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POLICIES FOR THE PROTECTION AND RESTORATION OF ESSENTIAL FISH HABITATS FROM BEACH RENOURISHMENT AND ASSOCIATED LARGE-SCALE COASTAL ENGINEERING

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Policy Context

The Council develops EFH policy statements to address specific habitats and activities that affect habitat. EFH policy statements provide detailed descriptions of habitat resources, discuss potential impacts to those resources, and identify actions that protect EFH. The Council's EFH policy statements and recommendations provide NMFS, state agencies, other Federal and regional habitat partners guidance and rationale to conserve and protect EFH in the South Atlantic region. The Council may revise EFH policies and recommendations or develop new policies as needed to address its habitat mandates.

This document establishes the policies of the South Atlantic Fishery Management Council (SAFMC) regarding protection of the essential fish habitats (EFH) and habitat areas of particular concern (EFH-HAPCs) impacted by beach renourishment (dredge-and-fill activities), and related large-scale coastal engineering projects (e.g., beach scraping). The policies are designed to be consistent with the overall habitat protection policies of the SAFMC as formulated and adopted in the Habitat Plan (SAFMC, 1998a), the Comprehensive EFH Amendment (SAFMC, 1998b) and Fishery Ecosystem Plan (SAFMC, 2009). This document is not intended to supersede any other applicable state or federal policy or regulation pertaining to beach dredge-and-fill projects, but intended to complement existing policies or regulations for the benefit of protecting essential fish habitat managed by the SAFMC.

The findings presented below assess the threats to EFH potentially related to large-scale dredging and placement of sediments in the coastal ocean and adjacent habitats, and the processes whereby those resources are placed at risk. The policies established in this document are designed to avoid, minimize and offset damage caused by these activities, in accordance with the general habitat policies of the SAFMC as mandated by law.

EFH at Risk from Beach Renourishment

The SAFMC finds:

1) Frequent and widespread beach renourishment projects (dredge-and-fill) occurring in the southeast United States may cause measurable impacts to EFH under the jurisdiction of the SAFMC. While beach renourishment is a common tool to reduce storm damage to oceanfront property, and is generally preferred over shoreline hardening, coastal communities are strongly encouraged to evaluate the full range of alternatives, long-term policies, and solutions, including targeted buy-outs and relocation, given the increasing threat from sea level rise, storm impacts, and erosion. When considering targeted buy-outs and relocation, short- and long-term plans could consider how current sand sources meet local or regional demand, funding sources for potential buy-outs, and permits or processes required for retreat. In addition to and in coordination with community plans, states are encouraged to include alternatives to beach nourishment (including retreat) in Coastal Zone Management Act enforceable policies of a state coastal management program.

2) The cumulative effects of these projects, especially in relation to increasing frequency of activity, change in season of activity, and recovery from these activities, have not been adequately assessed, including impacts on public trust marine and estuarine resources, state and federally protected species, and SAFMC-designated EFH and EFH-HAPCs. Impacts to public trust resources will vary based on presence of nearshore habitat and fish use. Long-term geoengineering of the southeastern coastline is being conducted without review of the collective consequence of these activities (Armstrong and Lazarus, 2019; Staudt et al., 2021). Recent reviews, however, synthesize impacts from various projects in different geographies (see Pickens et al. 2020a, Michel et al., 2013, Wenger et al., 2016).

3) The majority (74%) of the U.S. Atlantic coastline is less than 16 km from a large-scale beach renourishment project that has the potential to impact a variety of habitats, including (Armstrong and Lazarus, 2019; Miselis et al, 2021):

a) waters and benthic habitats in and near the dredging sites
b) waters between dredging and filling sites (i.e., along pipeline corridors)
c) waters and benthic habitats in and near the fill or placement sites, and
d) waters and benthic habitats as sediments move subsequent to deposition in fill areas.

