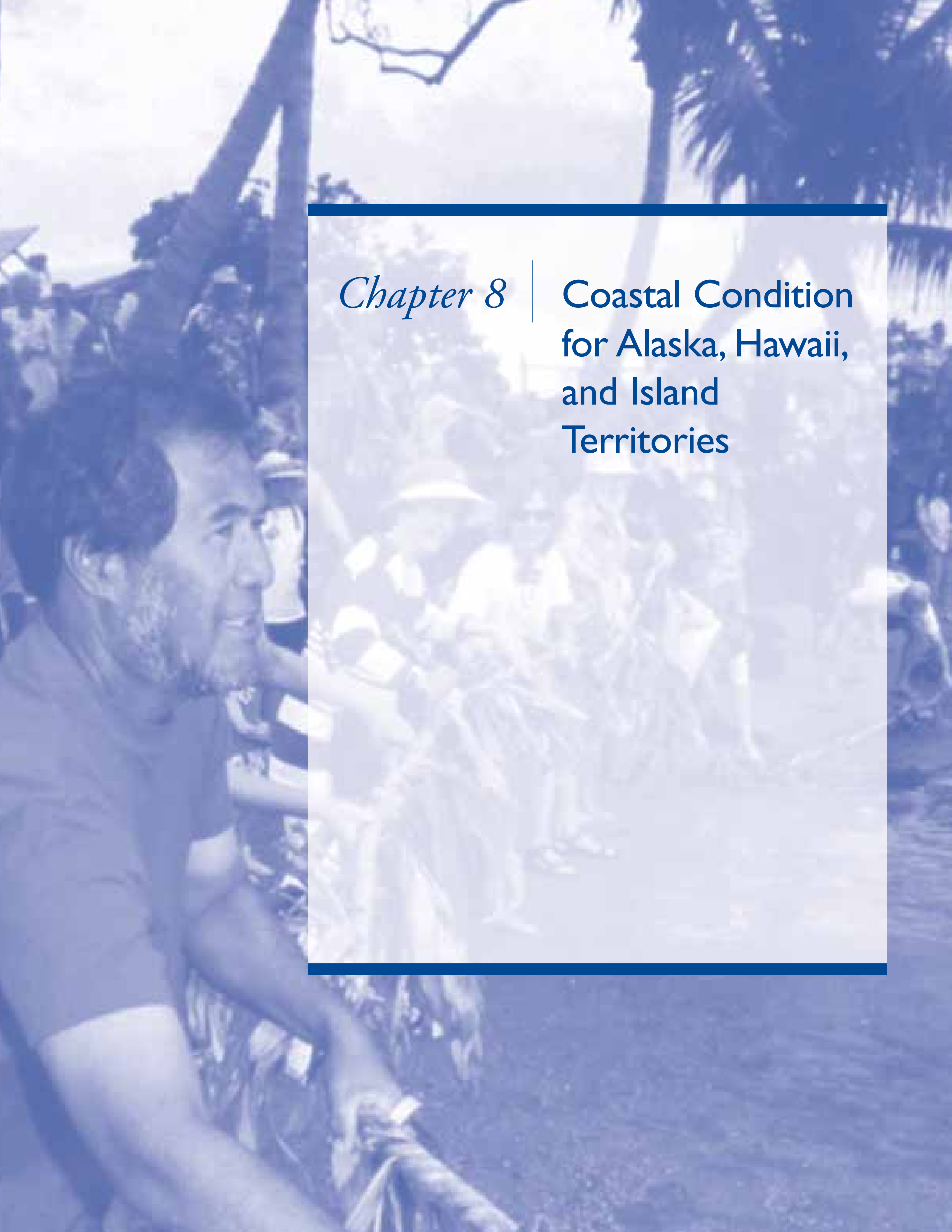


Chapter 8 Coastal Condition for Alaska, Hawaii, and Island Territories

Coastal Condition for Alaska, Hawaii, and Island Territories

There is currently very little monitoring of coastal resources in Alaska, Hawaii, and the island territories. EPA Regions 2 (Puerto Rico and U.S. Virgin Islands), 9 (Hawaii, Guam, the Northern Mariana Islands, and American Samoa), and 10 (Alaska) and the attendant state resources agencies conduct some water quality monitoring, but it is often irregular and focused on specific locations. There are no consistent monitoring programs that cover all the coastal resources in these states, territories, and commonwealths. Efforts conducted through EPA's NCA Program are starting to fill this void for Alaska (ongoing), Hawaii, and Puerto Rico, and the NCA plans to conduct coastal ecological condition surveys in the U.S. Virgin Islands, Guam, and American Samoa in coming years. No plans are currently in place, however, to survey conditions associated with the Northern Mariana Islands. In 2002, the NCA conducted surveys of Alaska (south-central region) and Hawaii, and information from these surveys will be available for future reports.

This chapter briefly describes the surveys and presents some preliminary findings. Both Alaska (southeastern region) and Hawaii will be surveyed in 2004. In 2000, the NCA surveyed Puerto Rico, and the results of that survey are also provided in this chapter. Plans to resurvey Puerto Rico were also scheduled for 2004.

During a dedication ceremony at the Hawaiian Islands Humpback Whale National Marine Sanctuary, the entire community was invited to participate in a Native Hawaiian fish-gathering activity known as a "hukilau." The sanctuary office sits in front of one of the last remaining Native Hawaiian fishponds in South Maui. Prior to the sanctuary's official approval, many people from the fishing community feared the imposition of additional sanctuary regulations. On the contrary, fishing is not regulated in the sanctuary, but rather encouraged and welcomed throughout its waters (Jeff Alexander).

Alaska

Coastal Monitoring Data

Alaska has approximately 45,000 miles of coastal marine shoreline, which constitute more than 50% of the total U.S. coastline. The surface area of coastal bays and estuaries in Alaska is 33,211 square miles, almost three times the estuarine area of the contiguous 48 states. Historically, coastal assessments have focused on areas of known or suspected impairment to examine the impacts of natural resource extraction activities, such as mining or oil exploration and production. One large-scale assessment occurring before resource development was the Alaska Outer Continental Shelf Environmental Assessment Program (OCSEAP), conducted by NOAA in the 1970s. A large amount of physical, chemical, and biological data was collected through this program, but much of it remains difficult to locate, though a summary may be found in Hood et al. (1986). Numerous assessments have also been conducted along the coastline affected by the Exxon Valdez oil spill in 1989, and this area continues to be monitored.

A few programs have provided an assessment of contaminants in Alaska as part of larger national assessments. For example, NOAA's NS&T Program analyzed contaminants in sediments and bottom fish at several sites along Alaska's coast as part of its Benthic Surveillance Program, as well as measured contaminants in intertidal mussels and sediments as part of its Mussel Watch Program. However, despite Alaska's long coastline, its extensive bays and estuaries, and the reliance of many coastal Alaskan communities on healthy populations of biological resources, no region-wide monitoring program has been established to document contaminant concentrations and spatial distributions, or to provide a baseline to assess trends in the future survey of data.

Promontory on Sutwik Island in Shelikof Strait, Southwest Alaska (Commander Grady Tuell, NOAA Corps).

Because of Alaska's low population relative to its size and the distance of most of its coastline from major urban or industrial areas, Alaska's coastal resources are generally in pristine condition. Concentrations of contaminants have been measured at levels significantly lower than those in the rest of the coastal United States. For most data collected in coastal Alaska to date, contaminant levels are consistently below EPA's level of concern; however, Alaska does have localized areas where specific contaminants can be quite high. For example, one of the highest concentrations of PAHs ever measured in a mussel tissue sample in the United States was collected from a boat harbor in a small Alaskan community (Mearns et al., 1999).

There has been increasing concern that contaminants from local sources and from long-distance transport have the potential to accumulate in Alaska's coastal resources. Long-range atmospheric and oceanic transport have been identified as major mechanisms for potential delivery of persistent organic contaminants to Alaska, and studies suggest that the Eastern Aleutian Islands may be receiving increased levels of PCBs relative to southeast Alaska (AMAP, 2004). Alaska's 1998 Section 303(d) list included 20 Tier I or Tier II coastal bays, estuaries, or harbors. Some of these waterbodies are affected by a specific industry, and others are affected by nonpoint source pollution. Although these impaired waterbodies amount to less than 1% of the total coastal bays, estuaries, and harbors in Alaska, there is concern that impairment due to pollution is increasing in the state. As a result, Alaska's Department of Environmental Conservation (ADEC) is implementing several strategies to assess and control potential environmental degradation. In a recent report (Chary, 2000), persistent organic pollutants were identified as a particular concern in Alaska, in part because of the subsistence lifestyle of many Native Alaskan communities.

In 2001, the NCA developed a sampling design in conjunction with ADEC and EPA Region 10 to assess all of the estuarine resources in Alaska by monitoring 250 sites spread throughout the state. Because of the huge expanse of Alaska, the reduced sampling window in Arctic regions, and the unique fiscal and logistical challenges of sampling coastal resources in the state, it is not feasible to survey the entire state at a single point in time. The NCA, EPA Region 10, ADEC, and other state resource agencies determined that the sampling design for Alaska would be executed in five parts—southeastern Alaska, south-central Alaska, the Aleutian Islands, the Bering Sea, and the Arctic region. Each part would survey one of these areas, and the target schedule for completion would be 5 to 10 years (Figure 8-1). Before this collaboration between Alaska's resource agencies and EPA, ADEC routinely assessed only about 1% of its coastal resources, focusing its efforts on waterbodies known or suspected to be impaired.

A sampling survey of the ecological condition of Alaska's estuarine resources in the south-central region of the state (Alaskan Province) was completed in 2002. The survey assessed 50 cores sites and 25 alternate sites (Figure 8-2). The south-central region of the state was selected for the first survey because of the importance of the major estuarine resources in the region (Prince William Sound and Cook Inlet) to the local and state economy, as well as to aquatic living resources. The indicators collected during the survey (55 stations successfully sampled) correspond to those collected in the surveys in other regions.

Because of the long distances between sites (even in this reduced area), the surveys were conducted using a large ocean-going research vessel (Figure 8-3). Many of the samples collected during the 2002 survey are still being analyzed. These data will be available in 2004; however, some of the preliminary data are reported in this chapter. Because the data are preliminary, they will not be presented in the same format as previously used in this report (e.g., maps of poor condition locations and pie charts of conditions).

Figure 8-1. Five Alaskan provinces used in the NCA sampling design (U.S. EPA/NCA).

Figure 8-2. Sampling design for the south-central region (Alaskan Province) of Alaska in 2002 (U.S. EPA/NCA).

The survey collected data at a total of 55 sites, with depths ranging from 1 to 108 feet. Many of the shallowest stations occurred in nearshore areas of Cook Inlet, areas known for wide intertidal, depositional zones. The deepest stations occurred in Prince William Sound, which is characterized by deep canyons and fjords that cross the continental shelf. The next survey (in 2004) will cover Alaska's southeastern region (Juneau and the island passage area), which includes 50 sites (Figure 8-4).

Figure 8-3. Research sampling vessel required for coastal surveys in Alaska (Alaska Department of Environmental Conservation).

Figure 8-4. Sampling design for southeastern region (Columbian Province) of Alaska in 2004 (U.S. EPA/NCA).

Large Marine Ecosystem Fisheries

Gulf of Alaska and East Bering Sea Ecosystems

Native Alaskan peoples and their heritage have a long, rich tradition of relying on salmon from the Gulf of Alaska and East Bering Sea ecosystems for economic, cultural, and subsistence purposes. Today, residents and nonresidents depend heavily on this resource for recreation, food, industry, and commercial fisheries, along with a rapidly growing salmon and groundfish sport fishery that provides the state of Alaska with its largest private-sector employment.

Oceanographic and Climate Forcing in the East Bering Sea Ecosystem

Recruitment responses of many Bering Sea fish and crabs are linked to decadal scale patterns of climate variability. Decadal changes in recruitment of some flatfish species in the eastern Bering Sea appear to be related to patterns seen in atmospheric forcing. The Arctic Oscillation, which tracks the variability in atmospheric pressure at the polar region and mid-latitudes, tends to vary between negative and positive phases on a decadal scale. The negative phase brings higher-than-normal pressure over the polar region, and the positive phase does the opposite, steering ocean storms farther north. These patterns in atmospheric forcing in winter may influence surface wind patterns that transport fish larvae on or off the shelf. Some species, such as Bering Sea herring, walleye pollock, and Pacific cod, show interannual variability in recruitment that appears more related to climate variability. Years of strong onshore transport, typical of warm years in the Bering Sea, correspond with strong recruitment of walleye pollock, possibly due to separation of young fish from cannibalistic adults. Alaskan salmon also exhibit decadal scale patterns of production, which are inversely related to salmon production patterns on the west coast. Environmental variables such as sea surface temperature and air temperature significantly improved the results of productivity models of Bristol Bay sockeye salmon compared to models containing only density-dependent effects.

highlight

Alaska's Cook Inlet Advisory Council

In the aftermath of the Exxon Valdez oil spill in Prince William Sound, Congress crafted the Oil Pollution Act of 1990 (OPA90) to insure that the complacent attitude that led to the spill would not be repeated in the future. Under OPA90, two Regional Citizen Advisory Councils (RCACs) were created—one for Prince William Sound and one for Cook Inlet. Congress envisioned these councils as a mechanism to foster long-term partnerships between industry, government, and the coastal communities of Alaska.

