Executive Summary


John Brooks, Channel Islands National Marine Sanctuary


NOAA


Lisa Wedding, NMFS


John McMillan, NMFS

Upper left, kelp forest off California; upper right, salt marsh in Rehoboth Bay, Delaware; lower left, school of yellow tang in Hawaii; lower right, pink salmon spawning in the Elwha River, Washington.

OVERVIEW

Our Living Oceans: Habitat. Status of the Habitat of U.S. Living Marine Resources is the first comprehensive national summary of the status and trends of the habitats used by the living marine resources under the purview of NOAA's National Marine Fisheries Service (NMFS). This document is part of the *Our Living Oceans* series, which includes *Our Living Oceans* reports on the Nation's living marine resources (NMFS, 1991, 1992, 1993, 1996a, 1999, 2009) and their economic aspects (NMFS, 1996b). This report provides a conceptual framework for understanding habitat-use patterns by the Nation's federally managed marine species, identifying the shortcomings in relevant information, and describing how and why these shortcomings should be addressed through additional research.

Habitat—the place where species live—plays a fundamental role in supporting the production of fishery and protected marine stocks and the ecosystems on which they all depend. However, this role is poorly understood, and demands and impacts on habitats are growing, with potentially large and far-reaching effects on productivity. Lack of knowledge about how marine species depend on and interact with habitats impedes effective management of harvested fishery stocks and protected species. The societal implications include lost or foregone yields for commercial fisheries and reduced opportunities for recreation

Brenda Rone, NMFS

A humpback whale dives among an aggregation of short-tailed shearwaters at Cape Cheerful, Unalaska.

(including fishing) that depends on the affected stocks, as well as increased risk of extinction of protected species.

This report primarily addresses the habitat use of fishery and protected species under NMFS jurisdiction. These fishery species include approximately 500 stocks of fish, shellfish, and other marine organisms managed under the Magnuson-Stevens Fishery Conservation and Management Act (MSA) by fishery management plans (FMPs) or fishery ecosystem plans (FEPs). The MSA has protections in place for essential fish habitat (EFH), defined as "… those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity" [MSA, 16 U.S.C. 1802(10)].

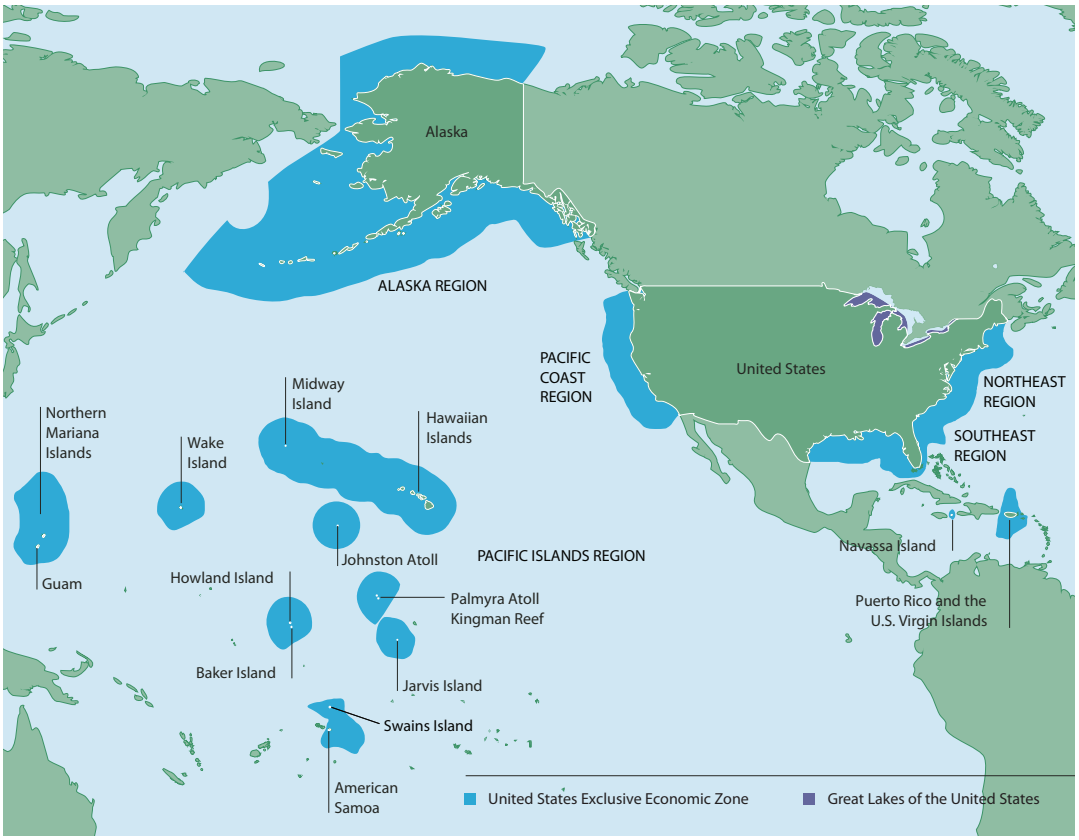
Protecting and conserving nearly all of the Nation's marine mammals is also a NMFS responsibility under the Marine Mammal Protection Act. In addition NMFS is responsible for protecting certain marine mammals, as well as sea turtles and certain fish, invertebrates, and seagrass species that are listed as threatened or endangered under the Endangered Species Act (ESA). These protections include conservation of the habitats designated as critical habitats for these species. The habitats occupied by federally managed marine species range from inland streams used for spawning by anadromous species such as salmon, to the 370 km (200 nautical mile [nmi]) offshore limit of the entire U.S. Exclusive Economic Zone (EEZ), and beyond.