4) While some environmental research studies have been completed for select beach renourishment activities in the southeast, these have often been limited by small sample size, short duration or inconsistent sample design (Bergquist and Crowe, 2009). Historically, emphasis has been placed on the logistics of dredging and economics, with environmental considerations dominated by compliance with the Endangered Species Act for sea turtles, shore birds, Atlantic sturgeon and other listed organisms. Less emphasis has been placed on the hundreds of other species affected (McCarthy et al., 2020), many with direct and significant fishery value. A recent study, however, tracked bony fishes, sharks, and sea turtles over six years off the Atlantic coast of Florida, finding high mobility and low site fidelity, with temporary disruptions during two dredge events that occurred during sampling (Iafrate et al., 2022).

5) Although minimization strategies have been developed for beach renourishment activities, such as those listed below as Best Management Practices, increasing demand for more frequent and higher volume renourishment activities from a growing number of coastal communities have increased pressure to locate borrow areas for sand mining in vulnerable habitats such as ebb-tide deltas, allow insufficient time for recovery (if recovery is even possible), and conduct activities during periods of high biological activity (Manning et al., 2014; Crowe et al., 2016; Woodbridge et al., 2016; Johnson et al., 2020ab; Staudt et al., 2021).

6) Large sections of South Atlantic waters potentially affected by these projects, both individually and collectively, have been identified as EFH or EFH-HAPC by the SAFMC**,** Mid-Atlantic Fishery Management Council (MAFMC), and National Marine Fisheries Service - Highly Migratory Species (HMS). When select fish species of economic and ecological importance were modeled with a suite of environmental factors, Pickens et al. (2020b) found that oceanographic characteristics played a larger role in influencing distribution. Geomorphology (e.g., shoals) played a minor role in explaining distributions; therefore, the "value" of shoals depends on co-location with preferred oceanographic conditions (Pickens et al. 2020b). Potentially affected species and their EFH under federal management include (SAFMC, 1998b):

a) summer flounder (various nearshore waters, including the surf zone and inlets; certain offshore waters)
b) bluefish (various nearshore waters, including the surf zone and inlets)
c) many snapper and grouper species (live hardbottom from shore to 600 feet, and – for estuarine-dependent species [e.g., gag grouper and gray snapper] – unconsolidated bottoms and live hardbottoms to the 100-foot contour).
d) black sea bass (various nearshore waters, including unconsolidated bottom and live hardbottom to 100 feet, and hardbottoms to 600 feet)
e) penaeid shrimp (offshore habitats used for spawning and growth to maturity, and waters connecting to inshore nursery areas, including the surf zone and inlets)
f) coastal migratory pelagics [e.g., king mackerel, Spanish mackerel] (sandy shoals of capes and bars, barrier island ocean-side waters from the surf zone to the shelf break inshore of the Gulf Stream; all coastal inlets)
g) corals of various types (hard substrates and muddy, silt bottoms from the subtidal to the shelf break)
h) areas identified as EFH for Highly Migratory Species (HMS) managed by the Secretary of Commerce (e.g., sharks: inlets and nearshore waters, including pupping and nursery grounds).
i) numerous species of crustaceans, mollusks, and annelids that are not directly managed, but form the critical prey base for most managed species, are killed or otherwise directly or indirectly affected by large dredge-and-fill projects.

7) Beach renourishment projects also potentially threaten important habitats for anadromous species under federal, interstate and state management (in particular, inlets and offshore overwintering grounds), as well as other important habitats for weakfish and other species managed by the Atlantic States Marine Fisheries Commission (ASMFC) and the states.