The Cook Inlet RCAC has numerous mandates under OPA90, one of which is to conduct environmental-monitoring programs to assess potential impacts of oil industry operations in the Cook Inlet area. Studies have been developed to assess hydrocarbon concentrations in subtidal and intertidal sediments and in the tissues of bivalves that live in the Cook Inlet sediments, including an emphasis on building a database of hydrocarbon "fingerprints" of potential man-made and natural sources.

To better interpret the results of their studies, the Cook Inlet RCAC sought opportunities to obtain data from the larger coastal areas surrounding Cook Inlet. This regionwide data provides a context by which to interpret the smaller, more focused Cook Inlet studies. The coastal EMAP is ideal because scientists use a core set of parameters, resulting in consistent and comparable data at the local, state, regional, and national level.

Granite Point platform in Cook Inlet. (Photo courtesy of Unocal).

In 2001, the Cook Inlet RCAC formed a unique partnership with ADEC and several other organizations to conduct the first portion of Alaska's coastal EMAP. Cook Inlet RCAC provided the scientific lead for planning and implementing the program as an in-kind match to the federal funds provided to ADEC. Through this partnership, the Cook Inlet RCAC and ADEC maximized the expertise and financial resources available for this coastal assessment.

In 2002, scientists from the Cook Inlet RCAC, the NMFS, the International Pacific Halibut Commission, the University of Washington, Washington DOE, and EPA completed a 50-day voyage to collect the necessary water, sediment, and bottom trawl samples for Alaska's coastal EMAP in south-central Alaska.

Additionally, the Cook Inlet RCAC is actively sponsoring research with the University of Alaska on the physical oceanography of Cook Inlet, developing numerical models to understand surface oil spill and dispersed plume trajectories. Cook Inlet is an extremely dynamic environment, possessing the world's second-highest tidal range. Cook Inlet RCAC has piloted a coastal habitat mapping project that provides coastal geomorphology and wetland, intertidal, and shallow subtidal biota data in south-central Alaska. This project provides the additional information needed to understand potential impacts to the different coastal habitats. A recent recommendation by agency partners in the Cook Inlet study suggested that the program should be expanded to coastlines statewide.

Through these partnerships, as well as the one developed for Alaska's coastal EMAP, the Cook Inlet RCAC is able to conduct and sponsor research that is of the highest scientific merit while fulfilling the mandates in OPA90.

Sorting bottom trawl samples (Alaska Department of Environmental Conservation).

In contrast, periods of strong Aleutian Lows are associated with weak recruitment for some Bering Sea crab species and are unrelated to recruitment of others, depending on species-specific life history traits. Winds from the northeast favor retention of crab larvae in offshore mud habitats that serve as suitable nursery areas for young Tanner crabs to burrow in sediment for protection. Winds from the opposite direction promote inshore transport of crab larvae to coarse, shallow water habitats in inner Bristol Bay that serve as nursery areas for red king crabs to find refuge among biogenic structures (Tyler and Kruse 1998). Timing and composition of the plankton blooms may also be important, because red king crab larvae prefer to consume *Thalassiosira* diatoms, whereas Tanner crab larvae prefer copepod nauplii.

Salmon Fisheries

Alaska salmon harvests in the state's two ecosystems have increased over the last three decades and may have peaked in 1995. After dropping to record low catches in the 1970s, most populations have rebounded, and the fisheries are now at or near all-time peak levels in many regions of the state. A number of factors have contributed to the high abundance of Pacific salmon currently in the state of Alaska. These factors include (1) pristine habitats with minimal impacts from extensive development, (2) favorable ocean conditions that promote high survival rates of juveniles, (3) improved management of the fisheries by state and federal agencies, (4) elimination of high-seas drift net fisheries by foreign nations, (5) hatchery production, and (6) reduction of bycatch in fisheries for other finfish species. Quality spawning and nursery habitat, favorable oceanic conditions, and sufficient numbers of spawning fish are most likely the paramount factors affecting current abundance. Alaska salmon management continues to focus on maintaining pristine habitats and ensuring adequate escapements; however, ocean conditions that favored high marine survival rates in recent years can fluctuate due to interdecadal climate oscillations. There is recent evidence that a change in ocean conditions in the north Pacific Ocean and Gulf of Alaska ecosystem may be underway, possibly reflecting the downturn in abundance of Alaska salmon runs observed in 1996 and 1997.

Pelagic Fisheries

Pacific herring is the major pelagic species harvested in the Gulf of Alaska and East Bering Sea ecosystems. These fisheries occur in specific inshore spawning areas. In the Gulf of Alaska ecosystem, spawning fish concentrate mainly off southeast Alaska in Prince William Sound and around the Kodiak Island-Cook Inlet area. In the East Bering Sea ecosystem, the centers of abundance are in northern Bristol Bay and Norton Sound. This fishery occurs within state waters (3-mile limit) and is monitored and managed by the Alaska Department of Fish and Game (ADFG) within 20 separate fishery areas. From catch records, it is evident that herring biomass fluctuates widely due to influences of strong and weak year-classes. Currently, the herring populations in both ecosystems remain at moderate levels and are in relatively stable condition, with the exception of Prince William Sound. Herring abundance levels typically increase abruptly following major recruitment events and then decline slowly over a number of years because of natural and fishing mortality. Prince William Sound herring continue to be depressed from a disease outbreak in 1993, but have recovered to above threshold levels. In more recent years, herring harvests in both ecosystems have averaged about 45,000 mt, with a value averaging around $30 million.

Groundfish Fisheries

The groundfish complex is the most abundant of all fisheries' resources off the Gulf of Alaska and the East Bering Sea ecosystems, totaling more than 21,000,000 mt of exploitable biomass and contributing more than 2,000,000 mt of catch each year. Another 1,000,000 mt of underutilized sustainable potential yield is available. The Magnuson-Stevens Fishery Conservation and Management Act extended federal fisheries management jurisdiction to 200 nautical miles and stimulated the growth of a domestic Alaskan groundfish fishery that rapidly replaced the foreign fisheries. Much of the groundfish catches are exported, particularly to Asia, and such trade contributes prominently as a major source of revenue for U.S. fishermen. The total catch in 1997 of the East Bering Sea and Aleutian Islands groundfish was 1,740,000 mt, valued at $405 million (ex-vessel). The dominant species harvested were walleye pollock, Pacific cod, and yellowfin sole. Groundfish populations have been maintained at high levels since implementation of The Magnuson-Stevens Act. The walleye pollock produce the largest catch of any single species inhabiting the U.S. EEZ. Until 1992, another large fishery targeted the portion of the Aleutian Basin stock residing outside of the U.S. and Russian EEZs in the "Donut Hole" of the central Bering Sea. Historical catches from this stock were apparently too high (well over 1,000,000 mt throughout the late 1980s) and not sustainable. Consequently, the abundance of the Aleutian Basin stock was greatly diminished, and all fishing ceased in 1993. Groundfish abundance in the Gulf of Alaska ecosystem peaked at 5,300,000 mt in 1982. Abundance since then has remained relatively stable, fluctuating between 4,500,000 and 5,300,000 mt.

The groundfish catches are dominated by pollock, followed by Pacific cod, flatfish, and rockfish. The recent average yield of the complex is 211,922 mt. Pollock abundance has been increasing in recent years. The western-central Gulf of Alaska ecosystem's total allowable catch for pollock is further apportioned among three areas and three seasons. This temporal and spatial apportionment of the pollock quota was implemented to accommodate Steller sea lion concerns; pollock are a major prey item of Steller sea lions in the Gulf of Alaska ecosystem. Pollock are considered fully utilized, and Pacific cod are abundant and fully utilized. Flatfish are, in general very abundant, primarily due to large increases in arrowtooth flounder biomass, and are underutilized due to halibut bycatch considerations. Rockfish (slope rockfish, pelagic shelf rockfish, thornyhead rockfish, and demersal shelf rockfish) are conservatively managed due their long life spans and consequent sensitivity to overexploitation. See *Our Living Oceans* (NOAA, 1999) for more information on transboundary issues and multispecies interactions.

Shellfish Fisheries

Major shellfish fisheries developed in the 1960s in the Gulf of Alaska ecosystem, subsequently expanded to the East Bering Sea ecosystem. Shellfish landings in 1997 generated an ex-vessel value of $151 million. The most important of these fisheries are the king and snow crab fisheries. King and Tanner crab fisheries are managed primarily by the state of Alaska, with advice from a federal FMP for the East Bering Sea and Aleutian Islands stocks.

Alaska crab resources are fully utilized. Catches are restricted by quotas, seasons, and size and sex limits, with landings limited to large male crabs. Fishing seasons are set at times of the year that avoid molting, mating, and soft-shell periods. Japanese and Russian

Sea lions often haul themselves onto floating docks to sunbathe (Paul Goetz).

fisheries were phased out of the Bering Sea in 1974; however, catches there have remained low. Gulf of Alaska ecosystem catches peaked in 1965, then varied at a relatively low level for a decade before dropping lower still in 1983. Almost all Gulf of Alaska ecosystem king crab fisheries have been closed since 1983.

Three king crab species (red, blue, and golden or brown) and two Tanner crab species (Tanner crab and snow crab) have traditionally been harvested commercially off the two major ecosystems of Alaska. The recent average yields for king crabs (7,170 mt) and Tanner crabs (2,857 mt) are below their respective, long-term potential of 36,481 and 21,751 mt, respectively. By contrast, the recent average yield of 39,053 mt for snow crab is above its long-term potential yield of 37,202 mt.

Shrimp are also managed by the state of Alaska. The domestic shrimp fishery in the waters of the East Bering Sea ecosystem is currently at a low level. Shrimp abundance is also too low in the Bering Sea to support a commercial fishery. The western Gulf of Alaska ecosystem has been the main area of operation for the shrimp fishery, with shrimp landings indicating that catches in the western Gulf rose steadily to about 58,000 mt in 1976 and then declined precipitously. As with crabs, the potential yields of shrimp stocks in both Alaskan marine ecosystems are not well understood.

Nearshore Fisheries

Nearshore fishery resources are those coastal and estuarine species found in the 0–3 nautical mile zone of coastal state waters and for which the NMFS has no direct management role. Nearshore resources vary widely in species diversity and abundance. Management authority is shared among the coastal states and other local bodies. Nearshore resources provide important subsistence and recreational fishing opportunities for Alaskans of the Gulf of Alaska and East Bering Sea. Most nearshore fisheries take place in the Gulf of Alaska ecosystem near population centers, although subsistence fishing is distributed all along the Alaska coastline into the Bering Sea and Beaufort Sea ecosystems.

The nearshore resources and fisheries are managed by the ADFG. Dungeness crabs are harvested near shore by small-boat commercial fleets and recreational fisheries, primarily in the Yakutat and Kodiak areas of the Gulf of Alaska ecosystem. Management of these crab fisheries suffers in the absence of stock assessment

Viewed at low tide, Pacific tidepool rocks are covered with kelp and other macro algae that support a healthy community of fish and invertebrates (Paul Goetz).

research. The traditional fishery for red king crab in the Gulf of Alaska ecosystem, however, is optimistic. The fishery reopened in 1993 following 8 years of closure and is now managed under a conservative harvest regime supported by an annual stock assessment survey.

The scallop fishery is regulated by the state of Alaska, which limits the number of vessels and sets catch quotas. Sea cucumbers and sea urchins are recent fisheries resources, harvested by divers and exported primarily to Asian markets. These fisheries are managed conservatively according to their recent historical performance. The ADFG surveys the resource periodically at selected sites to monitor major changes in relative abundance of the stocks. The amount of nearshore resources harvested by the subsistence and recreational fisheries off the three Alaska ecosystems (Gulf of Alaska, East Bering Sea, and Beaufort Sea ecosystems) has been difficult to compile because of the state's wide geographical expanse and remoteness of such fishing activities. The most important component of these resources are the invertebrates.

Alaska Assessment and Advisory Data

Clean Water Act Section 305(b) Assessments

Before monitoring efforts were conducted in coordination with the NCA Program, Alaska's water quality assessments focused on areas with known or suspected impairments. For its 2000 305(b) report, Alaska assessed 28 (0.1%) of its 33,204 estuarine square miles. Alaska reported on overall use support only, with 25 square miles (89% of assessed waters) of the state's estuaries impaired for overall use support (Figure 8-5).

The state also assessed 25 (0.1%) of its 36,000 miles of coastal shoreline. Sixty-four percent of the assessed shoreline miles fully support overall use, and the remaining 36% of assessed miles are impaired by some form of pollution or habitat degradation (Figure 8-6).

Fish Consumption Advisories

No consumption advisories were in effect for chemical contaminants in fish and shellfish species harvested in Alaskan waters in 2002 (U.S. EPA, 2003c).

Beach Advisories and Closures

Alaska did not report beach monitoring and advisory or closings data to the EPA in 2002 (U.S. EPA, 2003a).

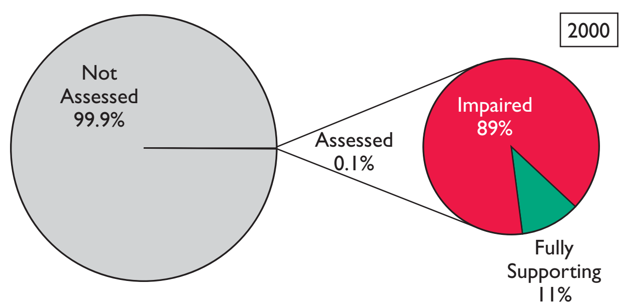


Figure 8-5. Water quality in assessed Alaskan estuaries (U.S. EPA, 2002).