This report contains a national summary and five regional chapters: Northeast, Southeast, Pacific Coast, Alaska, and Pacific Islands. These regions are based on geography and are generally similar to the NMFS regional structure. Four primary habitat categories are used. These broad habitat categories incorporate more specific habitat types such as seagrass beds, coral reefs, mangrove forests, and the open water column. The four habitat categories are defined as follows:

- Freshwater: habitats located between the headwater and the head-of-tide, with negligible salinity. (Headwater is the inland source from which a river originates; head-of-tide is the inland limit of water affected by tides.)
- Estuarine: habitats located in a semi-enclosed coastal body of water extending from head-of-tide to a free connection with the open sea, and within which sea water is mixed with fresh water.
- Shallow marine: habitats less than 200 m (656 ft) in bottom depth and located between the outer boundary of an estuary or coast (continent or island) and the outer boundary of the U.S. EEZ, usually 370 km (200 nmi) from shore.
- Oceanic: habitats greater than 200 m (656 ft) in bottom depth and located between the outer boundary of an estuary or coast (continent or island) and the outer boundary of the U.S. EEZ.

In this report, descriptions of habitat use by federally harvested marine species are organized by FMPs and FEPs. At the time this report was developed, there were 46 FMPs and FEPs combined (See Appendix 3 for a full listing). The Northeast Region has 13 FMPs[1]; the Southeast Region has 18 FMPs; the Pacific Coast Region has 4 FMPs; the Alaska Region has 6 FMPs; and the Pacific Islands Region has 5 FEPs. Habitat use by protected species is categorized by group: cetaceans (whales, dolphins, porpoises), pinnipeds (seals and sea lions), sea turtles, or other groupings as appropriate. Please see Appendix 5 for a listing of all species included in this report.

[1]Note that the Consolidated Atlantic Highly Migratory Species FMP is shared by the Northeast and Southeast Regions, but is discussed and counted only under the Southeast Region in this report.



The U.S. EEZ shown on this map is divided into five geographic regions for this report: Northeast, Southeast, Pacific Coast, Alaska, and Pacific Islands.

HABITAT AREAS

The total area of the U.S. EEZ is approximately 11.530 million km^2 (3.362 million nmi^2),[2,3] which is larger than the total land mass of the United States itself. In this report, the U.S. EEZ is divided into five geographic regions: Northeast, Southeast, Pacific Coast, Alaska, and Pacific Islands.

