 3 | 2 | 2 | 8 | 0.3 |
| | 4 - Florida Keys/Florida Bay | 1 | 3 | 2 | 2 | 8 | 0.3 |
| | 5 - SW Florida/Ten Thousand Islands | 2 | 3 | 1 | 2 | 8 | 0.3 |
| | 6 - West-Central Florida | 1 | 3 | 2 | 2 | 8 | 0.3 |
| | 7 - Big Bend | 3 | 3 | 2 | 2 | 10 | 0.5 |
| | 8 - Northwest Florida | 1 | 3 | 2 | 2 | 8 | 0.3 |
| Leatherback Sea Turtle *Dermochelys coriacea*, nesting beaches | | | | | | | |
| | 1 - Northeast Florida | 2 | 3 | 3 | 3 | 11 | 0.75 |
| | 2 - East Central Florida | 1 | 3 | 3 | 3 | 10 | 0.5 |
| | 3 - Southeast Florida | 1 | 3 | 3 | 3 | 10 | 0.5 |
| | 6 - Big Bend | 3 | 3 | 3 | 3 | 12 | 1 |
| Kemp's Ridley Sea Turtle, *Lepidochelys kempii*, nesting beaches | | | | | | | |
| | 1 - Northeast Florida | 3 | 3 | 3 | 3 | 12 | 1 |
| Hawksbill Sea Turtle, *Eretmochelys imbricata*, nesting beaches | | | | | | | |
| | 4 - Florida Keys/Florida Bay | 3 | 3 | 3 | 3 | 12 | 1 |
| Sea Turtles (inwater surveys) | | | | | | | |
| | 2 - East Central Florida | 1 | 1 | 2 | 2 | 6 | 0.25 |
| | 3 - Southeast Florida | 1 | 1 | 2 | 2 | 6 | 0.25 |
| | 4 - Florida Keys/Florida Bay | 1 | 1 | 2 | 2 | 6 | 0.25 |
| Ornante Diamondback Terrapin, *Malaclemys terrapin macrospilota* | | | | | | | |
| | 4 - Florida Keys/Florida Bay | 3 | 1 | 2 | 1 | 7 | 0.3 |
| | 5 - SW Florida/Ten Thousand Islands | 3 | 1 | 2 | 1 | 7 | 0.3 |
| | 6 - West-Central Florida | 3 | 1 | 2 | 1 | 7 | 0.3 |
| | 7 - Big Bend | 3 | 1 | 2 | 1 | 7 | 0.3 |
| | 8 - Northwest Florida | 3 | 1 | 2 | 1 | 7 | 0.3 |
| Mississippi Diamondback Terrapin, *Malaclemys terrapin pileata* | | | | | | | |
| | 8 - Northwest Florida | 3 | 1 | 3 | 3 | 10 | 0.5 |
| Carolina Diamondback Terrapin, *Malaclemys terrapin centrata* | | | | | | | |
| | 1 - Northeast Florida | 2 | 1 | 2 | 1 | 6 | 0.25 |

| FINE FILTER TARGETS | Subregion | Rare/ Common?* | Source Area? | Vulner-ability | Current Status | Total Score | Representation Percentage |
|---|---|---|---|---|---|---|---|
| Smalltooth Sawfish, *Pristis pectinata* | | | | | | | |
| | 1 - Northeast Florida | 3 | 1 | 1 | 3 | 8 | 0.3 |
| | 2 - East Central Florida | 3 | 1 | 1 | 3 | 8 | 0.3 |
| | 3 - Southeast Florida | 3 | 1 | 1 | 3 | 8 | 0.3 |
| | 4 - Florida Keys/Florida Bay | 3 | 1 | 1 | 3 | 8 | 0.3 |
| | 5 - SW Florida/Ten Thousand Islands | 3 | 1 | 1 | 3 | 8 | 0.3 |
| | 6 - West-Central Florida | 3 | 1 | 1 | 3 | 8 | 0.3 |
| | 7 - Big Bend | 3 | 1 | 1 | 3 | 8 | 0.3 |
| | 8 - Northwest Florida | 3 | 1 | 1 | 3 | 8 | 0.3 |
| Slashcheek Goby, *Ctenogobius pseudofasciatus* | | | | | | | |
| | 2 - East Central Florida | 3 | 1 | 3 | 3 | 10 | 0.5 |
