Conservation Strategic Plan

2017-2021

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Cornell Cooperative Extension of Suffolk County Marine Program

Our Mission

Healthy, thriving habitats of sufficient quantity and quality to support all life stages of Atlantic coastal, estuarine-dependent, and diadromous fishes

Our Vision

To accelerate the conservation, protection, restoration, and enhancement of habitat for native Atlantic coastal, estuarine-dependent, and diadromous fishes through partnerships between federal, tribal, state, local and other entities

Introduction

The Atlantic Coastal Fish Habitat Partnership (ACFHP – see Appendix A for all acronyms) is an assembly of public and private entities interested in the conservation of habitat for Atlantic coast diadromous, estuarine-dependent, and coastal fish species (see Appendix B for select definitions). ACFHP was formed in 2006 under the auspices of the National Fish Habitat Action Plan and operates within the National Fish Habitat Partnership framework. The NFHAP is a non-regulatory, voluntary plan designed to protect, restore, and enhance the nation's fish and aquatic communities through regional Fish Habitat Partnerships. The NFHAP is a strategy to identify restoration projects and other activities to help maximize the impact of on-the-ground conservation dollars appropriated by Congress to the United States Fish and Wildlife Service.

Every five years the ACFHP Steering Committee and partners re-evaluate and update their Conservation Strategic Plan (CSP), focused on broad coastwide strategies for determining and addressing the threats affecting habitats important for all life stages of Atlantic diadromous, estuarine-dependent, and coastal species. The CSP is used as a guidance document for the ACFHP Steering Committee, the Partnership-At-Large, state and federal agencies, and restoration practitioners. The Plan is designed to address goals, objectives, and strategies that the Partnership will focus on over the next five years to improve the condition of Atlantic coastal fish habitat. When appropriate, our goals and objectives have been aligned with those of our partners. Action Plans will be developed every two years and will include steps towards achieving objectives identified in this CSP.

The issues that ACFHP will address are complex, and tackling them is important for the conservation of Atlantic coastal habitats. This Partnership is designed to bring diverse groups together to identify the causes of habitat declines, implement strategic corrective action, and measure and communicate progress made through its efforts. The end result of ACFHP actions will benefit not only a great number of species, from diadromous to marine, but a large population of resource users as well. Covering a densely populated region in close proximity to some of the country's most productive and unique fish habitats, ACFHP's role in making the connection between headwater and continental shelf habitats; non-governmental organizations (NGOs), state, federal, tribal, and various stakeholders; and people and fish habitat is vital to maintaining healthy fish habitat.

Habitat is the physical space that an organism uses to fulfill its basic requirements for life, such as food, water, oxygen, and shelter. Put simply, habitat is where something lives. Sustainable recreational and commercial fisheries are dependent upon healthy habitat. The ACFHP region has a range of fish habitats that are critical to coastal fisheries. These habitats represent areas where coastal fishery species forage, seek refuge, grow, or spawn. The protection and restoration of these areas is critical to the protection and sustainability of coastwide fishery resources and the ways of life they support.

Habitat loss and degradation impair fish productivity and can impact fishery sustainability and recovery rates, even after management actions have successfully reduced fishing pressures. The relationship between habitat condition and fish populations is

Accomplishments 2012 – 2016

- Published the Species-Habitat Matrix, a tool for evaluating the relative importance of a specific habitat type to a given life history stage for an individual species
- Coordinated the development of the estuarine and diadromous portions of the Fish Habitat Decision Support Tool, a visualization and ranking tool to assess fish habitat spatially
- Wrote a paper on river herring habitat restoration needs in six Atlantic coast watersheds
- Welcomed three new partners: Merrimack River Watershed Council, International Federation of Fly Fishers, and North Carolina Coastal Federation
- Opened 75 river miles[1]
- Restored 0.5 acres of riverine spawning habitat, 2.95 acres of oyster reefs, 2.4 acres of salt marsh and mangroves, and 19 acres of seagrass beds[2]
- Increased communication and collaboration among over 60 different federal, state, county, local, academic, tribal, non-profit, private interest, and conservation entities
- Completed the Conservation Mooring Project, using advanced technology to replace traditional boat moorings and conserve surrounding seagrass
- Contributed over $400,000 directly to conservation projects, leveraging $4 for each ACFHP restoration dollar
- Added an annual estimated $41 million in economic value to the Atlantic coast[2]

Making the Connection

- From the headwaters to the continental shelf
- Among non-governmental, state, federal, tribal, and various stakeholders
- Between people and fish habitat

The ACFHP region includes:

- Over 25% of the U.S. population (approximately 87 million people)
- Nine of the ten most densely populated states
- The largest city in the U.S. (New York City)
- The most urban estuary in the U.S. (New York Harbor)
- The largest estuary in the world (Chesapeake Bay)
- The only barrier coral reef in the continental U.S. (off of South Florida)
- The largest cruise ship port in the world (Miami, Florida)
- The only U.S. city bordered by two National Parks (Miami: Everglades and Biscayne Bay NPs)
- Fish communities residing in climates ranging from cold temperate to tropical Atlantic
- Four National Marine Sanctuaries and one National Monument
- The largest number of diadromous species in the world (ACFHP's North Atlantic subregion)
- The most marine habitat of any Fish Habitat Partnership
- One of the most rapidly warming areas in the world (Gulf of Maine, warming 3x faster than the global average)

complex. In the past, the decline of a particular fish stock was often attributed to overfishing. Weakfish, river herring, and Atlantic sturgeon are examples of fish species that have not recovered even after having lengthy fishing moratoriums imposed on the stocks. This being said, the status of specific fish species can be an indicator of declining fish habitats and the need to take action to restore and protect the significant habitats to those fish populations.

Thriving, healthy waterways and robust fish populations are vital to the well-being of our society. They provide clean water and sustainable fisheries. They also are essential for less tangible reasons, as anyone who has fished wild waters or canoed a tranquil stream can attest. Unfortunately, in many waters around the country, fish and the habitats on which they depend are in decline. A substantial amount of work has been undertaken to protect, restore, and enhance these aquatic habitats. Although significant gains have been made, they have not kept pace with impacts resulting from population growth and land-use changes. Given the diverse array of federal, state, tribal, local, and private jurisdictions, the need has never been greater for increased action and improved coordination of fisheries conservation measures across boundaries and jurisdictions.[3]

Habitats like seagrass beds, coral reefs, and wetlands of sufficient quantity and quality supporting all life stages are critical for healthy fish communities. However, many of these habitats are being threatened. In fact, the National Fish Habitat Partnership reports that 89% of Mid-Atlantic estuaries are at high or very high risk of habitat degradation, and rank overall as the poorest quality marine habitat in the country.[4]