The Northeast Region extends from the U.S–Canada border in Maine, southwest to Cape Hatteras, North Carolina. The region covers about 3% (369,000 km^2 [108,000 nmi^2]) of the U.S. EEZ and includes three major areas from north to south: the Gulf of Maine, Georges Bank, and Southern New England/Mid-Atlantic Bight.

The Southeast Region extends from Cape Hatteras, North Carolina, south to the U.S.–Mexico border in Texas, and also includes the Commonwealth of Puerto Rico, the Territory of the U.S. Virgin Islands, and Navassa Island (located in the Caribbean Wildlife Refuge). The region encompasses about 12% (1.34 million km^2 [391,000 nmi^2]) of the U.S. EEZ.

The Pacific Coast Region lies adjacent to California, Oregon, and Washington and encompasses about 7% (812,000 km^2 [237,000 nmi^2]) of the total area of the U.S. EEZ. The region has two distinct areas: the Oregonian Province, bounded by the Strait of Juan de Fuca, Washington, to the north and Point Conception, California, to the south; and the U.S. portion of the San Diego Province, which extends from Point Conception, California, to Magdalena Bay, Mexico.

The Alaska Region covers areas of the North Pacific Ocean, the Bering Sea, the Chukchi Sea, and the Arctic Ocean and encompasses about 28% (3.258 million km^2 [950,000 nmi^2]) of the U.S. EEZ.

[2]All EEZ figures provided for the United States and its regions in this report are provided in square kilometers and square nautical miles, rounded to the nearest 1,000 square kilometers, and exclude state waters.

[3]Memorandum for the Record from M. Lockwood: Area of the U.S. Exclusive Economic Zone, dated 30 April 1993. Copy on file at USGS–NOAA Joint Office, Mapping and Research, 915 National Center, Reston, VA 22092.

The U.S. Pacific Islands Region includes 50 Pacific Ocean islands, including two archipelagos (Hawaiian and Marianas), part of another archipelago (Samoan), and eight isolated atolls or low-lying islands (Johnston Atoll, Kingman Reef, Palmyra Atoll, Jarvis Island, Howland Island, Baker Island, Swains Island, and Wake Island). Although the land area of the U.S. Pacific Islands Region is small when compared to North America, the total area of U.S. EEZ waters included in the Pacific Islands Region is over 5.751 million km^2 (1.677 million nmi^2), or almost 50% of the entire U.S. EEZ.

NATIONAL HABITAT-USE PATTERNS

Shallow marine and oceanic habitats are the habitat types most commonly used by federally managed marine fishery species in all regions; freshwater habitats are the least used. Specifically, over 95% of the Nation's FMPs and FEPs have one or more species that use shallow marine and/or oceanic habitats during one or more parts of their life cycles. Nationwide, only 16% of all FMPs and FEPs have species that use freshwater habitats, with anadromous species such as salmon being the primary users. In terms of estuaries, 82% of the Nation's FMPs and FEPs have one or more species that use these vital habitats. Fishery species make extensive use of estuaries for at least one stage in their life cycles in all regions except the Pacific Islands, which have relatively little estuarine habitat. Estuaries also provide habitat to at least one life stage of 68% of the dollar value (46% by weight) of the Nation's commercial catch of fish and shellfish. Estuarine species also account for approximately 80% of fish harvested recreationally (Lellis-Dibble et al., 2008). In addition, many non-FMP species that serve as important food sources for our managed stocks (they are often called "forage species") use freshwater and estuarine habitats.

Habitat use by the Nation's protected species of cetaceans, pinnipeds, and sea turtles is broadly similar to that of FMP/FEP species.[4] Cetaceans, pinnipeds, and sea turtles use shallow marine and oceanic habitats in every region. Estuarine habitats are frequently used by many cetaceans, pinnipeds, and sea turtles throughout the United States, although to a lesser degree in the Pacific Islands region where there is relatively little estuarine habitat. Estuaries are important for many marine mammals such as Gulf of Mexico and Atlantic bottlenose dolphins, which spend a major portion of their life in these waters. Freshwater habitat is the type least used by the Nation's cetaceans, pinnipeds, and sea turtles, with only a few species such as harbor seals and beluga whales occasionally using it.