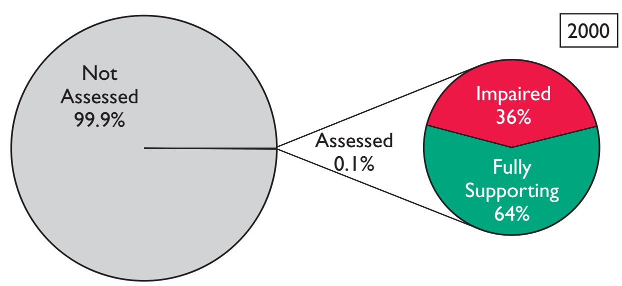


Figure 8-6. Water quality for assessed shoreline waters in Alaska (U.S. EPA, 2002).

Hawaii

Coastal Monitoring Data

Hawaii does not have a comprehensive coastal monitoring program. Some monitoring occurs in Oahu and is planned for adjacent coral reef ecosystems. Most monitoring of coastal resources, however, is targeted to address specific bays and issues such as nonpoint source runoff and offshore discharges. For example, Mamala Bay has been sampled intensively to examine public wastewater outfalls from Oahu into the bay. This sampling showed that the discharge areas were not statistically different from reference areas; however, no comprehensive spatial examination was conducted of Mamala Bay to interpret these findings in a statewide or regional context. In 2002, the NCA, in conjunction with state agencies, Region 9, and the University of Hawaii, conducted the first comprehensive survey of the condition of estuarine resources in Hawaii (Figure 8-7).

The dazzling peaks off the island of Kahoolawe are just one the many types of coastlines seen throughout Hawaii. Shorelines range from white sandy beaches on Oahu to the tallest sea cliffs in the world on Molokai. Each island offers its own unique habitat for marine life (Marc Hodges) .

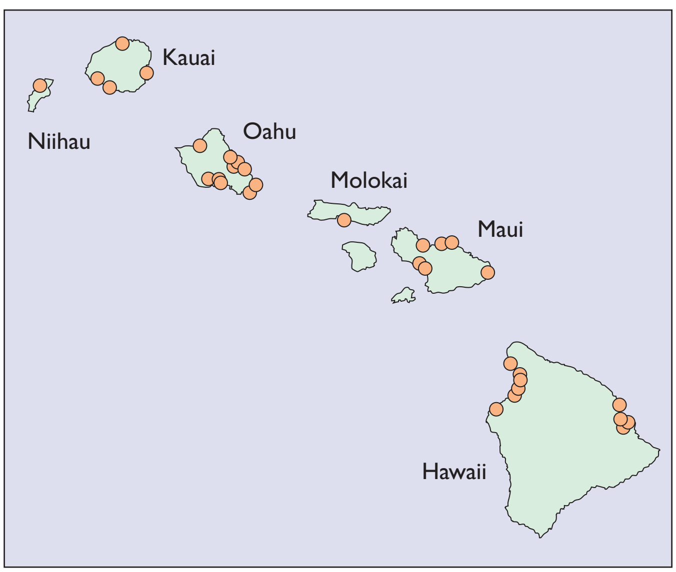


Figure 8-7. Sampling design for Hawaii in 2002 (U.S. EPA/NCA).

The survey sampled 79 stations on islands of the Hawaiian chain and included all of the indicators of the NCA surveys. The Hawaiian survey, however, did not produce estimates of sediment toxicity because of insufficient soft sediments, and rather than assessing contaminant levels in fish, it assessed the body burdens of sea cucumbers (Figure 8-8). Information from this survey will be available in the next edition of this report (2006).

Figure 8-8. An example of sea cucumbers used for assessment of tissue contaminants in Hawaii (Dr. Richard Brock, University of Hawaii at Manoa, 2003).

Large Marine Ecosystem Fisheries

The Insular Pacific-Hawaiian ecosystem supports a variety of fisheries in both the Northwestern Hawaiian Islands (NWHI) and the Main Hawaiian Islands (MHI). In the NWHI, the lobster fishery is the major commercial marine invertebrate fishery in the western Pacific. A very small-scale, primarily recreational fishery for lobster also exists in the MHI within the Insular Pacific-Hawaiian ecosystem, as well as outside the ecosystem in American Samoa, Guam, and the Northern Mariana Islands. A deepwater shrimp resource is found throughout the Pacific islands; however, this stock is relatively unexploited.

A resource of deepwater precious coral (gold, bamboo, and pink corals) also exists in the Insular Pacific-Hawaiian ecosystem and possibly in other western Pacific areas. Precious corals occurring in the U.S. EEZ are managed under an FMP implemented in 1983 by the Western Pacific Regional Fishery Management Council. Very limited quotas are allowed under regular permits, and experimental permits are required for unassessed coral beds. A short-lived (1974–1979) domestic fishery operated off Makapu'u Point on Oahu, but there has been no significant precious coral harvest for 20 years. Interest in the fishery has recently resurfaced, however, and one federal permit was issued in 1997.

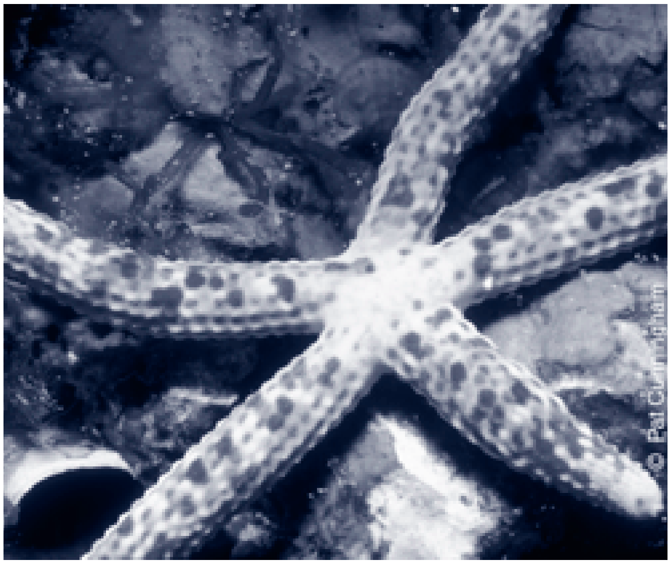
Invertebrate Fisheries

The NWHI lobster fishery, which began in 1977, harvests spiny and slipper lobsters and is governed by the Western Pacific Regional Fishery Management Council under an FMP. The MHI lobster fishery is managed by the state of Hawaii, although a few offshore banks are included in the *Fishery Management Plan for the Crustacean Fishery of the Western Pacific Region*. This FMP was implemented in 1983 and has since been amended nine times. Many of the earlier amendments were in response to requirements to eliminate lobster trap interactions with the endangered Hawaiian monk seal (Amendments 2 and 4), to protect spiny and slipper lobster reproductive potentials (Amendments 3 and 5), and to specify overfishing definitions (Amendment 6). The most significant change to the FMP occurred in 1992, when it was amended in response to continuing declines in commercial lobster CPUE (Amendment 7). This amendment set forth an annual 6-month closed season (January–June) for lobster harvesting, limited entry into the fishery, and established an annual catch quota. The FMP was amended again in 1996 (Amendment 9) to implement a quota system based on a constant harvest rate that allows only a 10% risk of overfishing in any given year, as well as the retention of all lobsters caught.

Populations of spiny and slipper lobster declined dramatically from the mid-1980s through the mid-1990s. Much of this decline has been attributed to the combined effect of a shift in oceanographic conditions affecting recruitment and fishing mortality in the mid-1980s. The spawning potential ratio (SPR), which is used to measure the status of the stocks, has ranged between 74% and 88% over the past three seasons (1995–1997).

Coral Fisheries

Because there has been no fishery on precious corals during the past 20 years, little solid evidence is available on recovery of the population from the low levels that existed when the Magnuson-Stevens Act was first passed in 1976; however, recent video analysis suggests that the previously harvested beds have recovered much of their potential and that new coral beds have been identified. Nonetheless, it also appears that illegal foreign fishing in some remote areas during the 1980s had a significant impact on some coral beds.



A colorful starfish creeps across the ocean bottom looking for food (Pat Cunningham).

In 1997, a company obtained a permit to harvest precious coral at Makapu'u, Oahu, under a 2-year permit quota for 4,409 pounds of pink coral and 1,322 pounds each for bamboo and gold coral. Harvesting of these species began in early 1998.

Bottomfish Fisheries

The western Pacific bottomfish fishery geographically encompasses the Insular Pacific-Hawaiian ecosystem (which includes the MHI and the NWHI), Guam, the Northern Mariana Islands, and American Samoa. In contrast, the pelagic armorhead is harvested from the summits and upper slopes of a series of submerged seamounts along the southern Emperor-Northern Hawaiian Ridge. This chain of seamounts is located just west of the International Dateline and extends to the northernmost portion of the NWHI.

In the MHI, as in Guam, the Mariana Islands, and American Samoa, these fisheries employ relatively small vessels on 1-day trips close to port. As a result, much of the catch is harvested by either part-time commercial or sport fishermen. In contrast, the NWHI species are fished by full-time, commercial fishermen on relatively large vessels that range far from port on trips of up to 10 days in duration. Fishermen use the handlining technique in which a single weighted line with several baited hooks is raised and lowered with a powered reel. The bottomfish fisheries are managed jointly by the Western Pacific Fishery Management Council and territorial, commonwealth, or state authorities.

In the Insular Pacific-Hawaiian ecosystem, the harvested bottomfish species include several snappers (ehu, onaga, opakapaka), jacks (ulua, butaguchi), and a grouper (hapu'upu'u), whereas the more tropical waters of Guam, the Mariana Islands, and American Samoa include a more diverse assortment of species within the same families, as well as several species of emperors. These fish are found on rock and coral bottoms at depths of 170–1300 ft. Catch weight, size, and fishing effort data are collected for each species in the five areas; however, the sampling programs among these areas vary in scope and design. About 90% of the total catch is taken in the Insular Pacific-Hawaiian ecosystem, with the majority of the catch harvested in the MHI as compared to the NWHI.

Stock assessments, though somewhat limited, indicate that the spawning stocks of several important MHI species (e.g., ehu, hapu'upu'u, onaga, opakapaka, and uku) are at only 5–30% of their original levels, with onaga and ehu presently appearing as the most stressed among MHI bottomfish species. Because overutilization is a concern and the fishery and bottomfish habitat are predominantly within Hawaiian waters, the Western Pacific Fishery Management Council has recommended that Hawaii take action to prevent overfishing. During the past two years, the state of Hawaii conducted a series of meetings with fishery managers, scientists, and fishermen to develop an FMP for the Hawaii's bottomfish fishery. In 1998, the state established a new administrative rule that governs bottomfishing in state waters and includes restrictions on fishing gear and fishing areas.

Armorhead Fisheries

The seamount groundfish fishery has targeted just one species: the armorhead. Since 1976, this bottom trawl fishery has been almost exclusively conducted by Japanese trawlers fishing the seamounts in international waters beyond the Hancock Seamounts. The fishing grounds comprising the Hancock Seamounts represent

The Kona Coast of Hawaii has many tidepools filled with a myriad of small fish, mollusks, echinoderms, and crustaceans (Paul Goetz).

less than 5% of the total fishing grounds. The long-term potential yield is 2,123 mt, but recovery to these former levels has not occurred.

Standardized stock assessments were conducted during 1985–1993. Research cruises were focused on Southeast Hancock Seamount, and the armorhead stock was sampled with bottom longlines and calibrated against Japanese trawling effort. Although catch rates vary, they have not shown the increases expected after the fishing moratorium was imposed. Furthermore, the increase in the 1992 seamount-wide CPUE caused by high recruitment was apparently short-lived, as CPUE declined appreciably in 1993 and thereafter. Closure of only the small U.S. EEZ portion of the pelagic armorhead's demersal habitat may not be sufficient to allow population recovery because these seamounts remain the only part of the fishery currently under management.

No progress toward cooperative international management is foreseen for the pelagic armorhead. Cooperative exchanges of fishery data with scientific colleagues in Japan have provided annual commercial catch data by seamount. Recently acquired biological data of importance for future management considerations indicate that armorhead undergo a 2-year pelagic phase prior to recruitment into the fishery, and that the seamount populations comprise a single stock.

Nearshore Fisheries

For the purposes of this report, nearshore fishery resources are defined as those coastal and estuarine species found in the 0–3 nautical mile zone of coastal state waters and for which the NMFS has no direct management role. Nearshore resources vary widely in species diversity and abundance. Many are highly-prized gamefish, whereas others are small fishes used for bait, food, and industrial products. The invertebrate species of greatest interest include crabs, shrimps, abalones, clams, scallops, and oysters.

Because the composition of the nearshore fauna is very diverse and management authority is shared among the many coastal states and other local bodies, a detailed treatment of their status is difficult. This chapter presents information on the more significant species of national interest. For more comprehensive assessments of individual species, readers should refer to reports published by state natural resource agencies.

Fisheries in the nearshore waters of the tropical and subtropical Insular Pacific-Hawaiian ecosystem and the other U.S.-associated Pacific islands are highly diverse, though lower in aggregate volume than commercial or recreational fisheries of the U.S. mainland. Landings are reported to be about 1,400 mt annually. Many fisheries are unique to certain localities, such as that for the palolo worm in American Samoa, seasonal fisheries for rabbitfish in Guam, and limpet (opihi) fisheries in the Insular Pacific-Hawaiian ecosystem. Other fisheries are common to all Western Pacific areas, such as the fisheries for bigeye scad (called akule) in the Insular Pacific-Hawaiian ecosystem, atule in American Samoa, and atulai in Guam and the Northern Mariana Islands.