Seagrasses are one of the most rapidly declining habitats around the world, with up to 7% loss in area annually associated with human activities like sewage discharge, shoreline hardening, coastal development, and deforestation.[5] The 150-mile long Indian River Lagoon estuary in Florida has lost 70% of the system's historic 70,000 acres of seagrass due to prolonged algae blooms attributed in part to nutrient additions to the system.[6]

Recreational Fishing along the Atlantic Coast (NOAA 2015)

Location	Number of Anglers	Number of Fishing Trips	Value Added Impact	Number of Jobs Created	Durable Goods Expenditures
New England	1.0 million	5.0 million	$1.2 billion	17,016	$1.4 billion
Mid-Atlantic	2.0 million	12.4 million	$2.6 billion	37,170	$2.8 billion
South Atlantic	2.2 million	16.5 million	$3.8 billion	58,019	$4.3 billion
TOTAL	**5.2 million**	**33.9 million**	**$7.6 billion**	**112,205**	**$8.5 billion**

Commercial Fishing along the Atlantic Coast (NOAA 2015)

Location	Pounds Landed	Landing Revenue	Value Added Impact	Number of Jobs Created
New England	599 million	$1.2 billion	$4.9 billion	139,712
Mid-Atlantic	649 million	$512 milllion	$5.1 billion	100,954
South Atlantic	106 million	$182 million	$6.9 billion	101,024
TOTAL	**1.354 billion**	**$1.894 billion**	**$16.9 billion**	**341,690**

The coral reef tract in southeast Florida contributes $5.7 billion annually to the regional economy and is responsible for supporting over 61,000 full and part-time jobs.[7] Unfortunately, these reefs are dissolving at a faster rate than previously thought.[8]

According to the Status and Trends of Wetlands in the Coastal Watersheds of the Conterminous United States 2004 to 2009, 15.9 million acres of Atlantic coast watershed is covered by wetlands, but from 2004 to 2009 this region experienced a net wetland loss of 111,960 acres (0.7% loss; though South Carolina, Georgia, and parts of Florida experienced a net gain of coastal wetlands). Overwhelmingly, this loss was freshwater wetlands. Oyster reefs are also on the decline – 85% have been lost globally,[9] and Chesapeake Bay coverage is less than 1% of historic mass.

[1]*http://www.atlanticfishhabitat.org/projects/fundedprojects/, http://www.atlanticfishhabitat.org/projects/endorsedprojects/*
[2]Calculation based on economic valuations from Charbonneau and Caudill, 2010. Conserving America's Fisheries: An Assessment of Economic Contributions from Fisheries and Aquatic Resource Conservation. U.S. Fish and Wildlife Service. Arlington, VA. *https://www.fws.gov/home/feature/2011/pdf/fisherieseconomicreport.pdf*
[3]Association of Fish and Wildlife Agencies. 2006. National Fish Habitat Action Plan. *http://www.fishhabitat.org/files/uploads/National_Fish_Habitat_Action_Plan_2006.pdf.*
[4]Crawford, S., Whelan, G., Infante, D.M., Blackhart, K., Daniel, W.M., Fuller, P. L., Birdsong, T., Wieferich, D.J., McClees-Funinan, R., Stedman, S. M., Herreman, K., and P. Ruhl. 2016. Through a Fish's Eye: The Status of Fish Habitats in the United States 2015. National Fish Habitat Partnership. *http://assessment.fishhabitat.org/.*
[5]Waycott, M., Duarte, C.M., Carruthers, T.J.B., Orth, R.J., Dennison, W.C., Olyarnik, S., Calladine, A., Fourqurean, J.W., Heck Jr., K.L., Hughes, A.R., Kendrick, G.A., Kenworthy, W.J., Short, F.T, and S.L. Williams. 2009. Accelerating loss of seagrasses across the globe threatens coastal ecosystems. Proceedings of the National Academy of Sciences of the United States of America 106(30): 12377-12381.
[6]Charles Jacoby, St. Johns Water Management District, personal communication.
[7]Giliam, D. 2013. A Quick Guide to SE Florida's Coral Reefs. Southeast Coral Reef Initiative. NOAA. *http://www.dep.state.fl.us/coastal/programs/coral/reports/LBSP/SEFCRI_Quick_Guide.pdf*
[8] *Muehllehner, N., Langdon, C., Venti, A. and D. Kadko, 2016. Dynamics of carbonate chemistry, production, and calcification of the Florida Reef Tract (2009-2010): evidence for seasonal dissolution. Global Biogeochemical Cycles 30: 661-688.*
[9]*http://www.nature.org/science-in-action/science-features/oyster-reef-interactive-graphic.xml*