A saltmarsh in the Delmarva Peninsula, Virginia.

Dwayne Meadows, NMFS

NATIONAL TRENDS IN HABITAT-USE INFORMATION

The significance of the information gaps identified below is that NMFS and its partner agencies and stakeholders are forced to base decisions involving habitat on very limited or, in some cases, non-existent information. The lack of knowledge of how fishery and protected stocks are affected by the quantity and quality of specific habitat types compromises managers' ability to prioritize habitats for protection, restore degraded habitats in a way that maximizes the benefits in terms of increased fishery yields and/or conservation of protected species, and most effectively mitigate the unavoidable impacts of some human activities.

[4]The protected species discussed in this report are limited to cetaceans, pinnipeds, and sea turtles (see Appendix 4). Some of the other species listed under the ESA (e.g. salmon) are discussed in the context of FMPs; but other listed species (e.g. corals) are not considered in detail in this report.

At the national level, habitat information for most federally managed fishery species consists of presence or absence data (also called distribution information) for a species or any of its life stages in a particular habitat type—this is the most basic level of information. The more detailed and better the information on habitat use, the less of it exists. The most informative type of habitat information, which links species productivity directly to habitat and is the highest level for identifying essential fish habitat, is not available for most fishery species, even the most economically valuable. A hypothetical example of this productivity information would be the number of individuals of sea trout, or their collective weight, produced per unit area of seagrass bed per year. In addition, most habitat-use information is available for adult life stages, which are surveyed for stock assessments. Much less information is available for the early life stages (e.g. eggs, larvae).

The most common level of habitat-use information for protected species of cetaceans, pinnipeds, and sea turtles in most regions is also data on the presence or absence of a species or life stage in a particular habitat type. As is the case with harvested species, the more detailed and better the information on habitat use is, the less of that information exists, even though it is this higher-level information that would be the most useful in identifying and conserving critical habitat. In addition, for marine mammals and sea turtles that are listed under the ESA, important pieces of information, which are often not available, are region- and habitat-specific distribution and density and seasonal changes in time and space. Such information is necessary for other federal agencies and industry applying to NMFS for permits to conduct surveys, exploration, development, or defense activities.

In general there is more, and more detailed, habitat-use information available for harvested fishery species than for protected cetaceans, pinnipeds, and sea turtles. Although the laws for fishery management and protecting species are all quite strong, more support is provided to NMFS for surveys and assessments on fishery species than on protected species. This difference leads to differences in information on habitat use by these respective groups.

NOAA

Seagrass beds like this one are important habitat for a variety of marine species.

HABITAT STATUS, TRENDS, AND ISSUES

The status and trends of habitats vary widely across regions and habitat types. These differences are due to both socioeconomic and historical factors such as population density, industrial development, and land-use; and to physical factors such as weather and climate, and geological and oceanographic characteristics. Many issues affecting habitat are common across regions and habitat types, though manifestations and impacts to species may differ regionally. At a high level, these issues include water quality and quantity, infrastructure in aquatic habitats, fisheries and other commercial uses of marine habitats, environmental issues, and habitat fragmentation and loss.

There are many factors that can affect habitat quality and quantity. A ubiquitous concern is climate change, which affects species distributions, temperatures, the timing of seasonal events (e.g. annual cycles of freezing and thawing), precipitation, and storm severity, as well as the related issue of increasing ocean acidity caused by rising carbon dioxide concentrations. In freshwater habitats, farming, industrialization, residential expansion, and flood control are examples of factors that can reduce the flow of fresh water, change the timing and spatial extent of flood events, and increase the quantity of nutrients and contaminants draining from upland habitats.

Julie Helmers, NOAA

A cargo ship has a near miss with a large whale.