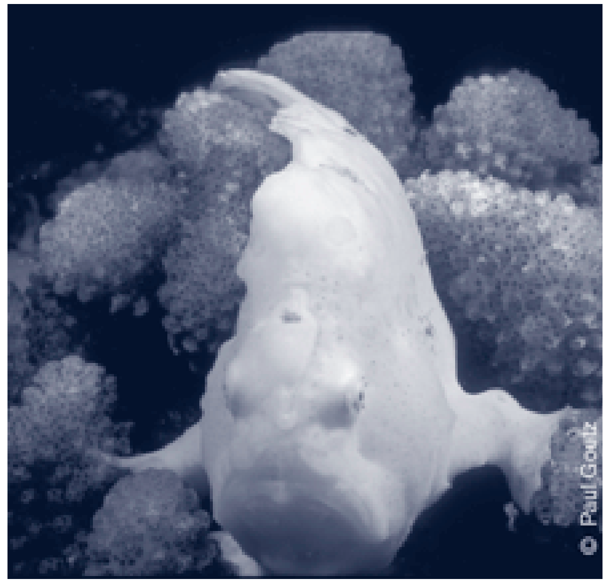
The more highly populated islands of the Insular Pacific-Hawaiian ecosystem receive the heaviest inshore fishing pressure, while less densely populated islands and mostly uninhabited islands of the Insular-Pacific-Hawaiian ecosystem and Commonwealth of the Northern Mariana Islands receive less fishing pressure. In the main islands of the Insular Pacific-Hawaiian ecosystem between 1980 and 1990, commercial fisherman reported an average annual harvest of 1,179 mt for fish and invertebrates taken from waters up to 600 feet in depth. According to the Hawaii Division of Aquatic Resources, two pelagic carrangids, akule and opelu, support the largest inshore fisheries in the state. During the 1993–1995 period, annual commercial landings for akule and opelu averaged 310 and 160 mt, respectively.

Other important commercial fisheries include those for surgeonfish, squirrelfish, parrotfish, goatfish, snappers, octopus, and various jacks or trevallies. There are significant recreational fisheries, but participation, landings, expenditures, and economic values are not well documented. The recreational and subsistence component of the marine fisheries of the Insular Pacific-Hawaiian ecosystem was last assessed in 1986, when it was estimated that 200,000 trips were taken by 6,700 vessels involved in nonmarket fishing (this total includes recreational, subsistence, and submarket sales). Estimated landings by these "recreational" fishermen were 9,525 mt (21 million), of which 4,536 mt (10 million) were sold ($22 million). Total direct expenditures by these fisheries totaled $24 million, and the nonmarket value of the fishing experience was valued at $23 million.

Hawaii Assessment and Advisory Data

Clean Water Act Section 305(b) Assessments

The state of Hawaii assessed 99% of its 55 estuarine square miles and 83% of its 1,052 miles of shoreline for its 2000 305(b) report. Of the assessed estuarine square miles, 43% fully support their designated uses, and 57% are impaired by some form of pollution or habitat degradation (Figure 8-9). Individual use support for Hawaii's assessed estuaries is shown in Figure 8-10. Of assessed shoreline, 97% fully supports its designated uses, 1% is threatened for one or more uses, and 2% is impaired by some form of pollution or habitat degradation (Figure 8-11). Individual use support for assessed shoreline in Hawaii is shown in Figure 8-12.



A lemon-yellow frogfish braces itself from the ebb and flow of the current with its leg-like pectoral fins (Paul Goetz).

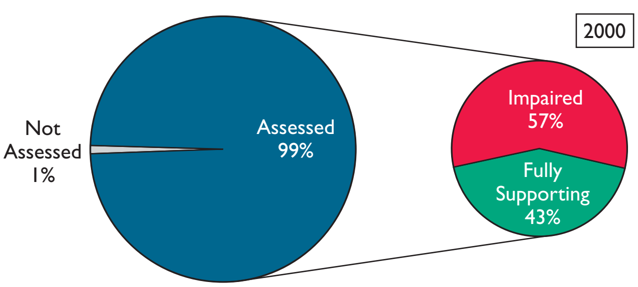


Figure 8-9. Water quality in assessed Hawaiian estuaries (U.S. EPA, 2002).

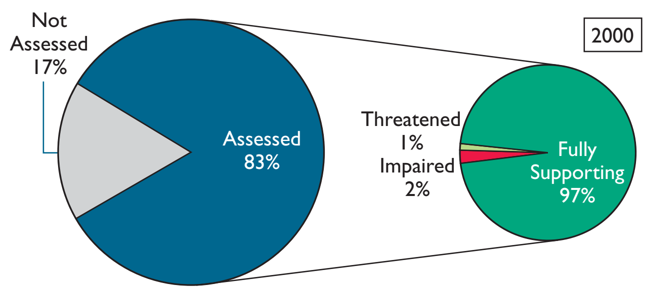


Figure 8-11. Water quality in assessed shoreline waters in Hawaii (U.S. EPA, 2002).

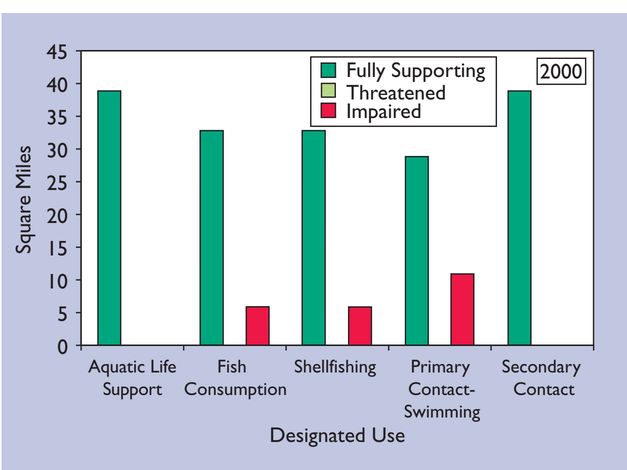


Figure 8-10. Individual use support for assessed estuaries waters in Hawaii (U.S. EPA, 2002).

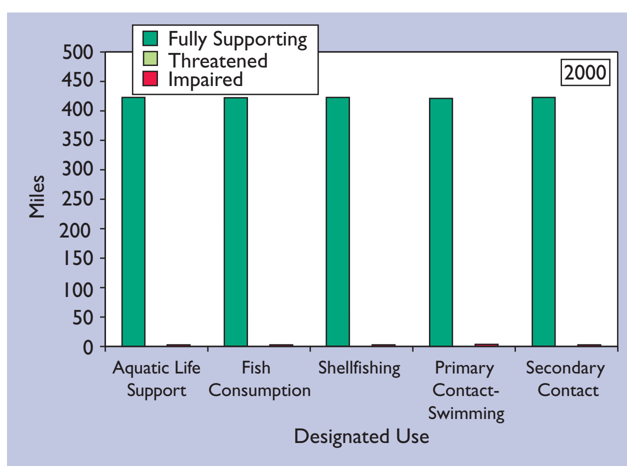


Figure 8-12. Individual use support for assessed shoreline waters in Hawaii (U.S. EPA, 2002).

Fish Consumption Advisories

The state of Hawaii reported that one estuarine advisory resulting from PCB contamination was in effect for the Pearl Harbor area on the island of Oahu. The advisory, which has been in effect since 1998, advises all members of the general population (including sensitive populations of pregnant women, nursing mothers, and children) not to consume any fish or shellfish from the waters of Pearl Harbor (U.S. EPA, 2003c).

Beach Advisories and Closures

Beach advisory and closure data were provided for the islands of Oahu, Hawaii, Kauai, and Maui (Figure 8-13). Of the 87 coastal beaches that reported information to EPA, only 8% (seven beaches) were closed or under an advisory for any period of time in 2002. Beach advisories and closures were implemented primarily for preemptive reasons associated with sewage-related problems (Figure 8-14). Sewer line problems were cited as the source of beach contamination in 75% of the survey responses (Figure 8-15).

Hanauma Bay in Hawaii attracts snorkelers and divers to a beautiful coral reef within minutes of downtown Honolulu (Paul Goetz).

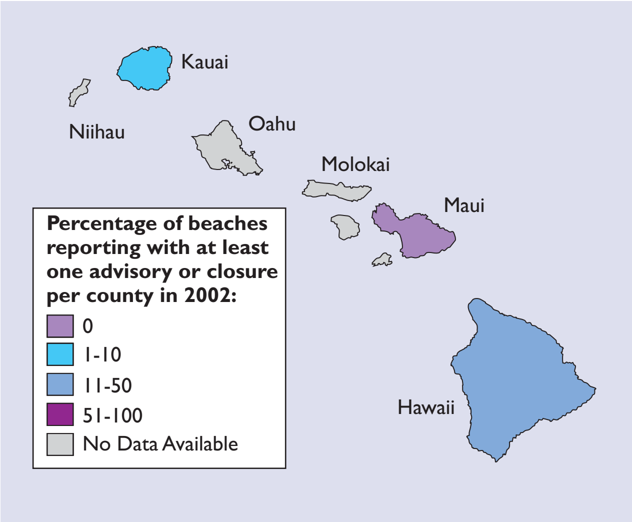


Figure 8-13. The percentage of Hawaiian beaches participating in the survey that had a least one advisory or closure in 2002 (U.S. EPA, 2003a).

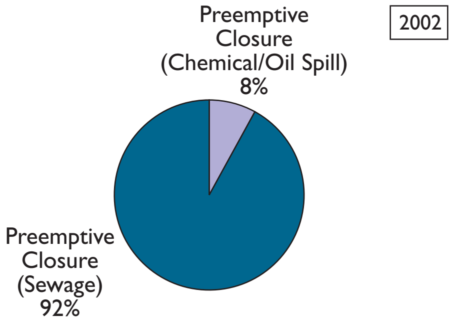


Figure 8-14. Reasons for beach advisories and closings in Hawaii (U.S. EPA, 2003a).

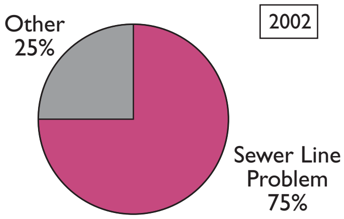


Figure 8-15. Sources of beach contamination in Hawaii (U.S. EPA, 2003a).

Puerto Rico

Coastal Monitoring Data

Although EPA Region 2, the San Juan Harbor National Estuary Program, and the Caribbean Environmental Protection Division have conducted some coastal monitoring in Puerto Rico, these surveys have been completed almost exclusively in the San Juan area. In 2000, the NCA, in cooperation with the above offices and programs, conducted a comprehensive survey of the ecological condition of Puerto Rico estuarine waters (Figure 8-16). The survey included 50 sites and examined the full suite of indicators, with the exception of fish tissue contaminants. The survey was not granted a permit to trawl for fish because of the sensitive nature of the bottom communities (e.g., soft corals) in these waters. Fish tissue contaminants will be examined in subsequent surveys.

Elkhorn coral are a predominant shallow-water species found throughout the warm waters of the Atlantic and Caribbean (Pat Cunningham).

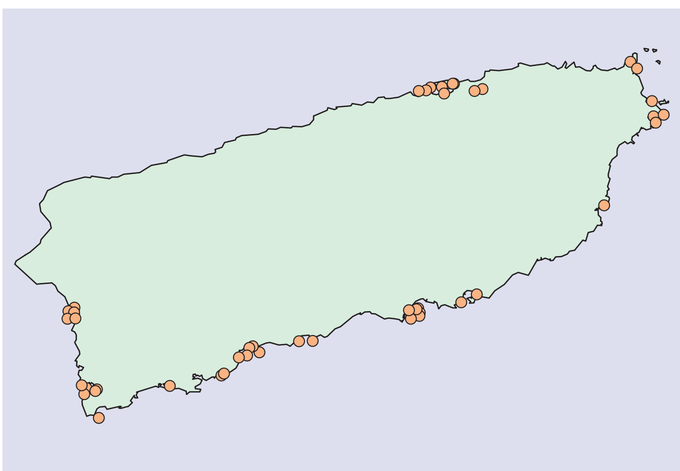


Figure 8-16. Sampling design for Puerto Rico for the NCA Program's 2000 survey (U.S. EPA/NCA).

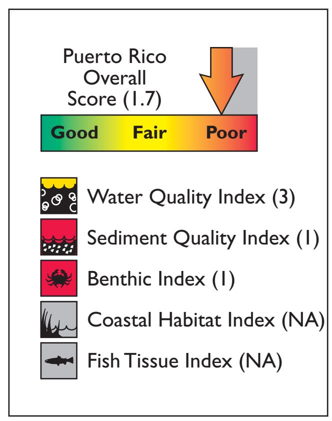


Figure 8-17. The overall condition of Puerto Rico's estuaries is borderline poor.

The overall condition of Puerto Rico's estuarine waters is borderline poor (Figure 8-17). Based on information collected in 2000 from 47 sites throughout Puerto Rico, none of the assessed estuarine area is in good ecological condition (Figure 8-18). Sixteen percent of assessed estuaries are threatened for aquatic life use, and 77% of Puerto Rico's estuarine area showed indications of poor aquatic life conditions (benthic community conditions) or showed degradation in water or sediment quality.