ACFHP Partners

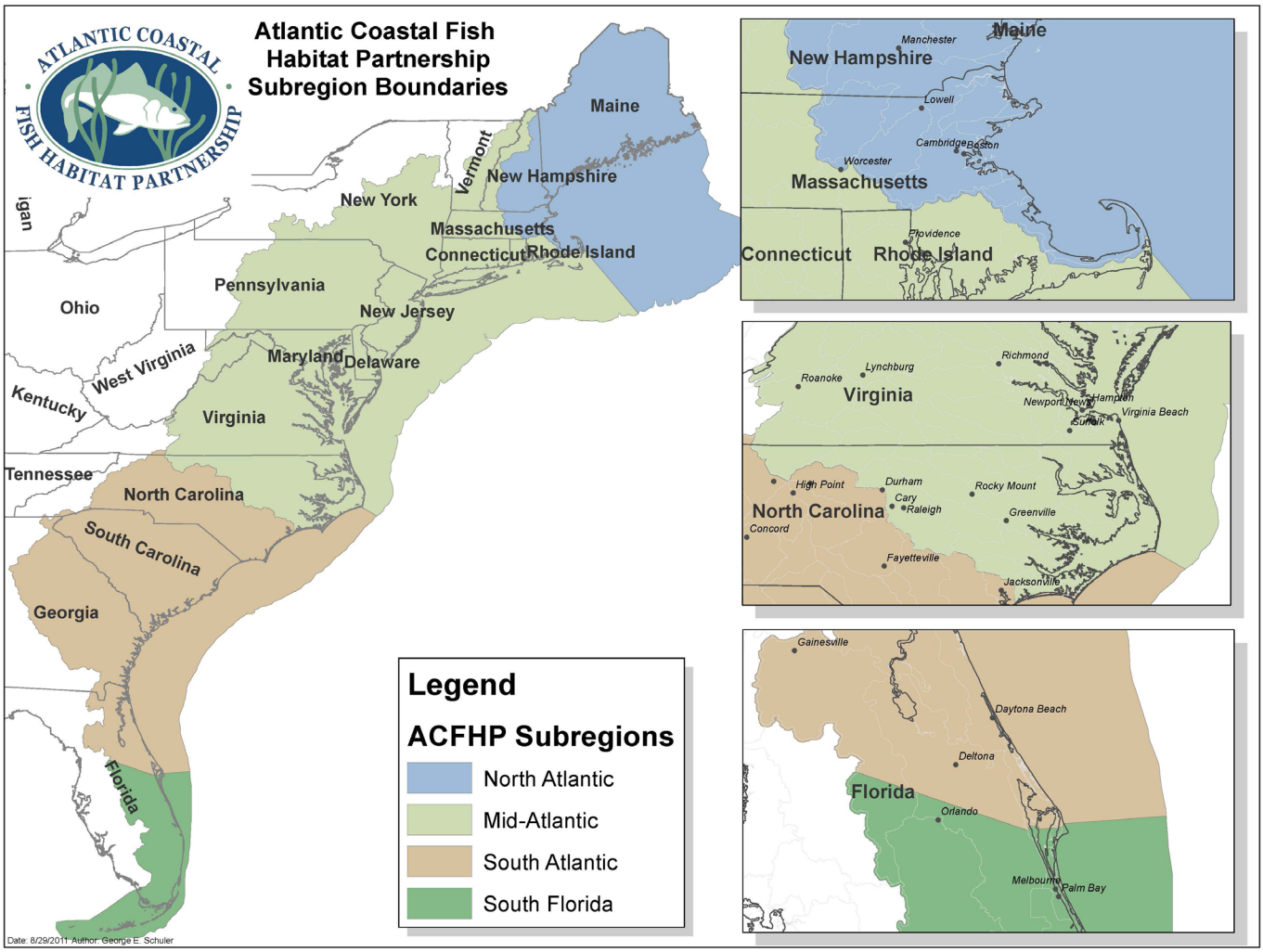
To address Atlantic coast fish habitat issues, ACFHP created a Memorandum of Understanding. It affirms the commitment of the 33 signatories to develop local, regional, state, tribal, federal, and private partnerships that extend beyond the traditional boundaries of resource management agencies and non-governmental organization responsibilities for the benefit of their shared aquatic resources. The Partnership hopes to bring in additional organizations committed to conserving fish habitat along the Atlantic coast in the future. ACFHP's Charter and By-Laws can be found at: *http://www.atlanticfishhabitat.org/Documents/ACFHP-Charter-and-Bylaws.pdf*

- Albemarle-Pamlico National Estuary Partnership
- American Littoral Society
- American Rivers
- Atlantic States Marine Fisheries Commission
- Chesapeake Bay Foundation
- Connecticut Department of Environmental Protection
- Delaware Department of Natural Resources and Environmental Control
- Environmental Defense Fund
- Florida Fish and Wildlife Conservation Commission
- Georgia Department of Natural Resources
- Houlton Band of Maliseet Indians
- International Federation of Fly Fishers
- Maine Department of Marine Resources
- Maryland Department of Natural Resources
- Massachusetts Division of Marine Fisheries
- Merrimack River Watershed Council
- National Oceanic and Atmospheric Administration
- New Hampshire Fish and Game Department
- New Jersey Division of Fish and Wildlife
- New York Department of Environmental Conservation
- North Carolina Coastal Federation
- North Carolina Department of Environmental Quality
- Oyster Recovery Partnership
- Partnership for the Delaware Estuary
- Pennsylvania Fish and Boat Commission
- Rhode Island Division of Fish and Wildlife
- South Carolina Department of Natural Resources
- The Nature Conservancy
- United States Fish and Wildlife Service
- United States Geological Survey
- Vermont Fish and Wildlife Department
- Virginia Marine Resources Commission
- Wells National Estuarine Research Reserve

Scope

ACFHP utilizes subregional boundaries for the purposes of habitat prioritization. These subregions represent ecologically distinct units and were derived from Marine Ecoregions of the World[10] as established by the World Wildlife Fund and The Nature Conservancy. These include the Gulf of Maine, Virginian, Carolinian, and Floridian ecoregions which correspond to ACFHP subregions North Atlantic, Mid-Atlantic, South Atlantic, and South Florida, respectively.

ACFHP plans to work throughout the defined subregions, however, less emphasis will be placed on upstream headwaters and offshore marine ecosystems and more on the approximately 29,000 miles of shoreline and



coastal waters. ACFHP will seek to ensure contiguous watershed coverage with adjacent Fish Habitat Partnerships while minimizing overlap or duplication of effort. As ACFHP develops on-the-ground projects, it will work with these partnerships to identify where cooperation should occur, as well as new avenues for collaboration. This will ensure that ACFHP is not working in competition, but in concert with existing partnerships towards fish habitat conservation.

In this CSP and our work, ACFHP acknowledges the importance and severity of global and regional climate change effects on fish habitat. The impacts and severity of climate change on fish habitats throughout the ACFHP region will vary. For example, the Gulf of Maine is a climate change hotspot, with temperatures predicted to rise three times more rapidly than the global average.[11] Sea level rise; ocean acidification; increased water temperatures; increased storm frequency and severity; habitat expansion, contraction, and fragmentation; species geographic shifts; and eutrophication are all factors that will lead to fish habitat modifications in pending climate change effects. The full impacts and timeline of those impacts are uncertain. However, climate change is likely to influence all habitats and species along the Atlantic coast in some way, including people. For instance, sea level rise in south Florida currently causes coastal flooding during peak lunar tides, and may cause marginal wetland habitats (mangroves and fringing seagrass meadows) to be lost by squeezing them against developed shorelines. Climate change has the potential to strongly influence how we plan and execute habitat protection and restoration projects. The ways in which climate change influences projects will likely evolve over time as we learn more about how the atmosphere and oceans are changing. The CSP will not specifically address climate change; however, ACFHP will develop, recommend, and implement restorative and adaptive solutions (e.g. living shorelines) to fish habitat conservation to address this significant threat.

[10]*http://www.worldwildlife.org/publications/marine-ecoregions-of-the-world-a-bioregionalization-of-coastal-and-shelf-areas*
[11]Saba, V.S., Griffies, S.M., Anderson, W.G., Winton, M., Alexander, M.A., Delworth, T.L., Hare, J.A., Harrison, M.J., Rosati, A., Vecchi, G.A., and R. Zhang. 2016. Enhanced warming of the northwest Atlantic Ocean under climate change. Journal of Geophysical Research: Oceans 121(1): 118-132.

Shorey's Brook (NY) before and after dam removal. Photos courtesy of Great Works Regional Land Trust.

Habitats

The full list of ACFHP Habitats to the right has been excerpted from the ACFHP Species-Habitat Matrix. This list should not be considered a comprehensive index of all habitats along the Atlantic coast; however, these habitats were determined to best represent the range of habitats supporting Atlantic coastal, estuarine-dependent, and diadromous fishes at a coast-wide level.