Estuarine habitats are also strongly affected by human activities on the land surrounding them and the rivers that drain into them. Eutrophication, for example, is a common problem in estuarine habitats, whereby excess nutrients can result in elevated turbidity (i.e. cloudy water) and reduced dissolved oxygen concentrations, both of which adversely affect aquatic life. Habitat fragmentation and loss are some of the primary issues facing vital wetland habitats in freshwater and estuarine coastal environments. Coastal wetlands comprise about one-third of all the wetlands in the continental United States and include marshes, swamps, mangrove forests, and seagrass beds. Although overall wetland loss for the country has decreased significantly due to federal and state laws and policies, it remains a significant problem in coastal watersheds. Two reports published jointly by NOAA and the U.S. Fish and Wildlife Service have concluded that wetland loss in coastal watersheds is substantial—about seven football fields an hour—and increasing (Stedman and Dahl, 2008; Dahl and Stedman, 2013). Human activities, such as development, are a primary cause.

Compared to freshwater and estuarine habitats, shallow marine and oceanic habitats generally have better water quality, and relatively less habitat has been lost to human activities. Nevertheless, there are some widespread threats that can decrease habitat quality and quantity, such as sedimentation on coral reefs, the uncertain effects of climate change and ocean acidification, and the impacts of fishing and fishing gear, particularly bottom trawls on seafloor habitats. More localized degradation can result from, among other things, marine debris (including discarded or lost fishing gear), oil spills and slicks, oil and gas development, sand and gravel mining, cable deployment, and anchoring. Harmful or toxic algal blooms are a recurring problem in some areas and can further impact shallow marine and oceanic habitats by killing marine animals and rendering seafood unfit for consumption by humans or pets. Vessel traffic and ocean noise are also two factors of particular concern, particularly for marine mammals. Human-made underwater noise can affect marine mammals through the chronic effects of long-term increases in ocean noise and through the acute impacts of a specific, typically intense, sound source. For some species, such as the highly endangered North Atlantic right whale, collisions with vessels continue to be a threat to their recovery, although recent speed restrictions in areas where shipping lanes overlap with their habitat, and other protective measures, are helping reduce the probability of lethal collisions.

HABITAT PROTECTION AND RESTORATION

Habitat protection and restoration can help conserve and rebuild fishery and protected species. Protecting habitat maintains existing functions and prevents further losses, while restoration repairs habitat that is degraded or creates new habitat. Restoration is costly, and fully restoring ecological functions may not always be feasible or can take a long time, but restoration can result in a net increase of habitat.

Regulations and conservation easements, combined with public awareness, form the basis for habitat protection. At the broadest level, the United States has over 1,700 marine protected areas that cover approximately 40% of the Nation's marine waters. The size of these areas and their level of protection vary. The most comprehensive level of protection may be "no take," in which all types of harvest are prohibited. This level of protection is in place for only 3% of U.S. waters (NOAA, 2011). However, there are many options for less restrictive levels of protection (e.g. banning the

use of bottom trawls) that can provide significant conservation benefits for habitat.

One noteworthy example of habitat protection is the Papahānaumokuākea Marine National Monument, which encompasses over 360,000 km^2 (140,000 mi^2) of emergent and submerged lands and waters of the Northwest Hawaiian Islands—an area larger than all the national parks in the United States combined. This Monument is also home to approximately 80% of the critically endangered Hawaiian monk seal population and is the breeding ground for over 95% of the Hawaiian green sea turtle population. Protecting the Monument's diverse and unique habitats from human impacts helps to ensure the continued existence of the functioning ecosystems and the living resources that occur there.

There are also many examples of habitat protections in place that exist as a result of fishery management. In Alaska, for example, the Aleutian Islands Fishery Management Area was closed to bottom trawling, as were designated areas of the Gulf of Alaska, to protect deep-sea corals and other fragile parts of the ecosystem. The Aleutian Islands area closed to bottom trawling was designated the Aleutian Islands Habitat Conservation Area and encompasses over 950,000 km^2 (366,797 mi^2), approximately the size of Texas and Colorado combined. As another example, NMFS and the South Atlantic Fishery Management Council established five Habitat Areas of Particular Concern in 2010 for deep-sea corals, totaling 61,548 km^2 (24,215 mi^2) off the southeastern coast of the United States, where most types of fishing gear that contact the seafloor are prohibited and deep-sea coral habitat is protected.