8) Many of the habitats potentially affected by these projects have been identified as EFH-

HAPCs by the SAFMC. The specific fishery management plan is provided in parentheses:

a) all nearshore hardbottom areas, artificial reefs and Special Management Zones (SAFMC, snapper grouper).
b) all coastal inlets (SAFMC, penaeid shrimps, and snapper grouper).
c) near-shore spawning sites (SAFMC, penaeid shrimp).
d) benthic *Sargassum* (SAFMC, snapper grouper).
e) from shore to the ends of the sandy shoals of Cape Lookout, Cape Fear, and Cape Hatteras, North Carolina; Hurl Rocks, South Carolina; *Phragmatopora* (worm reefs) reefs off the central coast of Florida and nearshore hardbottom south of Cape Canaveral (SAFMC, coastal migratory pelagics).
f) Florida Bay, Biscayne Bay, Card Sound, and coral hardbottom habitat from Jupiter Inlet through the Dry Tortugas, Florida (SAFMC, Spiny Lobster)
g) Hurl Rocks (South Carolina), The *Phragmatopoma* (worm reefs) off central east coast of Florida, nearshore (0-4 meters; 0-12 feet) hardbottom off the east coast of Florida from Cape Canaveral to Broward County; offshore (5-30 meters; 15-90 feet) hardbottom off the east coast of Florida from Palm Beach County to Fowey Rocks; Biscayne Bay, Florida; Biscayne National Park, Florida; and the Florida Keys National Marine Sanctuary (SAFMC, Coral, Coral Reefs and Live Hardbottom Habitat).
h) EFH-HAPCs designated for HMS species (e.g., sharks) in the South Atlantic region (NMFS, Highly Migratory Species).

9) Habitats likely to be affected by impacts from the dredging or filling associated with beach renourishment projects include many recognized in state-level natural resource management plans. Examples of these habitats include designated fish habitats areas (Coral, Live Rock, Strategic Habitat Areas, Primary Nursery Areas, and Crab Sanctuaries) established by the North Carolina Marine Fisheries Commission.

<u>Threats to Marine and Estuarine Resources from Beach Renourishment Activities and Related Large Coastal Engineering Projects</u>

The SAFMC finds that beach renourishment activities (dredge-and-fill) and related large-scale coastal engineering projects (including inlet alteration projects) and placement of material for navigational maintenance, may affect EFH through the following mechanisms:

1) Direct mortality, displacement, and altered community structure of benthic organisms and habitats including submerged aquatic vegetation at and near sediment dredging sites (Van Dolah *et al.*, 1992; Wilber and Stern, 1992; Van Dolah *et al.*, 1994; Jutte *et al.*, 1999a and b; Greene, 2002; Byrnes *et al.*, 2004a and b; Diaz *et al.*, 2004; Bergquist *et al.*, 2009)

2) Direct mortality of fish larvae, as well as other planktonic and nektonic organisms at and near sediment dredging sites due to entrainment and decreased water quality. (Olney and Bilkovic, 1998; Wilber and Clarke, 2001, Greene, 2002). There is also direct mortality of newly settled and early juvenile fishes due to burial of nearshore hardbottom reef habitat (Lindeman and Snyder 1999; CSA International, 2009;

McCarthy et al 2020.) and direct burial of spawning sites of >30 species of cryptobenthic species of importance to local food webs (McCarthy et al 2020.)

3) Direct mortality, displacement, and altered community structure of invertebrates and nekton, at or near initial sediment fill sites (Rakocinski *et al.*, 1996; Peterson *et al.*, 2000a; Greene, 2002; Posey and Alphin, 2002; Peterson *et al.* 2000b; Peterson *et al.* 2006; Colosio *et al.*, 2007; Lewis *et al.*, 2012; Schlacher *et al.* 2012; Speybroeck *et al.*, 2006; Van Tomme *et al.*, 2013; Johnson et al., 2020ab)

4) Elevated turbidity and deposition of fine sediments where present result in:

- stress or mortality to organisms downstream or down-current from dredging sites adversely altering water quality, impacting larval transport and smothering coral and live hardbottom habitat (Dodge *et al.*, 1974; Jordan *et al.*, 2010)
- decreased primary productivity at dredged sites due to greater depths (Greene, 2002)
- elevated turbidity in and near initial fill sites, especially in the surf zone, and downstream deposition of fine sediment down-current from initial fill sites (Peterson *et al.*, 2000a and b; Greene, 2002; Speybroeck *et al.*, 2006).