This table illustrates the 25 habitat types organized within seven habitat categories (see Appendix C Habitat Characterizations for more detailed descriptions). The habitat types are examples of particular habitat characterizations that fall within a broader habitat category.

ACFHP Habitats by Category and Type

Habitat Category	Habitat Type
Marine and Estaurine Shellfish Beds	Oyster aggregations/reef Scallop beds Hard clam beds Shell accumulations
Coral and Live/Hard Bottom	Coral reefs Patch reef, soft corals, or anemones Live rock
Macroalgae	*Fucus* spp., *Laminaria* spp., *Ulva lactuca*
Submerged Aquatic Vegetation	Tidal fresh & oligohaline plant species Mesohaline & polyhaline plant species
Tidal Vegetation	Estuarine emergent marsh Tidal freshwater marsh Mangrove
Unvegetated Coastal Bottom	Loose fine bottom Loose coarse bottom Firm hard bottom Structured sand habitat
Riverine Bottom	Higher gradient headwater tributaries Lower gradient tributaries Higher gradient large mainstem river Lower gradient large mainstem river Low order coastal streams Non-tidal freshwater mussel beds Coastal headwater pond Non-tidal freshwater marsh

Subregional Priority Habitats

ACFHP has selected three to four priority habitats within each subregion using the results of the Species-Habitat Matrix as a guide, and professional judgment to consider threats facing each habitat. Given limited resources, projects addressing the Priority Habitats appropriate for the given subregion will receive heightened consideration and ACFHP support and implementation during the next five years (2017-2021). With this in mind, ACFHP will support efforts to accelerate the conservation, protection, restoration, and enhancement of all habitats listed on the previous page. Note that the priority habitats selected for each subregion are not ranked or prioritized within the subregion.

ACFHP PRIORITY HABITATS BY SUBREGION

NORTH ATLANTIC

- Riverine Bottom
- Submerged Aquatic Vegetation
- Marine and Estuarine Shellfish Beds

SOUTH ATLANTIC

- Riverine Bottom
- Submerged Aquatic Vegetation
- Marine and Estuarine Shellfish Beds
- Tidal Vegetation

MID-ATLANTIC

- Riverine Bottom
- Submerged Aquatic Vegetation
- Marine and Estuarine Shellfish Beds
- Tidal Vegetation

SOUTH FLORIDA

- Submerged Aquatic Vegetation
- Coral and Live/Hardbottom
- Tidal Vegetation (mangrove)

Partnership for the Delaware Estuary

FL Keys Reef Restoration, FL FWCC

Priority Threats

Habitat destruction and degradation in the Atlantic coastal drainage systems, which provide critical habitats for diadromous, estuarine-dependent, and coastal fish species, must be reversed. Threats that impact important spawning and nursery habitats are of particular concern. ACFHP has identified Priority Threats that are currently impacting habitats along the Atlantic coast that it has the capacity to address as a Partnership, recognizing the Partnership is limited in its ability to reduce the impact of some threats. Since climate change was addressed earlier in this document, it will not be discussed here. It is a major threat the Partnership will seek to adaptively manage.

In the first CSP, ACFHP Priority Threats were informed by the results of the Partnership's 2009 Assessment of Existing Information. The Assessment is a database of over 500 documents, datasets, and information portals on Atlantic coastal habitats which were collected and analyzed for indicator, threat, and action information. In 2016, the ACFHP Steering Committee re-evaluated these Priority Threats and supported using those originally identified in 2009.

LIST OF PRIORITY THREATS IMPACTING ACFHP HABITATS ON A COASTWIDE SCALE

Obstructions to Fish Passage/Habitat Connectivity

Examples: Dams; hydropower facilities; hurricane and storm barriers; road crossings and culverts; thermal barriers; reduced stream flow and low flow areas caused by diversions, withdrawals, legacy effects, and reduced base flow; jetties and breakwater; tidal turbines; and beaver dams or debris jams

Importance: Hurricane and storm barriers are an emerging concern as new activities to protect coastal populations from storm damage are considered. Dams, culverts, tide gates, sedimentation, and other water quality or flow impediments to fish passage can impact and limit the survivability of fish populations and lead to local extinctions in rivers, streams, and estuaries along the Atlantic coast. Obstructions to fish passage can adversely affect life history stages of diadromous and important estuarine fish populations.

--continued

Doug Clark

Dredging and Coastal Maintenance

Examples: Dredging; blasting; port expansion and maintenance; dredge spoil disposal; and beach maintenance (including beach fill, mining of sand, bulldozing, sand bypass, sand bags, and shoreline stabilization)

Importance: Human activities around marinas, ports, and residential docks can have major impacts on fish habitat. The direct impacts of this threat are the removal, degradation, or smothering of habitat. Indirect impacts involve the blockage of sunlight or are linked with other threats noted in this section (e.g. water quality degradation and eutrophication). This threat is serious and persistent given its on-going and reoccurring nature. Once habitat is allowed to re-establish in impacted areas, it is often impacted again. The areas of greatest impact are nursery and spawning areas; protection of these areas is vitally important to ensure sustainability of critical life stages of many species.

Water Quality Degradation and Eutrophication

Examples: Surface water and groundwater quality and quantity; point/non-point source pollution; nutrient loading; atmospheric deposition; and dissolved oxygen concerns

Importance: This threat can occur in all aquatic habitats. Water quality decline and eutrophication are among the most common causes of aquatic habitat degradation. For example, nutrients promoting excessive algal blooms, such as nitrogen and phosphorus, can decrease oxygen levels in the water column and cause die-off of fish and other marine species. This threat is one of the most pervasive and difficult to target and reverse. Often the causes of this threat must be addressed in order for habitat restoration to be successful over the long-term.

Consumptive Water Withdrawal

Examples: Withdrawals for industrial, agricultural, residential, and recreational uses, such as irrigation, desalinization, and energy generation; flow concerns; and freshwater withdrawal in the salt front

Importance: Consumptive water withdrawal can reduce water quantity or flow for fish and their habitats, degrade water quality, and alter the location of fresh-salt water interfaces. This is a particularly challenging threat to address because of the inherent difficulties of balancing conflicting water needs of fish and humans from a particular water body. Impacts to habitat can result from groundwater as well as surface water removals.

Sedimentation

Examples: Suspended and deposited solids; construction of impervious surfaces in the watershed (e.g. parking lots, roads, buildings); point and non-point source runoff; and development of shorelines and riparian areas

Importance: While movement of the natural sediment load is important in aquatic ecosystems; excess, contaminated, or polluted sedimentation is a particularly important threat to consider when dealing with riverine or estuarine habitats. Watersheds with a high percentage of impervious surfaces and erosion often have detrimental sedimentation impacts on aquatic habitats. Sediment runoff can smother fish eggs, impact physiological and behavioral responses in fish, vegetation, shellfish beds, submerged aquatic vegetation (SAV), dislodge plants, decrease light penetration, and increase susceptibility to disease.