Creating or restoring habitat is usually more expensive and less effective than protecting habitat that already exists and functions well. Nonetheless, habitat restoration can be important in recreating the structure and function of habitats and ecosystems and returning them to a close approximation of their original condition. Habitat restoration can take many forms: repairing damage caused by accidental loss or degradation of habitat, compensating for losses by replacing the lost habitat functions with new or restored habitat in another location, or re-establishing the former condition of habitat by removing or reversing human alterations. A recent example relates to the Elwha Dam in Washington State, which was removed in 2012, and the nearby Glines Canyon Dam, removed in 2014. These projects represent the largest dam removals in U.S. history, and will allow Chinook salmon (also referred to as king salmon), to return to their historical spawning grounds. In 2012, Chinook salmon began spawning in the Elwha River in the summer.

National Park Service

The Elwha Dam in Washington State was removed in 2012, restoring miles of habitat for spawning salmon that had been blocked for a century.

Monitoring is an important component of restoration, to ensure that the restoration goals are being met. Monitoring can improve effectiveness, for example, by detecting early if a project is not on track. Habitat enhancement complements other conservation tools such as habitat restoration and protection, and has the potential to increase available habitat for aquatic species. Enhancement activities include placement of artificial structures such as large woody debris in streams, nesting structures in coastal areas, and underwater reefs.

HABITAT RESEARCH NEEDS

Identifying habitat research needs is a necessary step in tailoring science programs that can comprehensively, yet efficiently, meet these needs. Meeting these research needs will have both immediate and long-term benefits by improving NMFS' ability to target and design habitat protection and restoration measures. These improvements will translate into


NMFS

Adult male and female Steller sea lions at a haulout site.

higher fishery yields and more effective conservation of protected species. At a high level, many of the research needs are similar around the country, though the finer-scale details of these needs, and how they can best be met, differ across regions, habitat types, and the species that depend on these habitats. No single entity can meet all these needs, but NMFS, with its mandates for the management and conservation of fishery and protected species and its scientific expertise and capabilities in all regions of the country, can play a leading role.

For most species, key questions related to fish–habitat linkages remain unanswered. Limited information on the habitat linkages of marine mammals and sea turtles presents many of the same research needs as for fishery species. Overall, research needs vary somewhat among regions, and can be found within the regional sections of this report. Nevertheless, there are overarching gaps in knowledge that reach across all regions. One key research need is to conduct more life history studies in relation to habitat for all fishery and protected species, particularly on early life stages. Another need is to determine essential habitat requirements, particularly habitat quantity and quality, for each species and life stage. A universal need is to further delineate and map important habitats, including coastal areas, estuaries, salt marsh wetlands, streams used by anadromous species, riparian zones, submerged aquatic vegetation (e.g. eelgrass), deep-sea corals, pinnacles, seamounts, and fishing grounds on the Continental Shelf and Slope.

There is also a need in all regions to monitor natural and human-caused changes in habitat quality, quantity, and use, and the effects of these changes on fishery and protected species. Particular factors to study and monitor are the direct and indirect effects of climate change and ocean acidification, the impacts of severe storms and sea level rise, and the ecological effects of fishing, invasive species, and toxic algal blooms on species and their habitats. Improving the understanding of the effects of underwater sound is of particular interest for marine mammal protection and conservation. Additional research is also needed to enhance and develop habitat restoration methods; to evaluate approaches for habitat protection, such as innovative fishing gear designs that minimize habitat impacts; to develop and implement advanced methods for research, surveys, and monitoring; and to determine the societal and economic benefits of conserving and restoring habitat.