5) Alteration of seafloor topography and associated current and waves patterns and magnitudes at dredging areas (Greene, 2002; Blake *et al.*, 1996; Byrnes *et al.* 2004a and b; Maa *et al.*, 2004; Finkl and Hobbs, 2009).

6) Alteration of seafloor sediment size-frequency distributions at dredging sites, with secondary effects on benthos at those sites (Van Dolah *et al.*, 1992; Van Dolah *et al.*, 1994; Van Dolah *et al.*, 1998; Jutte and Van Dolah, 1999 and 2001; Jutte *et al.*, 2001; Greene, 2002; Jutte *et al.*, 199a and b; Diaz *et al.*, 2004; Nairn *et al.*, 2004; Bergquist *et al.*, 2009; Xu *et al.*, 2014).

7) Increased deposition of fine-grained sediments and organic matter in dredged areas, potentially resulting in decreased dissolved oxygen and increased hydrogen sulfide levels (Greene, 2002; Byrnes *et al.*, 2004a and b; Bergquist *et al.*, 2009)10) Alteration of nearshore topography and current and wave patterns and magnitudes associated with fill (Greene, 2002; Benedet *et al.* 2004; Speybroeck *et al.*, 2006; Hartog *et al.*, 2008)

8) Movement of deposited sediment away from initial fill sites, especially onto hardbottoms (Greene, 2002; Speybroeck *et al.*, 2006; Jordan *et al.*, 2010)
Mechanism – Physical alteration

9) Alteration of large-scale sediment budgets, sediment movement patterns and feeding and other ecological relationships, including the potential for cascading disturbance effects (Peterson *et al.*, 2000a; Greene, 2002; Benedet *et al.*, 2004; Nairn *et al.*, 2004; Speybroeck *et al.*, 2006)

10) Alteration of large-scale movement patterns of water, with secondary effects on water quality and biota (Greene, 2002; Nairn *et al.*, 2004; Hartog *et al.*, 2008)

11) Alteration of movement patterns and successful inlet passage for larvae, post-larvae, juveniles and adults of marine and estuarine organisms (Greene, 2002).

12) Alteration of long-term shoreline migration patterns (inducing further ecological cascades with consequences that are difficult to predict) (Greene, 2002)

13) Exacerbation of transport and/or biological uptake of toxicants and other pollutants released at either dredge or fill sites (Greene, 2002).

In addition, the interactions between cumulative and direct (sub-lethal) effects among the above factors likely trigger non-linear impacts (CSA International, 2009McCarthy et al, 2020) that are completely unstudied.

SAFMC Best Management Practices for Beach Renourishment Projects and Related Large Coastal Engineering Projects

The SAFMC establishes the following best management practices for unavoidable beach renourishment and related large-scale coastal engineering projects, to clarify and augment the general policies already adopted in the Habitat Plan and Comprehensive Habitat Amendment (SAFMC 1998a; SAFMC 1998b):

1) In general, frequent and widespread beach renourishment projects (dredge and fill) occurring in the United States southeast together may cause measurable impacts to EFH under the jurisdiction of the SAFMC. Coastal communities are strongly encouraged to evaluate the full range of alternatives, including targeted buy-outs and relocation, to these types of projects when addressing erosion and sea level rise.

2) For each project, a comprehensive environmental document should be prepared based on the best available information, and should include:

   a) Defined areas of direct and indirect impact, using guidance provided in 40 CFR Section 1508.8 Effects. Areas of direct impact should at a minimum include the borrow sites (dredged or mined areas), the beach/nearshore sites (fill areas), and the Equilibrated Toe of Fill. Areas of indirect impact should at a minimum include the areas adjacent to direct impact areas that would be affected by indirect project impacts (e.g., turbidity plumes).