Vessel Operation Impacts

Examples: Recreational and commercial vessel operation; prop washing; anchoring; grounding; and discharge

Importance: Vessel impacts are most prevalent in shallow water estuarine and marine habitats. Vessel operation can lead to propeller scarring, localized siltation issues, shoreline erosion due to wakes and grounding, and shading from boats and associated docks.

Lisa Havel, ASMFC

Contamination of Water (ground and surface) and Sediments

Examples: Heavy metal accumulation; acid precipitation; pesticides and herbicides; petrochemical spills; and pharmaceuticals

Importance: Contamination can degrade the health of both habitats and species, especially for elements that easily bioaccumulate in tissues and sediments. Identifying the sources of and avenues to address contamination issues can be particularly challenging. An emerging concern involves the prevalence of pharmaceuticals in water supplies that affect humans and fish alike. Contamination is a major concern because it can cause lethal and sub-lethal effects, disease, locomotor impairment, abnormal mating and other behaviors, incomplete or abnormal development, inadequate nutrient balance, susceptibility to parasites, and other problems.

Invasive Species

Examples: Introduction of invasive species, including plants, invertebrates, and vertebrates, and lack of invasive species eradication

Importance: Demonstrated many times over, invasive species can have a major impact on fish and their habitats. Native habitat types may be outcompeted, smothered, or displaced by invasive plants (such as common reed *Phragmites australis* or water lettuce *Pistia stratiotes*) and animals (such as zebra mussel *Dreissena polymorpha*, mitten crab *Eriocheir sinensis*, and pink barnacle *Tetraclita rubescens*). The best way to address this threat is to try to prevent introductions through public education and encouraging the use of best management practices (BMPs) (e.g. in vessel transport). Once an invasive species is introduced, it is difficult or impossible to eradicate.

Other Threats

Other threats to Atlantic coast fish habitat were identified. However, those threats were determined not to be as high of a priority for ACFHP, or were of a nature that could not be effectively addressed by ACFHP. Those threats included:

- **Fishing gear impacts** (including hydraulic clamming, bottom-tending gears, and recreational and commercial fishing impacts on habitat)
- **Aquaculture** (including pathogen transfer, entanglement, nutrient issues, and genetic sustainability)
- **Inadequate development and implementation of regulatory systems** (including permitting, zoning, land-use planning, sewage treatment, floodplain management, and fishery management)
- **Physical impacts to fish** (including entrainment, impingement, propeller strikes, prop wash, and turbines)

All of these threats can be cumulative, which can possibly cause irreversible changes to the ecosystem.

Jerry Prezioso, NOAA Fisheries

Kevin Kalasz, DE DNREC

The Major Threats within Each Subregion to ACFHP's Priority Habitats[12]

Submerged Aquatic Vegetation	Dredging and Coastal Maintenance	NA, MA, SA, SF
	Water Quality Degradation and Eutrophication	NA, MA, SA, SF
	Vessel Operation Impacts	NA, MA, SA, SF
	Sedimentation	NA, SA, SF
	Contamination of Water and Sediments	SA, SF
	Invasive Species/Disease	SA, SF
Riverine Bottom	Obstruction to Fish Passage/Habitat Connectivity	NA, MA, SA
	Dredging and Coastal Maintenance	NA, MA, SA
	Water Quality Degradation and Eutrophication	NA, MA, SA
	Consumptive Water Withdrawal	NA, MA, SA
	Sedimentation	NA, MA, SA
	Contamination of Water and Sediments	MA, SA
	Invasive Species/Disease	MA, SA
Marine and Estaurine Shellfish Beds	Water Quality Degradation and Eutrophication	NA, MA, SA
	Sedimentation	NA, MA, SA
	Dredging and Coastal Maintenance	MA, SA
	Consumptive Water Withdrawal	MA, SA
	Invasive Species/Disease	NA, SA
	Vessel Operation Impacts	SA
	Contamination of Water and Sediments	SA
Tidal Vegetation	Dredging and Coastal Maintenance	MA, SA, SF
	Water Quality Degradation and Eutrophication	MA, SA, SF
	Sedimentation	MA, SA, SF
	Vessel Operation Impacts	MA, SF
	Invasive Species/Disease	MA, SF
	Contamination of Water and Sediments	SA
Coral and Live/ Hardbottom	Dredging and Coastal Maintenance	SF
	Water Quality Degradation and Eutrophication	SF
	Vessel Operation Impacts	SF
	Contamination of Water and Sediments	SF
	Invasive Species/Disease	SF

ACFHP Ecological Subregions: NA = North Atlantic, MA = Mid-Atlantic, SA = South Atlantic, SF = South Florida

[12]Climate change is affecting all habitats in each region to varying degrees and is not included in this table.

A. Conservation Objectives

CONSERVATION OBJECTIVE 1: Work with partners to protect, restore, or maintain resilient Subregional Priority Habitats (using strategies outside of fish passage) to optimize ecosystem functions and services to benefit fish and wildlife.

Strategy A.1.1: Support on-the-ground conservation projects that protect, restore, or maintain Subregional Priority Habitats (outside of fish passage).

Strategy A.1.2: Minimize or reduce adverse impacts to Subregional Priority Habitats associated with coastal development and water-dependent uses.

Strategy A.1.3: Promote the use of best management practices (BMPs) for protection and restoration of Subregional Priority Habitats.

Strategy A.1.4: Work with partners to identify and conserve intact coastal habitats and buffers in need of protection.

CONSERVATION OBJECTIVE 2: Work with partners to support the maintenance of water quality and hydrology standards for functional priority habitats and improvement of water quality in degraded priority habitat areas.

Strategy A.2.1: Coordinate with partners to assess and identify critical watersheds for water quality improvement that are having a major impact on Subregional Priority Habitats.

Strategy A.2.2: Support on-the-ground projects that improve water quality within Subregional Priority Habitats.

CONSERVATION OBJECTIVE 3: Coordinate with partners to restore, enhance, and maintain adequate and effective fish passage to ensure connectivity within and among required Subregional Priority Habitats.

Strategy A.3.1: Coordinate with partners to identify and prioritize watersheds for conservation where fragmentation of, or barriers to, fish passage are a potentially critical threat to be addressed.

Strategy A.3.2: Coordinate with partners to disseminate a "standardized toolbox" of fish passage technologies and guidance to assist the public in the development and implementation of effective fish passage protocols.

Strategy A.3.3: Work with partners to increase habitat connectivity within and among Subregional Priority Habitats by directly addressing physical barriers.