SOLUTIONS—THE WAY FORWARD

NOAA developed the Habitat Blueprint[5] to provide a framework to think and act strategically across NOAA programs and thereby conserve, protect, and create healthy habitats that sustain resilient and thriving marine resources, help recover protected species, and protect coastal communities from storm damage. The Blueprint is helping to guide NOAA's habitat strategy and actions going forward. The Habitat Blueprint has a three-pronged approach that includes these features:

- establishing Habitat Focus Areas in each NOAA region, where collaboration among NOAA's management and science programs and external partners can address multiple habitat-dependent objectives;
- implementing a systematic and strategic approach to conducting habitat science that ultimately guides effective decision-making; and
- strengthening policy and legislation at the national level to achieve meaningful habitat conservation results.

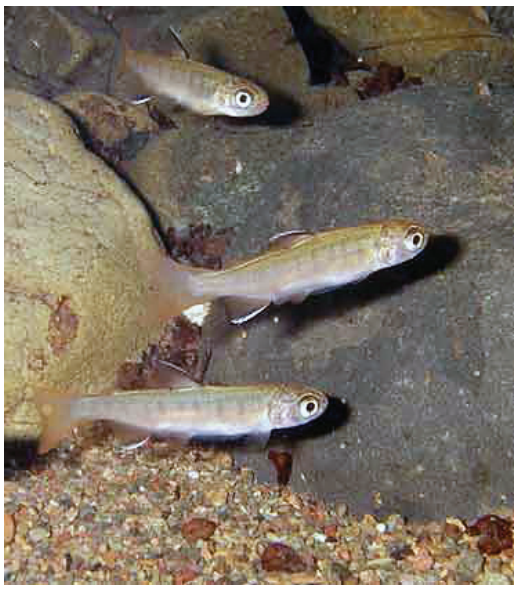
A key example of the Blueprint's effectiveness and utility can be found in California, where the Russian River watershed was selected as the Blue-

[5]Please see http://www.habitat.noaa.gov/habitatblueprint/ (accessed March 2015) for more information.

print's first Habitat Focus Area. The Russian River drains an area of over 3,600 km^2 (1,400 mi^2) and is a vital resource for agriculture, vineyards, and the local water supply. Endangered and threatened salmon species use the river for habitat. Once considered a prime fishing area, by 2000 its aquatic habitats were significantly degraded and its salmon were nearly extinct. There are many competing uses, and high demand, for the river's water. By combining expertise across NOAA in areas such as salmon ecology and habitat requirements, flood and weather forecasting, habitat protection and restoration, and coastal management, NOAA is more effectively addressing issues that face this watershed. Efforts currently underway in the Focus Area include restoration projects to reduce flooding, open coho salmon breeding grounds, and recover fish populations. Important lessons learned from this project will be applied elsewhere, both regionally and nationally. Additional Habitat Focus Areas include the Penobscot River watershed (Maine), Choptank River watershed (Maryland/Delaware), Muskegon Lake (Michigan), St. Louis River estuary (Minnesota/Wisconsin), Kachemak Bay (Alaska), Biscayne Bay (Florida), Northeast Reserves and Culebra Island (Puerto Rico), Manell-Geus watershed (Guam), and West Hawaii (on the Island of Hawaii).

The Habitat Blueprint incorporates scientific concepts developed in the NMFS Marine Fisheries Habitat Assessment Improvement Plan (NMFS, 2010). The Marine Fisheries Habitat Assessment Improvement Plan is a national plan that focuses on habitat science needs for fishery species and other living marine resources. This plan identifies current gaps in NMFS' habitat science, steps to improve habitat assessments (the process and products associated with providing the best available information on habitat characteristics relative to the population dynamics of living marine resources), and the need for a nationally coordinated habitat science program. The plan also addresses the current lack of knowledge regarding the association of marine species and their habitats, which impedes effective fisheries and habitat management, protection, restoration, and stock assessment. The plan is intended to serve as a guide for NMFS to coordinate its diverse habitat research, improve habitat assessments, and guide efforts to increase support for habitat science.


NMFS


NMFS

Above, the Russian River Valley, in California; below, juvenile coho salmon in the river.

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