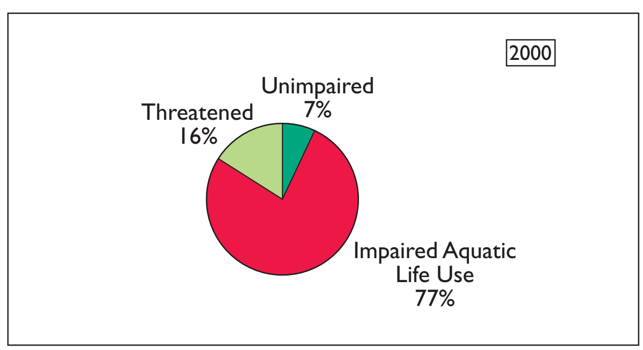


Figure 8-18. Puerto Rico estuarine condition (U.S. EPA/NCA).

Water Quality Index

Based on the cumulative score for the five water quality indicators (nitrogen, phosphorus, and chlorophyll, dissolved oxygen, and water clarity), the water quality index in Puerto Rico's estuaries is fair. Although only 9% of waters were determined to have poor water quality (poor condition for two or more indicators), 63% of estuarine waters in Puerto Rico are rated either poor or fair (Figure 8-19).

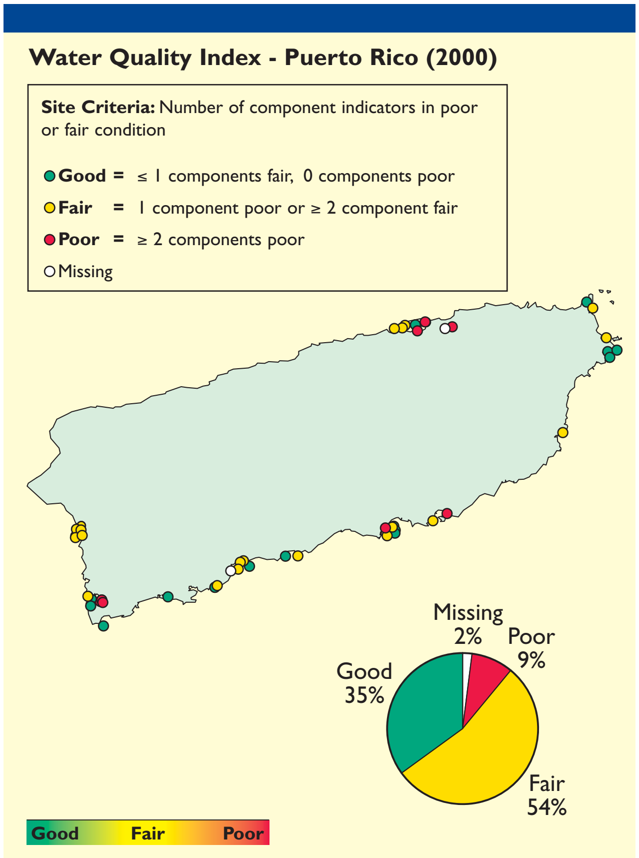


Figure 8-19. Water quality index data for Puerto Rico's estuaries (U.S. EPA/NCA).

Nutrients: Nitrogen and Phosphorus

Nutrients in Puerto Rico's estuaries are rated fair for nitrogen and good for phosphorus for the period sampled. High DIN concentrations for tropical estuarine ecosystems (> 0.1 mg/L) were not observed at any of the sampling locations in Puerto Rico (Figure 8-20).

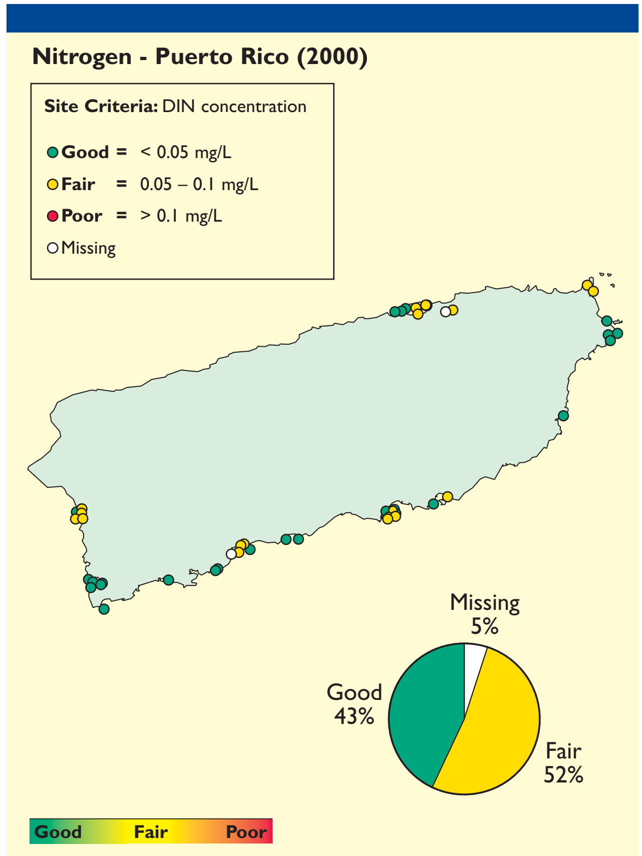


Figure 8-20. DIN concentration data for Puerto Rico's estuaries (U.S. EPA/NCA).

The sampling conducted in the EPA NCA Program has been designed to estimate the percent of estuarine area (nationally or in a region or state) in varying conditions and is displayed as pie diagrams. Many of the figures in this report illustrate environmental measurements made at specific locations (colored dots on maps); however, these dots (color) represent the value of the indicator specifically at the time of sampling. Additional sampling may be required to define variability and to confirm impairment or the lack of impairment at specific locations.

Although DIN concentrations did not exceed 0.1 mg/L (the value indicative of poor conditions), 52% of estuarine waters had concentrations between 0.05 and 0.1 mg/L and were thus rated fair. Elevated phosphorus concentrations (> 0.01 mg/L) occurred in 6% of the estuarine waters of Puerto Rico (Figure 8-21). Elevated concentrations of dissolved nutrients are not expected during late summer months in tropical coastal waters because freshwater inflow is lower and available dissolved nutrients are readily utilized by phytoplankton during summer months.

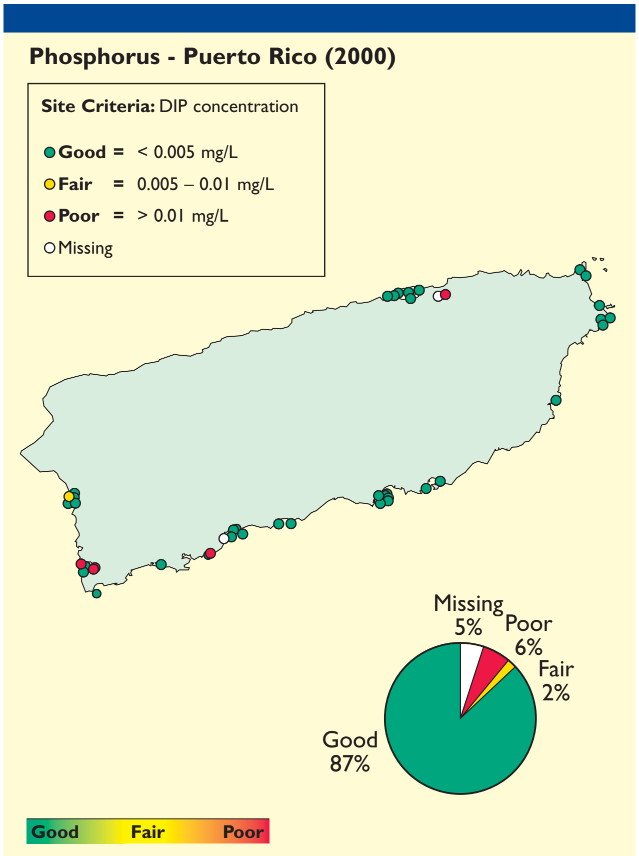


Figure 8-21. DIP concentration data for Puerto Rico's estuaries (U.S. EPA/NCA).

Chlorophyll *a*

Puerto Rico's estuaries are rated poor for chlorophyll *a*. Twenty-nine percent of estuarine waters in Puerto Rico have concentrations of chlorophyll *a* that were greater than 1 g/L (Figure 8-22), indicating that whatever dissolved nutrients are available in the summer months are rapidly incorporated into phytoplankton biomass.

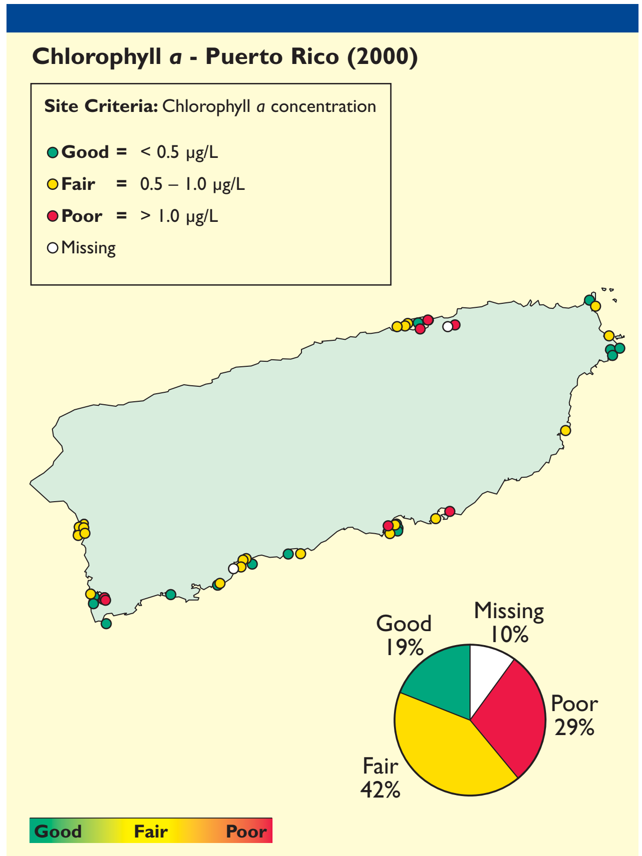


Figure 8-22. Chlorophyll *a* concentration data for Puerto Rico's estuaries (U.S. EPA/NCA).

Jobos Bay National Estuarine Research Reserve. Sea turtles are occasionally seen near seagrass meadows around coral reefs in the Reserve (NOAA National Estuarine Research Reserve Collection, Jobos Bay, Puerto Rico).

Water Clarity

Water clarity in Puerto Rico's estuarine waters is fair. Water clarity was estimated by light penetration through the water column and compared with the reference condition for tropical ecosystems supporting SAV and coral communities. In approximately 20% of the waters in Puerto Rican estuaries, less than 20% of surface light penetrated to a depth of 1 meter (Figure 8-23).

Dissolved Oxygen

Dissolved oxygen conditions in Puerto Rico's estuaries are good, except for in a single location in San Juan Harbor. The NCA estimates for Puerto Rico's estuaries show that about 1% of bottom waters in these estuaries have hypoxic conditions or low dissolved oxygen (<2 mg/L) on a continual basis in late summer (Figure 8-24). This area is associated with the inner reaches of San Juan Harbor.

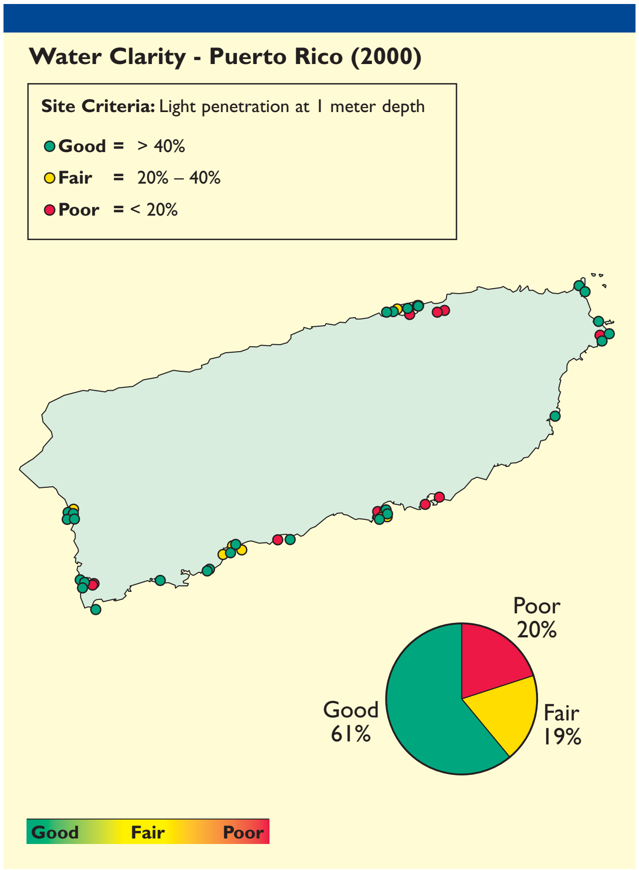


Figure 8-23. Water clarity condition for Puerto Rico's estuaries (U.S. EPA/NCA).