B. Science and Data Objectives

SCIENCE AND DATA OBJECTIVE 1: Work to achieve ACFHP Science and Data needs and fulfill science and data responsibilities established by NFHAP.

Strategy B.1.1: Develop an online searchable database of the Species-Habitat Matrix.

Strategy B.1.2: Produce a fine scale ACFHP region-wide GIS map, using existing data, that shows areas for priority habitat protection and restoration which can be used to better target our actions.

Strategy B.1.3: Develop project tracking capabilities for the purpose of capturing and reporting conservation results to stakeholders.

Strategy B.1.4: Analyze monitoring data to assess success of fish habitat restoration projects.

SCIENCE AND DATA OBJECTIVE 2: Support ongoing research related to identifying or assessing fish habitat conservation activities and the threats to fish habitats.

Strategy B.2.1: Identify and communicate pertinent challenges affecting fish habitat management and create a prioritized list of data gaps that would help ACFHP achieve its goals (i.e. spatial data for various life stages of priority fish species and/or habitat maps of subregional priority habitats).

Strategy B.2.2: Seek funding or endorse applied science/research projects aimed at (1) monitoring the impacts of Priority Threats on ACFHP habitats, (2) evaluating the effectiveness of fish habitat conservation techniques or methodologies, (3) identifying causes of habitat loss and the resulting effects on ACFHP species, and (4) collecting data to fill gaps identified in Science and Data Objective B.2.1.

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C. Outreach and Communication Objectives

OUTREACH AND COMMUNICATION OBJECTIVE 1: Develop new and update current printed and digital content for communicating information that supports ACFHP's goals to target audiences: scientists, resource managers, state and federal legislatures, non-governmental organizations, stakeholders, media, and others as identified.

Strategy C.1.1: Determine which communications platforms maximize ACFHP's ability to deliver its messaging to target audiences.

Strategy C.1.2: Upgrade and seek improvements to content/organization of the ACFHP website to make better use of available technology and enhance accessibility/usability by target audiences.

Strategy C.1.3: Redesign outreach materials for consistency to optimize our messaging.

Strategy C.1.4: Disseminate communication materials via social media platforms, the website, and participation at professional conferences/tradeshows to extend our coverage.

OUTREACH AND COMMUNICATION OBJECTIVE 2: Promote and broadly disseminate information about the products, projects, and services of ACFHP.

Strategy C.2.1: Share the successes of the on-the-ground conservation projects that ACFHP supports with target audiences.

Strategy C.2.2: Seek opportunities to expand media coverage of ACFHP products, projects, and services.

Strategy C.2.3: Facilitate the dissemination of BMPs and other fish habitat conservation information from partners to our targeted audiences.

OUTREACH AND COMMUNICATION OBJECTIVE 3: Maintain relations with the National Fish Habitat Partnership Board, fellow Fish Habitat Partnerships, and Beyond the Pond.

Strategy C.3.1: Promote the mission and accomplishments of ACFHP and exchange lessons learned with the National Fish Habitat Partnership Board.

Strategy C.3.2: Enhance fish habitat improvement through cooperation with fellow Fish Habitat Partnerships.

OUTREACH AND COMMUNICATION OBJECTIVE 4: Seek avenues to promote the activities and products of partners.

Strategy C.4.1: Publicize partners' actions and products via various communication platforms.

Strategy C.4.2: Distribute and publicize the Atlantic States Marine Fisheries Commission's (ASMFC) Habitat Committee actions and products, including a link in ACFHP's website to ASMFC's website.

Partnership for the Delaware Estuary, courtesy of The Milford Beacon

D. Finance Objectives

FINANCE OBJECTIVE 1: Maintain infrastructure and mechanisms for managing ACFHP finances.

Strategy D.1.1: Coordinate with ASMFC to maintain ACFHP operations.

Strategy D.1.2: Coordinate with Beyond the Pond staff and partners to establish financial capacities for managing grant proposals and awards.

FINANCE OBJECTIVE 2: Utilize NFHAP funding to achieve the greatest overall benefits for on the ground conservation and Partnership productivity.

Strategy D.2.1: Solicit and select high quality conservation projects through an annual request for proposals process.

Strategy D.2.2: Enhance ACFHP's performance score in the annual NFHAP funding determinations.

Strategy D.2.3: Support federal legislation for NFHAP.

FINANCE OBJECTIVE 3: Leverage new funding for restoration projects and ACFHP operations.

Strategy D.3.1: Adopt a working Business Plan.

Strategy D.3.2: Implement the Business Plan and pursue private donors for funding.

Strategy D.3.3: Continue to pursue additional conservation project funding and endorsement opportunities.

Strategy D.3.4: Identify and pursue new sources of operational funding.

FINANCE OBJECTIVE 4: Fund projects for Science and Data and Outreach and Communications.

Strategy D.4.1: Secure funding or in-kind support to develop Science and Data and Outreach and Communication priority materials and products.

Appendix A
ACRONYMS

ACFHP	Atlantic Coastal Fish Habitat Partnership
ASMFC	Atlantic States Marine Fisheries Commission
BMP	Best management practice
CSP	Conservation Strategic Plan
GIS	Geographic information system
NFHAP	National Fish Habitat Action Plan
NGOs	Non-governmental organizations
NOAA	National Oceanic and Atmospheric Administration
SAV	Submerged aquatic vegetation

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Appendix B
GLOSSARY

Bioaccumulate	The concentration of substances within an organism
Coastal resiliency	Building the ability of a community to 'bounce back' after hazardous events rather than simply reacting to impacts (modified from National Ocean Service, NOAA)
Cobble	Rocks 64 – 256 mm in diameter
Connectivity	The degree to which streams and rivers facilitate or inhibit movement among resources[13]
Consumptive water withdrawal	The permanent removal of water from its source, through natural or anthropogenic processes
Desalination	Salt and mineral removal from a substance
Diadromous	Fish that spend part of their life cycle in fresh water and part of their life cycle in salt water
Dredge	The removal of sediment, plants, etc. to maintain a desired depth and width within a waterway
Embayment	A bay or conformation resembling a bay
Emergent	Rising above the water
Entrainment	Entrapment
Estuarine-dependent	Fish that reside in the estuary for at least part of their life cycle
Eutrophication	Excessive nutrients in a body of water, causing an increase in primary producers, leading to a decrease in oxygen upon their decay
Fragmentation	When continuous habitat divides into smaller, separated habitats, usually due to habitat loss
Headwaters	The tributaries or streams closest to its source
Hydrology	The science of the distribution, movement, and quality of the water on Earth
Impingement	Collision or violent contact
Intertidal	The area between high and low tide
Lagoon	Shallow water bodies separated from larger water bodies, usually with little tidal or freshwater flow

Locomotor	Influencing the ability of moving from one location to another
Moratorium	Delay or suspension of an activity or law
Primary production	Converting energy into organic substances by organisms (autotrophs)
Riparian	Areas adjacent to rivers and streams
Shoreline hardening	The use of groins, jetties, offshore breakwaters, sea walls, tombolos, or other hardened beach structures on the shore (www.coastalcare.org)
Spawn	To deposit eggs or sperm directly into the water
Supratidal	Area above high tide that is regularly splashed with seawater, but is not under water
Spatial data	Data elements with a spatial component i.e. associated with a location
Symbiosis	An interaction between two different organisms in close proximity. Usually the interaction is mutually beneficial.
Threat	A thing likely to cause damage
Unicellular	Consisting of one cell
Vascular	The plant tissue that transports water, sap, and nutrients

[13]Modified from Taylor, P.D., Fahrig, L, Henein, K. and G. Merriam. 1993. Connectivity is a vital element of landscape structures. Oikos 68: 571-573.