   Baseline surveys designed with appropriate methodology to adequately document pre-project conditions for biological, physical and water resources in both direct and indirect impact areas. Baseline surveys should follow the BACI (Before- After, Control-Impact) sampling framework (Stewart-Oaten 1986). Biological resources at a minimum include benthic infauna and epifauna, SAV, hard bottom habitat, hard bottom-dependent species, coral reef habitat, and coral reef-dependent species (e.g., corals, octocorals). Physical and water resources at a minimum include topography, bathymetry, water quality (turbidity, sedimentation, total suspended solids and dissolved oxygen) and sediment characteristics (grain size, sorting, and mineralogy). Changes to biological resources should be analyzed in context of physical process and naturally occurring changes to understand attribution or causal nature of effects. Studies should be of sufficient longitude and space scale before and after to describe system variability and document recovery to pre-existing conditions or new stable baseline.

b) An analysis of alternatives, including alternatives that may minimize future need for additional nourishment activities (e.g., sand bypass), to include the following components:

i. Identification of avoidance and minimization efforts.

ii. Identification of the direct and indirect project impacts that cannot be avoided or minimized, using appropriately designed baseline surveys identified in b above.

iii. Identification of cumulative impacts that at a minimum includes impacts associated with other regional beach dredge-and-fill projects, as well as any other large-scale coastal engineering projects that are both geographically and ecologically related.

c) A during-construction monitoring plan as deemed necessary for a specific project, designed with appropriate methodology to adequately detect and document both direct and indirect project impacts. This may require multiple years and seasons to account for natural variability. Monitoring plans should follow the BACI sampling framework.

d) A post-construction monitoring plan for biological, physical and water resources designed with appropriate methodology to adequately detect and document both direct and indirect project impacts. Monitoring plans should follow the BACI sampling framework. Post-construction monitoring should include quantitative comparisons of abundance, biomass, species diversity, and community composition in direct and indirect impact area and reference (control) areas before and after dredge-and-fill operations.

2) Fill material should match the sediment characteristics of the recipient beach as closely as possible and consider placement in a manner that maximizes recovery (e.g., Cahoon et al., 2012). States, communities, and federal agencies are encouraged to set and enforce compatibility guidelines.

3) Borrow area dredging should be limited to bathymetric peaks or accreting system components (rather than depressions or level sea bottom) in areas characterized by strong currents and sand movement, in order to increase sediment infilling rates and decrease the duration of impacts to benthic habitats.

4) The depth of dredged bottom should be limited to the shallowest depths possible to minimize changes in wave energy and currents, thus reducing the likelihood of infilling with fine- grained sediments. Removal should not dredge to depths that lead to a change in sediment type (e.g., from sand to clay) but rather retain the same bottom character to promote recruitment of similar organisms that reflect pre-dredge community composition.

5) In areas with seasonal benthic recruitment periods (Lindeman and Snyder 1999), beach renourishment and large- scale coastal engineering activities should be conducted during periods of low biological activity (environmental windows), for example, ahead of spring/summer benthic recruitment periods, to allow maximum recovery of adversely impacted communities.

6) Habitats designated as EFH-HAPC or recognized in state-level natural resource management plans should not be used as borrow areas for sand mining.

Research Needs

NOAA Conservation Recommendation provided during EFH consultations may help direct potential research. The SAFMC also encourages funding scientific research on the following topics:

1) An analysis of the spatial and temporal dimensions of these beach renourishment projects (dredge-and-fill) combined with other large-scale coastal engineering projects, within the SAFMC geographic range.

2) Adverse and potentially beneficial cumulative impacts, on productivity and biomass of nearshore ecosystems, occurring as a result of beach renourishment (dredge-and-fill) activities. Specifically, a meta-analysis which incorporates both spatial and temporal dimensions.

3) Appropriate compensatory mitigation for beach renourishment and borrow (sand mining) area impacts (e.g., for hardbottom or SAV)(Bishop and Peterson, 2005).

4) Survey fish on soft substrates that have shown affinity for sand in other areas (e.g., juvenile red snapper and lane snapper) but have been under-studied in the South Atlantic

5) Characterize the spatial and temporal use of soft substrate by reef-associated fishes, and how use changes in different lifestages.

6) Identify shallow-water habitat of Coastal Migratory Pelagics.

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