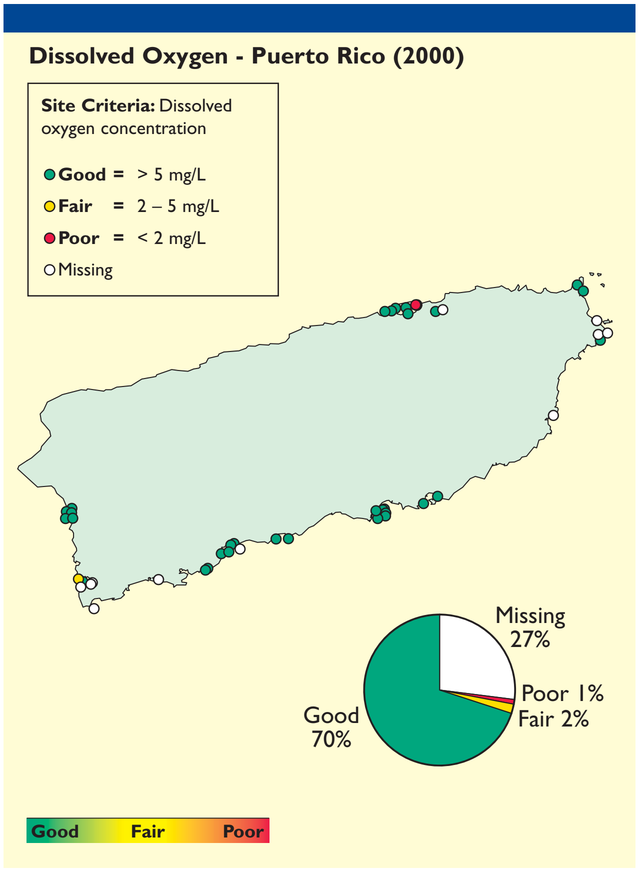


Figure 8-24. Dissolved oxygen concentration data for Puerto Rico's estuaries (U.S. EPA/NCA).

A snorkeler encounters a friendly, slow-moving manatee (Paul Goetz).

Sediment Quality Index

The condition of the estuarine sediments of Puerto Rico was determined to be poor. Sixty-one percent of the estuarine sediments in Puerto Rico displayed poor condition for one or more of the three indicators—sediment contaminants, sediment toxicity, and the proportion of sediments that contains TOC (Figure 8-25).

Sediment Toxicity

Only 3% of sediments sampled were toxic to test organisms (Figure 8-26). As a result, Puerto Rico's estuarine sediments are ranked good with regard to sediment toxicity. Sediments were determined to be toxic when test organisms exposed to the sediments had more than a 20% mortality rate in a 10-day exposure test.

A diver encounters a spiny pufferfish, whose defense strategy is to blow itself up with water to deter would-be predators (Paul Goetz).

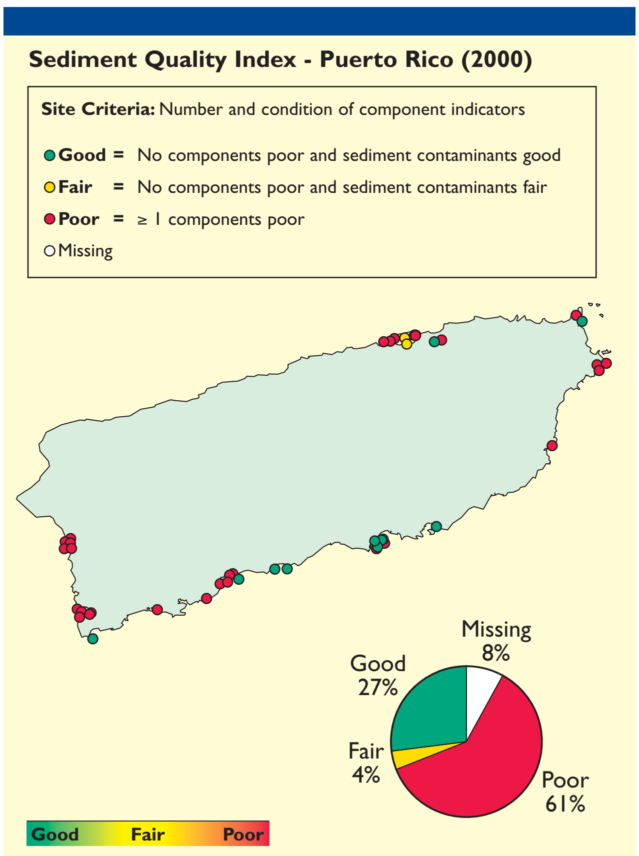


Figure 8-25. Sediment quality index data for Puerto Rico's estuaries (U.S. EPA/NCA).

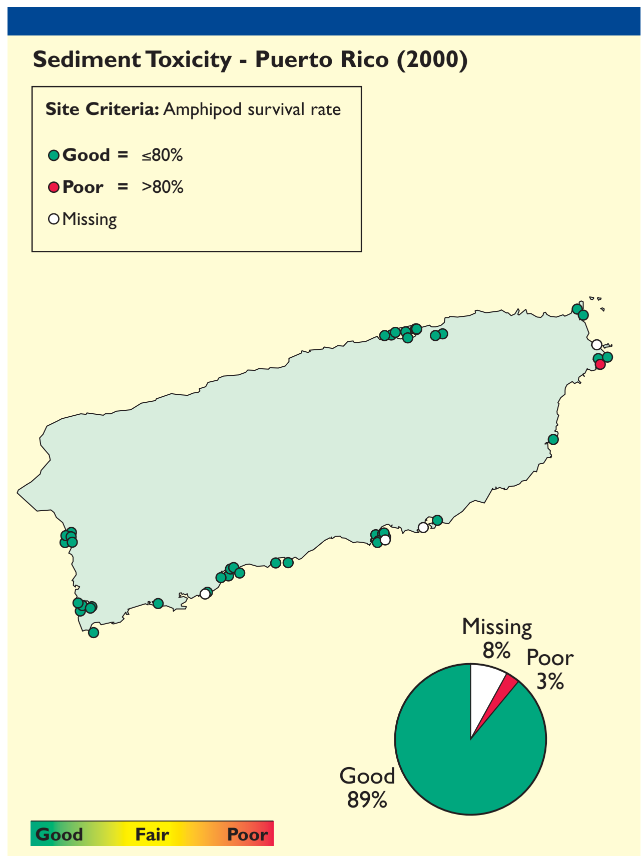


Figure 8-26. Sediment toxicity data for Puerto Rico's estuaries (U.S. EPA/NCA).

Sediment Contaminants

Estuarine sediments in Puerto Rico contained several contaminants that exceeded guidelines representing the likelihood of biological effects. These sediments were ranked poor and included 23% of all estuarine sediments in Puerto Rico (Figure 8-27). In most of these cases, concentrations exceeded the ERM guideline (i.e., the concentration likely to result in biological effects). An additional 44% of sediments exceeded the ERL guideline (i.e., the concentration that potentially could result in a biological effect) for at least one contaminant.

Of the 23% of sediments ranked poor, 100% showed exceedances in heavy metals, 41% showed exceedances in pesticides, and 26% showed exceedances in PCBs. None of these sediments contained PAHs exceeding the guidelines.

Sediment Total Organic Carbon

Puerto Rico sediments are rated poor with regard to sediment TOC. Analyses of estuarine sediments in Puerto Rico showed that 44% contained TOC content greater than 5% (Figure 8-28) and were thus ranked poor. An additional 33% of sediments contained between 2% and 5% TOC. Although higher percentages of TOC would be expected in tropical regions (sometimes 2% to 3%), TOC levels in estuarine sediments above 5% are often associated with organic loading to the estuaries via untreated wastewaters, agricultural runoff from livestock areas, and industrial discharges. However, these elevated TOC levels are occasionally associated with natural processes in mangrove estuaries.

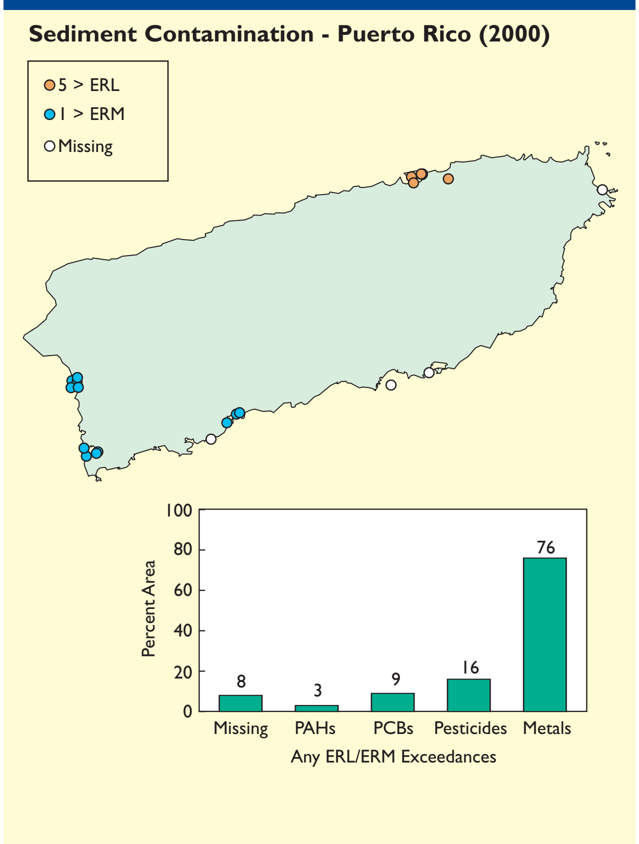


Figure 8-27. Sediment contaminant data and locations for sites with more than five contaminants exceeding ERL guidelines or one contaminant exceeding ERM guidelines in Puerto Rico (U.S. EPA/NCA).

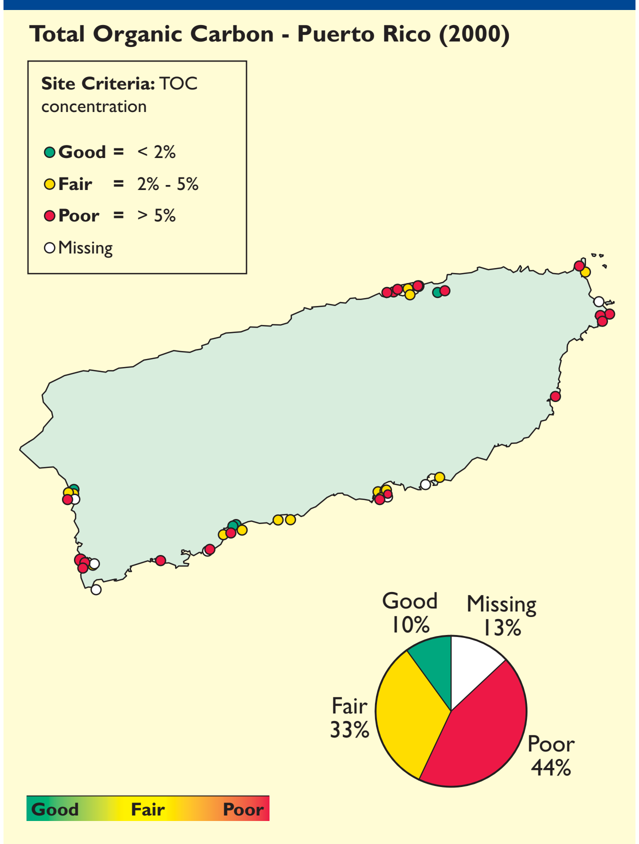


Figure 8-28. Sediment TOC data and sample sites in Puerto Rico (U.S. EPA/NCA).

Benthic Index

A benthic index has not yet been developed for Puerto Rico, but one will be developed as additional data are collected. As a surrogate for benthic condition, the benthic samples from Puerto Rico's estuaries were examined using ecological community indicators: biological diversity, species richness, and abundance. Biological diversity and species richness are measurements that contribute to all of the benthic indices developed by the NCA Program in the Northeast Coast, Southeast Coast, and Gulf Coast regions. Biological diversity is directly affected by natural gradients in salinity and silt-clay content. Analyses using data for Puerto Rico showed no significant relationships between benthic diversity and either salinity or silt-clay content. Thus, benthic diversity was used directly to evaluate benthic condition. If a site's benthic diversity was less than 75% of the observed mean diversity for all locations in Puerto Rico, the site was rated poor (Figure 8-29).

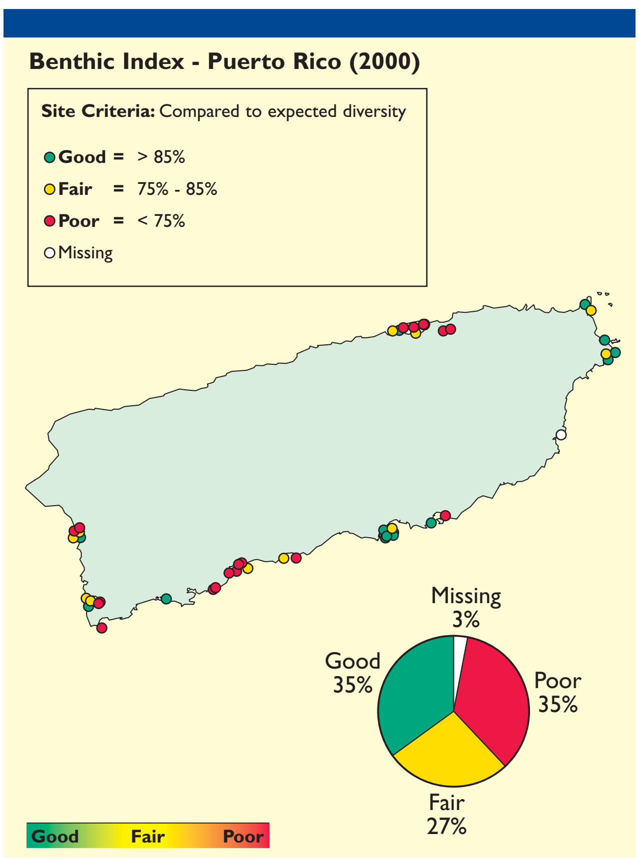


Figure 8-29. Benthic index data for Puerto Rico's estuaries (U.S. EPA/NCA).