FL FWCC

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Appendix C
HABITAT CHARACTERIZATIONS

MARINE AND ESTUARINE SHELLFISH BEDS

Oyster aggregations/reef

Structures formed by the Eastern oyster (*Crassostrea virginica*) that provide the dominant structural component of the benthos (bottom), and whose accumulated mass provides significant vertical relief (> 0.5 m).

Scallop beds

Areas of dense aggregations of scallops on the ocean floor. Common Atlantic coast species include: (1) the large Atlantic sea scallop (*Placopecten magellanicus*), which ranges from Newfoundland to North Carolina; (2) the medium-sized Atlantic calico scallop (*Argopecten gibbus*), which is found in waters south of Delaware; and (3) the bay scallop (*Argopecten irradians*), which occurs from Cape Cod to Florida, as well as in the Gulf of Mexico.

Hard clam beds

Dense aggregations of the hard clam (*Mercenaria mercenaria)* found in the subtidal regions of bays and estuaries to approximately 15 m in depth. Clams are generally found in mud flats and firm bottom areas consisting of sand or shell fragments.

Shell accumulations

Shells of dead mollusks sometimes accumulate in sufficient quantities to provide important habitat. Accumulations of Eastern oyster shells are a common feature in the intertidal zone of many southern estuaries.

CORAL AND LIVE/HARD BOTTOM

Coral reefs

Reef-building corals are of the order Scleractinia, in the class Anthozoa, of the phylum Cnidaria. Coral accumulations are restricted to warmer water regions, where the average monthly temperature exceeds 18°C (64°F) throughout the year. Through symbiosis with unicellular algae, reef- building corals are the source of primary production in reef communities.

Patch reef, soft corals, or anemones

A patch reef is an isolated, often circular, coral reef usually found within a lagoon or embayment. Soft corals are species of the anthozoan order Alcyonacea, of the

subclass Octocorallia. In contrast to the hard or stony corals, most soft corals do not possess a massive external skeleton (e.g. sea pens and sea fans). Anemones are cnidarians of the class Anthozoa that possess a flexible cylindrical body and a central mouth surrounded by tentacles found in soft sediments.

Live rock

Calcareous rock that is removed from the vicinity of a coral reef with some of the life forms still living on it. These may include bacteria, coralline algae, sponges, worms, crustaceans, and other invertebrates.

Macroalgae

Large marine multi-cellular macroscopic algae (seaweeds). There are three types of macroalgae: green, brown, and red.

Examples of macroalgae species found along the Atlantic coast include:
Chlorophyta (green algae)
Ulva lactuca, sea lettuce

Phaeophyta (brown algae)
Fucus vesiculosus, bladderwrack; *Laminaria* spp.; *Sargassum* spp.

Rhodophyta (red algae)
Chondrus crispus, Irish moss

SUBMERGED AQUATIC VEGETATION (SAV)

SAV refers to rooted, vascular plants that live below the water surface in large meadows or small patches in coastal and estuarine waters. SAV can be further classified by the range of salinity of the waters in which they are found.

Tidal fresh and oligohaline plant species

Generally found in areas where salinity ranges from 0.5 to 5.0 ppt.

Examples include: *Vallisneria americana*, wild celery
Ceratophyllum demersum, coontail

Mesohaline and polyhaline plant species

Generally found in areas where salinity ranges from 5 ppt up to 30 ppt.

Examples include: *Zostera marina*, eelgrass
Ruppia maritime, widgeon grass

Natural eelgrass meadow in the Peconic Estuary, by Kimberly Manzo, Cornell Cooperative Extension Marine Program.

TIDAL VEGETATION

Estuarine emergent marsh

Salt marsh is an environment in the coastal intertidal zone between land and brackish water. The low marsh zone floods twice daily, while the high marsh floods only during storms and unusually high tides. Smooth cordgrass (*Spartina alterniflora*) dominates the regularly flooded low marsh along much of the Atlantic coast. In addition, salt meadow cordgrass (*Spartina patens*), saltgrass (*Distichlis spicata*), and needle rush (*Juncus* spp.) species comprise much of the vegetative community of the mid to upper salt marsh and brackish marsh.

Tidal freshwater marsh

Tidal freshwater marsh occurs where the average annual salinity is below 0.5 ppt. It is found along free-flowing coastal rivers, and is influenced twice daily by the incoming tides. Tidal freshwater marsh can be located just upstream of the salt front, where the river essentially backs up as it meets resistance from high tides. Tidal freshwater marsh is characterized by salt intolerant plant species. These include: giant cordgrass (*Spartina cynosuroides*), sawgrass (*Cladium jamaicense*), cattails (*Typha* spp.), arrow arum (*Peltandra virginica*), pickerelweed (*Pontedaria cordata*), blue flag (*Iris virginica*), and soft stem bulrush (*Scirpus validus*).

Mangrove

The mangrove ecological community includes four tree species collectively called mangroves. This swamp system occurs along intertidal and supratidal shorelines in southern Florida. The four species found in Florida mangrove swamps are:

Rhizophora mangle, red mangrove
Avicennia germinans, black mangrove
Laguncularia racemosa, white mangrove
Conocarpus erectus, buttonwood

UNVEGETATED COASTAL BOTTOM

Loose fine bottom

Submerged underwater bottom habitat in estuaries and oceans where the dominant sediment type is mud, silt, or sand.

Loose coarse bottom

Submerged underwater bottom habitat in estuaries and oceans where the dominant sediment type ranges from gravel to cobble.

Firm hard bottom

Submerged underwater bottom habitat in estuaries and oceans where embedded rock or boulders are the dominate sediment types.

Structured sand habitat

Linear, narrow sand features that develop where a stream or ocean current promotes deposition of sand.