| River Goby, *Awaous banana* | | | | | | | |
| | 2 - East Central Florida | 3 | 1 | 3 | 3 | 10 | 0.5 |
| | 8 - Northwest Florida | 3 | 1 | 3 | 3 | 10 | 0.5 |
| Bigmouth Sleeper, *Gobiomorus dormitor* | | | | | | | |
| | 2 - East Central Florida | 3 | 1 | 3 | 3 | 10 | 0.5 |
| | 3 - Southeast Florida | 3 | 1 | 3 | 3 | 10 | 0.5 |
| Mangrove Rivulus, *Rivulus marmoratus* | | | | | | | |
| | 2 - East Central Florida | 3 | 1 | 2 | 3 | 9 | 0.3 |
| | 3 - Southeast Florida | 3 | 1 | 2 | 3 | 9 | 0.3 |
| | 4 - Florida Keys/Florida Bay | 3 | 1 | 2 | 2 | 8 | 0.3 |
| | 6 - West-Central Florida | 3 | 1 | 2 | 3 | 9 | 0.3 |
| Opossum Pipefish, *Microphis brachyurus* | | | | | | | |
| | 1 - Northeast Florida | 3 | 1 | 3 | 3 | 10 | 0.5 |
| | 2 - East Central Florida | 3 | 1 | 3 | 3 | 10 | 0.5 |
| | 6 - West-Central Florida | 3 | 1 | 3 | 3 | 10 | 0.5 |
| Striped croaker, *Bairdiella sanctaeluciae* | | | | | | | |
| | 2 - East Central Florida | 3 | 1 | 3 | 3 | 10 | 0.5 |
| Gulf Sturgeon, *Acipenser oxyrhynchus desotoi* | | | | | | | |
| | 6 - West-Central Florida | 3 | 1 | 3 | 3 | 10 | 0.5 |
| | 7 - Big Bend | 3 | 1 | 3 | 3 | 10 | 0.5 |
| | 8 - Northwest Florida | 3 | 1 | 3 | 3 | 10 | 0.5 |
| Atlantic Sturgeon, *Acipenser oxyrhynchus oxyrhunchus* | | | | | | | |
| | 1 - Northeast Florida | 3 | 1 | 3 | 3 | 10 | 0.5 |
| | 2 - East Central Florida | 3 | 1 | 3 | 3 | 10 | 0.5 |

| FINE FILTER TARGETS | Subregion | Rare/ Common?* | Source Area? | Vulner-ability | Current Status | Total Score | Representation Percentage |
|---|---|---|---|---|---|---|---|
| Shortnose Sturgeon, *Acipenser brevirostrum* | | | | | | | |
| | 1 - Northeast Florida | 3 | 1 | 3 | 3 | 10 | 0.5 |
| Saltmarsh Topminnow, *Fundulus jenkinsi* | | | | | | | |
| | 8 - Northwest Florida | 2 | 1 | 3 | 3 | 9 | 0.3 |
| Alabama Shad, *Alosa alabamae* | | | | | | | |
| | 7 - Big Bend | 2 | 3 | 2 | 2 | 9 | 0.3 |
| | 8 - Northwest Florida | 2 | 3 | 2 | 2 | 9 | 0.3 |
| Key Silverside, Menidia conchorum | | | | | | | |
| | 4 - Florida Keys/Florida Bay | 3 | 1 | 3 | 3 | 10 | 0.5 |
| Elkhorn Coral, *Acropora palmata* | | | | | | | |
| | 3 - Southeast Florida | 3 | 1 | 3 | 3 | 10 | 0.5 |
| | 4 - Florida Keys/Florida Bay | 3 | 1 | 3 | 3 | 10 | 0.5 |
| Johnson's Seagrass, *Halophila johnsonii* | | | | | | | |
| | 2 - East Central Florida | 3 | 1 | 3 | 3 | 10 | 0.5 |
| | 3 - Southeast Florida | 3 | 1 | 3 | 3 | 10 | 0.5 |
| Fish spawning aggregations (harvested species) | | | | | | | |
| | 3 - Southeast Florida | 3 | 3 | 3 | 3 | 12 | 1 |
| | 4 - Florida Keys/Florida Bay | 3 | 3 | 3 | 3 | 12 | 1 |