Overall benthic condition in Puerto Rico's estuaries is rated poor. Thirty-five percent of the estuarine sediments in Puerto Rico had low benthic diversity (Figure 8-29). Of these areas of low benthic diversity, 90% co-occurred with poor sediment conditions, and 60% co-occurred with poor water quality conditions (Figure 8-30).

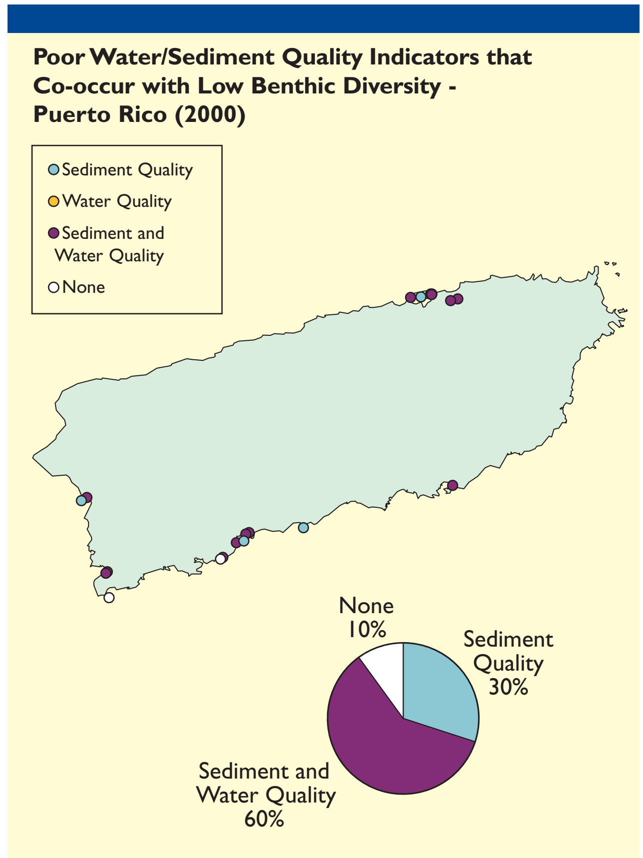


Figure 8-30. Indicators of poor water/sediment quality that co-occur with low benthic diversity in Puerto Rico (U.S. EPA/NCA).

Coastal Habitat Index

The coastal wetland indicator for Puerto Rico cannot be scored because the only information available regarding the acreage of coastal wetlands for Puerto Rico represents a single point in time, and rate of loss cannot be determined from this value. In 1990, the acreage of coastal wetlands in Puerto Rico was determined to be 17,300 acres. Although acreage estimates for 2000 are not available, it is clear that losses to coastal wetland acreage in Puerto Rico can be affected by development, sea-level rise, and interference with normal erosional/depositional processes.

Puerto Rico Assessment and Advisory Data

Clean Water Act Section 305(b) Assessments

Puerto Rico assessed 175 linear miles of estuaries (total number of estuarine square miles is unknown) and 550 linear miles of shoreline (100%) for its 2000 305(b) report. Of estuarine miles, 6% fully support their designated uses, 10% are threatened for one or more uses, and the remaining 84% are impaired by some form of pollution or habitat degradation (Figure 8-31). Fifty-five percent of ocean shoreline fully supports its designated uses, 24% is threatened for one or more uses, and the remaining 21% is impaired by some form of pollution or habitat degradation (Figure 8-32). Individual use support for assessed shoreline in Puerto Rico is shown in Figure 8-33.

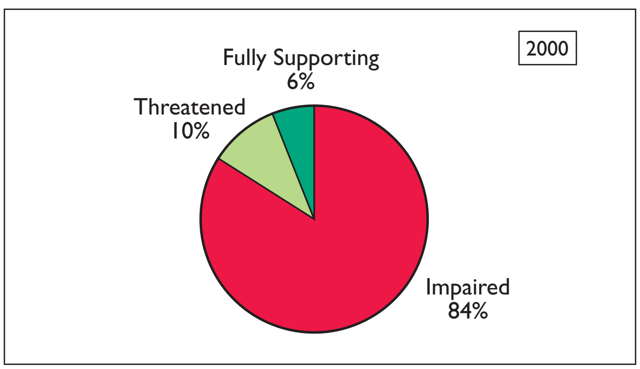


Figure 8-31. Water quality in assessed estuaries in Puerto Rico (U.S. EPA, 2002). Puerto Rico assessed 175 linear miles of estuaries, but the total number of estuarine square miles is

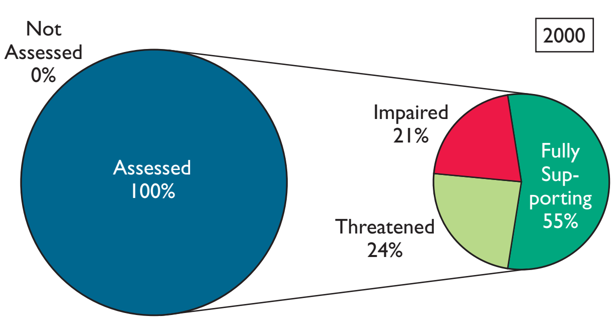


Figure 8-32. Water quality for assessed shoreline waters in Puerto Rico (U.S. EPA, 2002).

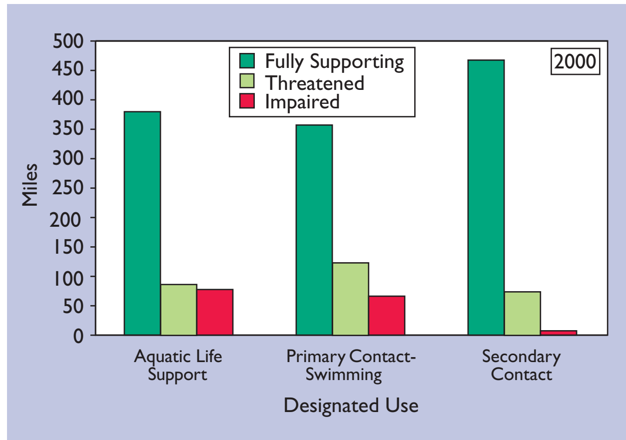


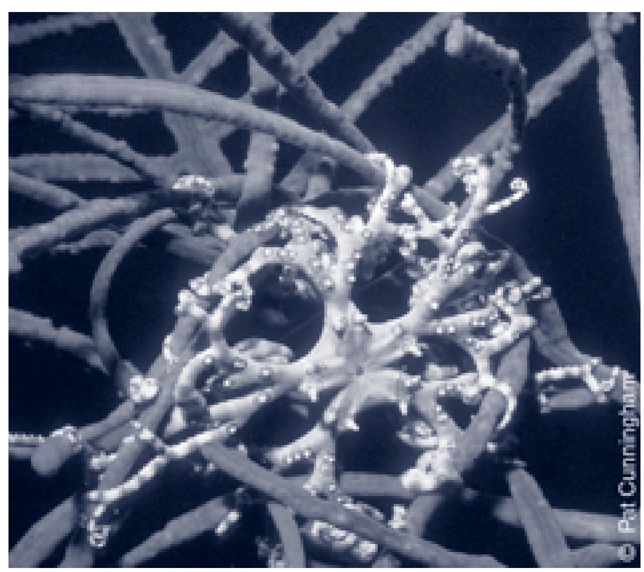
Figure 8-33. Individual use support for assessed shoreline waters in Puerto Rico (U.S. EPA, 2002).

Fish Consumption Advisories

Puerto Rico did not report fish consumption advisory information to EPA in 2002 (U.S. EPA, 2003c).

Beach Advisories and Closures

Puerto Rico reports beach advisories and closure data to EPA, but of the 24 beaches reporting in Puerto Rico, none reported being affected by either an advisory or a closure during 2002 (U.S. EPA, 2003a).



A juvenile basket star entwines itself in the soft coral for protection during the day (Pat Cunningham).

Coastal Biological Invasions

Biological invasion is considered the greatest cause of loss of plant and animal diversity after habitat destruction (Vitousek et al., 1997). The National Invasive Species Council reports that early detection of invasive species and a quick, coordinated response can eradicate or contain these invasions at much lower cost than long-term control programs, which may be unfeasible or prohibitively expensive. Carlton (2001) postulated that eradication of new populations of non-native species may succeed with the implementation of an early warning system. While there are several terrestrial models (e.g., the USDA's Animal and Plant Health Inspection Service), there is no such system for coastal waters, nor is there a national plan to monitor, share information, or advise field response teams on how best to control alien species before they become widespread.

With growing scientific concern for the increasing rate of biological introductions to United States coastal waters and the relative lack of action to reverse this trend, NOAA initiated in fiscal year 2002 a new coastal alien species program with five components:

(1) an inventory of coastal marine species

(2) a warning system to alert managers

(3) a national information dissemination system

(4) risk assessments and predictions of alien species becoming invasive

(5) early detection and monitoring of alien species.

The first implemented prototype component of this program is the Hawaiian Pilot Reporting, Warning, and Information Dissemination System for Coastal Alien Species. One of many partners, Bishop Museum, is preparing an electronic inventory of Hawaiian coastal species. Taxonomic experts will peer review this species inventory, while the state of Hawaii, the University of Hawaii, NOAA's Fisheries Service, and other organizations are making their monitoring data available to NOAA. NOAA's Coastal Data Development Center will integrate the monitoring data and link it to the inventory to create an information-dissemination system that Web site users can query by species name, search by geographic area, and download summary data to their desktops.

An up-do-date inventory of native and alien species known to reside in U.S. coastal waters and a verification process for validating the names of species reported as new to a region is integral to building a reliable reporting and warning system for biological invaders. The American Fisheries Society (AFS) has published peer-reviewed volumes on the names of fishes and invertebrates of Canada and the continental United States, and updates the volumes each decade. A primary partner in the new venture, AFS has granted copyrights to NOAA so that this information can be used to build the initial baseline inventory. Voucher specimens and photographs will be required before reported species can be confirmed, a warning to coastal managers issued, and the baseline inventory revised. Members of the museum community and other taxonomic experts who helped prepare and peer review the AFS volumes have volunteered to assist in the reporting system and to verify species reported as potentially new to a region.

Following successful testing of the prototype system in fiscal year 2003, NOAA and its partners will expand the Hawaiian coastal inventory, reporting, warning, and information-dissemination system to include other regions of the United States. (Other likely candidate regions include the Gulf of Mexico and Caribbean and Pacific Islands.) NOAA and the USGS are planning a joint venture in fiscal year 2004 to initiate the early detection and monitoring components of the alien species program.

Other Island Systems

Coastal Monitoring Data

No consistent coastal monitoring programs exist for American Samoa, Guam, the Northern Mariana Islands, or the U.S. Virgin Islands. The NCA Program may include one or more of these territories in the 2004 survey.

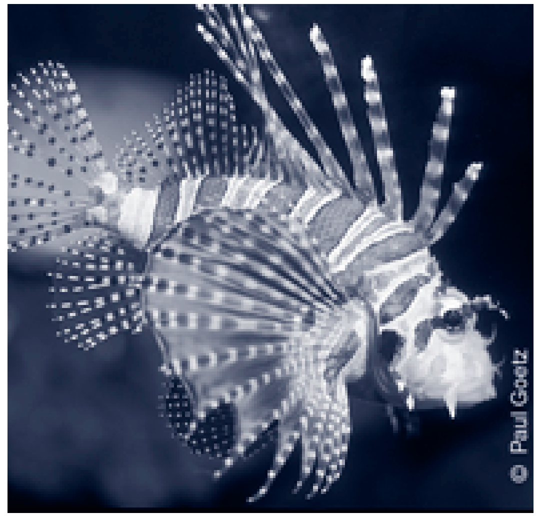
American Samoa

Large Marine Ecosystem Fisheries

The islands of American Samoa are partially surrounded by a narrow, fringing coral reef that is inhabited by a diverse array of fish and invertebrates. These reefs are harvested by local residents on an almost daily basis. Total inshore subsistence catch for 1993–1995 averaged 160 mt, with a value worth $560,000. The catch is dominated in some years by the coastal migratory species atule, but typically, more resident species such as other jacks, surgeonfish, mullet, octopus, groupers, and snappers are most consistently harvested.

Samoans also fish on the predicted nights of emergence of the paolo worm, whose reproductive segments are considered a delicacy. During its annual spawning, the hind end of the paolo worm containing the reproductive segments or epitokes separate from the anterior end of the worm and swarm to the surface, releasing sperm and eggs into the ocean. These epitokes are collected and consumed by many local fishermen. The head end of the worm remains below and regenerates a new epitoke in preparation for spawning the following year.

For Samoan inshore fisheries, downward trends in catch and CPUE have been observed in recent years, especially when the catches of the highly variable atule have been removed from the analysis.



The beauty of the Pacific lionfish belies its venomous spines (Paul Goetz).

Assessment and Advisory Data

Clean Water Act Section 305(b) Assessments

American Samoa assessed 53 (46%) of its 116 shoreline miles for its 2000 305(b) report. Of the assessed miles, 13% fully support designated uses, 57% are threatened for one or more uses, and the remaining 30% are impaired by some form of pollution or habitat degradation (Figure 8-34). Individual use support for American Samoa's shoreline is shown in Figure 8-35.