RIVERINE BOTTOM

Higher gradient headwater tributaries

Streams in which the dominant substrate is comprised of gravel and cobble. The stream slope is greater than 2%. This characterization includes 1st to 3rd order streams.[14]

Lower gradient tributaries

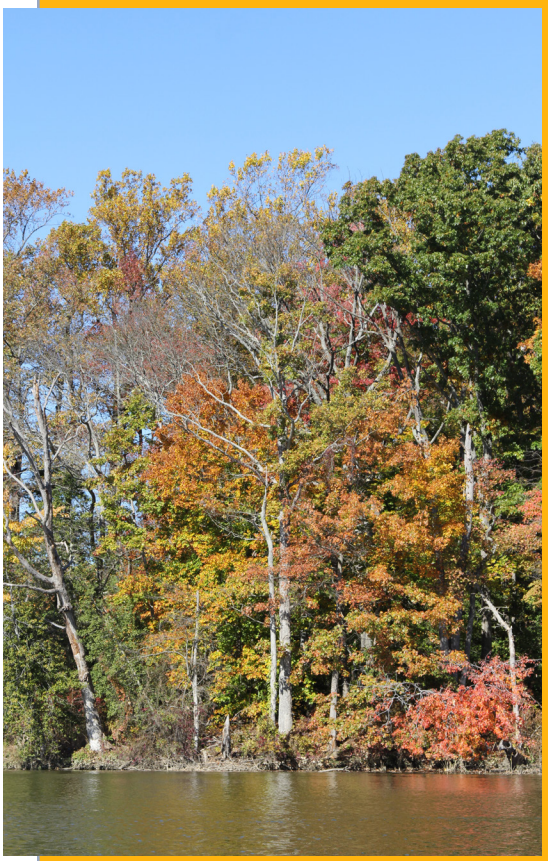
Streams in which the dominant substrate is comprised of sand, gravel, and small cobble. The stream slope is between 0.51% and 2.0%. This characterization includes 1st to 3rd order streams.

Higher gradient large mainstem river

Rivers in which the dominant substrate is sand, gravel, and cobble. The stream slope is between 0.51% and 2%. This characterization includes 4th order rivers and above.

Lower gradient large mainstem river

Rivers in which the dominant substrate is fine sediments (silt, mud, sand). The stream slope is between 0.51% and 2%. This characterization includes 4th order rivers and above.



Laura Leach, ASMFC

Low order coastal streams

Generally low gradient 0% to 0.05% in slope. This characterization includes 1st to 3rd order streams located along the coast.

Non-tidal freshwater mussel beds

Freshwater mussel beds, located above tidal influence.

Coastal headwater pond

A pond connected to coastal streams and rivers, generally located near the headwaters.

Non-tidal freshwater marsh

A marsh that occurs in the non-tidal section along a river. The main feature of a freshwater marsh is its openness, with only low-growing or "emergent" plants. It may include grasses, rushes, reeds, typhas, sedges, and other herbaceous plants (possibly with low-growing woody plants) in a context of shallow water.

[14]Strahler Stream Order is a hierarchical classification of streams. Headwaters are the first order, and two first order streams combine to form a second order stream. Two second order streams form a third order stream, and so on.

Appendix D

WEBSITES AND DOCUMENT LINKS

4 National Fish Habitat Action Plan
www.fishhabitat.org/files/uploads/National_Fish_Habitat_Action_Plan_2006.pdf

4 Restoration practitioners
www.atlanticfishhabitat.org/wp-content/uploads/2012/10/Aligning-the-ACFHP-Efforts-with-Restoration-Practitioners.pdf

5 Species-Habitat Matrix
https://academic.oup.com/bioscience/article/66/4/274/2464081/The-Importance-of-Benthic-Habitats-for-Coastal

5 Fish Habitat Decision Support Tool
www.fishhabitattool.org

5 River Herring Habitat Restoration Needs
www.atlanticfishhabitat.org/wp-content/uploads/2012/10/RIVER-HERRING-RESTORATION-NEEDS-final-edited.pdf

7 NOAA Fisheries Economics of the Unites States, 2015
www.st.nmfs.noaa.gov/economics/publications/feus/fisheries_economics_2015/index

8 Memorandum of Understanding
www.atlanticfishhabitat.org/wp-content/uploads/2012/10/ACFHP-MOU-2015-with-signatures-1.pdf

8 ACFHP Charter and By-Laws
www.atlanticfishhabitat.org/Documents/ACFHP-Charter-and-Bylaws.pdf

8 ACFHP Partners

Albemarle-Pamlico National Estuary Partnership
www.apnep.org/web/apnep

American Littoral Society
www.littoralsociety.org

American Rivers
www.americanrivers.org

Atlantic States Marine Fisheries Commission
www.asmfc.org

Chesapeake Bay Foundation
www.cbf.org

Connecticut Department of Environmental Protection
www.ct.gov

Delaware Department of Natural Resources and Environmental Control
www.dnrec.delaware.gov

Environmental Defense Fund
www.edf.org

Florida Fish and Wildlife Conservation Commission
www.myfwc.com

Georgia Department of Natural Resources
www.gadnr.org

Houlton Band of Maliseet Indians
www.maliseets.com

International Federation of Fly Fishers
www.flyfishersinternational.org

Maine Department of Marine Resources
www.maine.gov

Maryland Department of Natural Resources
www.dnr.maryland.gov

Massachusetts Division of Marine Fisheries
www.mass.gov/eea/agencies/dfg/dmf

Merrimack River Watershed Council
www.merrimack.org

National Oceanic and Atmospheric Administration
www.noaa.gov

New Hampshire Fish and Game Department
www.wildlife.state.nh.us

New Jersey Division of Fish and Wildlife
www.state.nj.us

New York Department of Environmental Conservation
www.dec.ny.gov

North Carolina Coastal Federation
www.nccoast.org

North Carolina Department of Environmental Quality
www.deq.nc.gov

Oyster Recovery Partnership
www.oysterrecovery.org

Partnership for the Delaware Estuary
www.delawareestuary.org

Pennsylvania Fish and Boat Commission
www.fish.state.pa.us

Rhode Island Division of Fish and Wildlife
www.dem.ri.gov

South Carolina Department of Natural Resources
www.dnr.sc.gov

The Nature Conservancy
www.nature.org

United States Fish and Wildlife Service
www.fws.gov

United States Geological Survey
www.usgs.gov

Vermont Fish and Wildlife Department
www.vtfishandwildlife.com

Virginia Marine Resources Commission
www.mrc.state.va.us

Wells National Estuarine Research Reserve
www.wellsreserve.org

13 2009 Assessment of Existing Information
http://www.atlanticfishhabitat.org/Documents/ACFHP%20Assessment%20of%20Existing%20Information%20Final%20Report.pdf


ATLANTIC COASTAL
FISH HABITAT PARTNERSHIP