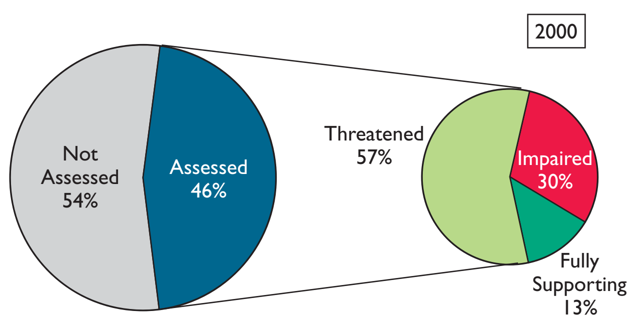


Figure 8-34. Water quality for assessed shoreline waters in American Samoa (U.S. EPA, 2002).

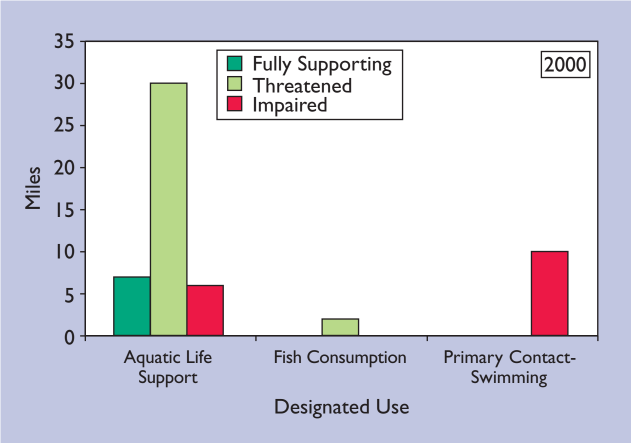


Figure 8-35. Individual use support for assessed shoreline waters in American Samoa (U.S. EPA, 2002).

Fish Consumption Advisories

Since 1993, American Samoa has had a fish consumption advisory in effect for chromium, copper, DDT, lead, mercury, zinc, and PCBs in Inner Pago Pago Harbor (U.S. EPA, 2003c). This estuarine advisory advises all members of the general population (including sensitive populations of pregnant women, nursing mothers, and children) not to consume any fish, fish liver, or shellfish from the waters under advisory. In addition, these same waters are also under a commercial fishing ban that precludes the harvesting of fish or shellfish for sale in commercial markets.

Beach Advisories and Closures

American Samoa did not report monitoring or closing information for any beaches in 2002 (U.S. EPA, 2003a).

Guam

Large Marine Ecosystem Fisheries

Guam is the southernmost and largest island in the Mariana Island Archipelago, and like American Samoa, the principal inshore fisheries are based on a wide assortment of coral reef fishes. Harvested fish include jacks and scads (especially atulai, the bigeye scad), surgeonfish, squirrelfish, fusilier, rudderfish (guili), snappers, mullet (aguas), goatfish (ti'ao), and rabbitfish (mañahak). Invertebrate species include various marine crabs (including land crabs), spiny and slipper lobsters, sea urchins, octopus, squid, cuttlefish, tridacnid clams, topshells, chitons, conchs, strombids, and nerites. Guam's inshore reefs appear to be fully exploited and have shown signs of overfishing. During 1993–1995, the catch of nearshore reef fisheries averaged 90 mt.

Assessment and Advisory Data

Clean Water Act Section 305(b) Assessments

Guam assessed 17 (15%) of its 117 coastal shoreline miles for its 2000 305(b) report. Six percent of the assessed miles fully support designated uses, 35% are threatened for one or more uses, and 59% are impaired because of some form of pollution or habitat degradation (Figure 8-36).

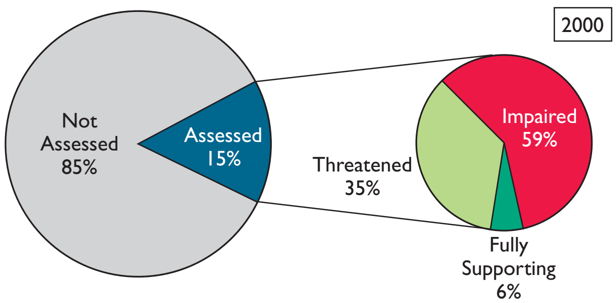


Figure 8-36. Water quality for assessed shoreline waters in Guam (U.S. EPA, 2002).

Fish Consumption Advisories

Guam did not report fish consumption advisory information to EPA in 2002 (U.S. EPA, 2003c).

Beach Advisories and Closures

Of 42 beaches in Guam that reported information to EPA, 39 (93%) were under advisories or closings at least once during 2002. Many of these advisories or closings were issued because monitoring had revealed elevated bacterial levels. Also, some beaches were closed preemptively because of sewage discharges or spills. The major source of elevated bacterial levels was unknown in most cases; however, the source of preemptive closures was sewerline blockage or pipe breakage (U.S. EPA, 2003a).

Northern Mariana Islands

Assessment and Advisory Data

Clean Water Act Section 305(b) Assessments

The Commonwealth of the Northern Mariana Islands assessed 1 (less than 0.01%) of its 15,989 square miles of bays, estuarine areas, and lagoons for its 2000 305(b) report. The entire assessed estuarine area (100%) is impaired because of some form of pollution or habitat degradation (U.S. EPA, 2002).

Fish Consumption Advisories

The Northern Mariana Islands did not report fish consumption advisory information to EPA in 2002 (U.S. EPA, 2003c).

Beach Advisories and Closures

Three beaches reported advisory or closing information, and all three beaches were affected by public beach notifications. The beach notifications were issued in all three cases because monitoring revealed elevated bacteria levels. The sources of the elevated bacterial counts were SSOs, septic systems, stormwater runoff, and other sources.

U.S. Virgin Islands

Assessment and Advisory Data

Clean Water Act Section 305(b) Assessments

The U.S. Virgin Islands assessed 202 (97%) of its 209 miles of coastal shoreline for its 2000 305(b) report. Eighty-six percent of assessed shoreline fully supports its designated uses, 10% is threatened for one or more uses, and the remaining 4% is impaired by some form of pollution or habitat degradation (Figure 8-37). Individual use support for assessed U.S. Virgin Islands shoreline is shown in Figure 8-38.

Fish Consumption Advisories

The U.S. Virgin Islands did not report fish consumption advisory information to EPA in 2002 (U.S. EPA, 2003c).

Beach Advisories and Closures

All three of the main islands of the U.S. Virgin Islands—St. Croix, St. Thomas, and St. John—reported beach advisory and closing data in 2002 (U.S. EPA, 2003a). Of 62 beaches reporting data, only 3% (three beaches) reported advisories or closings, and these three beaches were all on St. Croix. The reason for all three closures was preemptive—sewage discharges or spills of sewage from POTWs.

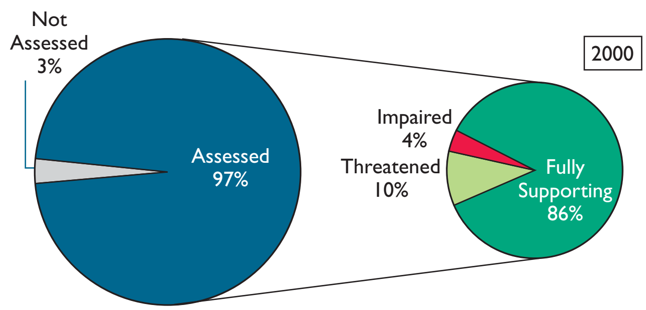


Figure 8-37. Water quality for assessed shoreline waters in the U.S. Virgin Islands (U.S. EPA, 2002).

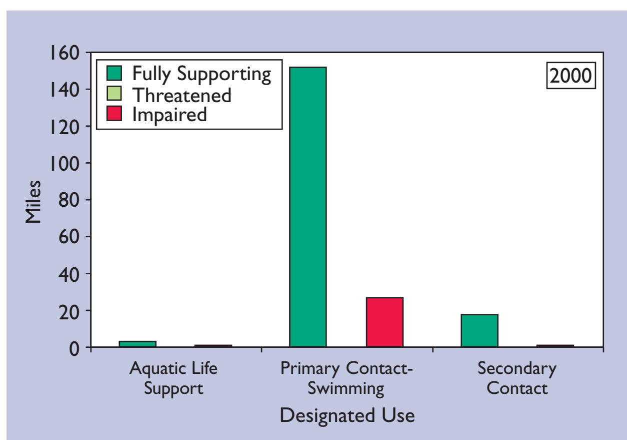
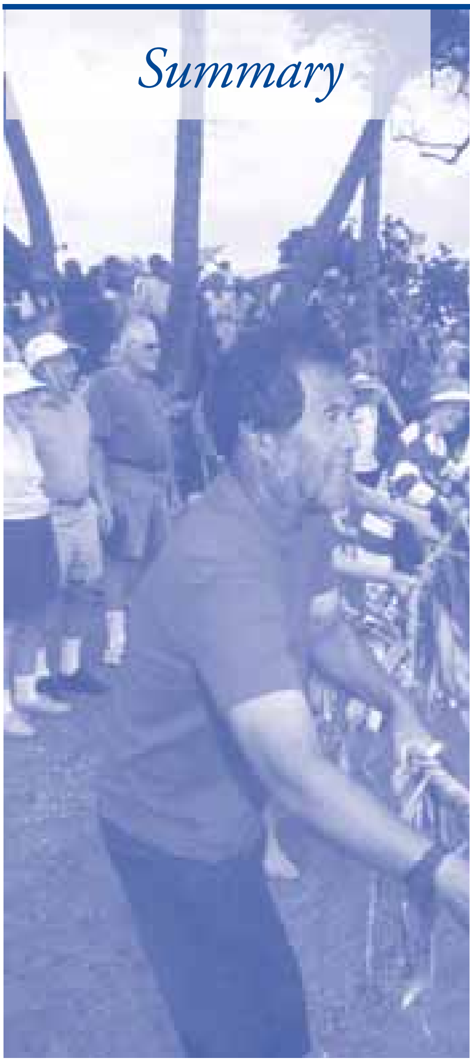


Figure 8-38. Individual use support for assessed shoreline waters in the U.S. Virgin Islands (U.S. EPA, 2002).



Summary

Ecological conditions of the coastal resources in Alaska, Hawaii, Puerto Rico, the U.S. Virgin Islands, and the Pacific island territories of American Samoa, Guam, and the Northern Mariana Islands are largely unknown. Alaska assessed less than 0.1% of its coastal estuaries and less than 0.1% its coastal shoreline in 2000; however, NCA assessments were completed for the Alaskan Province in 2002 and were scheduled in 2004 for Alaska's southeast region (Columbian Province), which includes Juneau and the island passage area. Additional NCA monitoring is planned for the Aleutian, Bering Sea, and Arctic areas in subsequent monitoring years because of the geographic expanse of these areas and the restricted time period in which sampling can be conducted.

Hawaii's 2000 305(b) data suggest that 57% of Hawaii's estuarine area is impaired by some form of pollution or habitat degradation, whereas only 2% of its coastal shoreline is impaired. Most monitoring in Hawaii is focused on known AOCs; therefore, it is difficult to interpret these results. NCA surveys conducted in 2002 and 2004 will provide a less biased view of Hawaii's estuarine condition in future National Coastal Condition Reports.

Although coastal monitoring in Puerto Rico has occurred in some coastal regions, these surveys were almost exclusively conducted in the San Juan area. The NCA Program conducted comprehensive survey of coastal resources in Puerto Rico in 2000. This survey, which included data from 50 sampling stations throughout the island, determined that the overall condition of Puerto Rico's estuarine waters is borderline poor, with 7% of the estuarine condition rated as unimpaired, 16% rated as threatened, and 77% judged to be impaired by some form of pollution. Habitat degradation for Puerto Rico could not be scored because the only information on the island's coastal wetlands represents a single point in time (17,300 acres of wetlands existed on the island in 1990). Puerto Rico's 2000 305(b) data provided similar results on estuarine area conditions, with 6% of assessed estuaries in Puerto Rico fully supporting their designated uses, 10% rated as threatened, and 84% impaired by some form of pollution or habitat degradation.

The 2000 305(b) data for the U.S. Virgin Islands suggests that the islands' coastal resources are in good condition. Approximately 86% of assessed shoreline fully supports its designated uses, 10% is threatened for one or more uses, and only the remaining 4% are impaired by some form of pollution or habitat degradation. Estuarine areas on the U.S. Virgin Islands were not assessed because these islands do not have waterbodies that are true estuaries.

Coastal resources in several of the Pacific island territories are believed to be in good condition; however, available data are relatively scarce for these jurisdictions. The 2000 305(b) data for American Samoa revealed that of the assessed coastline miles, 13% fully support their designated uses, 57% are threatened for one or more uses, and the remaining 30% are impaired by some form of pollution or habitat degradation. The 2000 305(b) data for Guam revealed that of the assessed coastline miles, only 6% fully support their designated uses, 35% are threatened for one or more uses, and the remaining 59% are impaired by some form of pollution or habitat degradation. No water quality assessments of estuarine condition were made for American Samoa or Guam. Finally, the 2000 305(b) data for the Northern Mariana Islands revealed that of the 1 square mile of estuaries and bays assessed (representing less than 0.01% of 15,989 square miles of estuarine area), 100% is impaired by some form of pollution or habitat degradation. The NCA Program may include one or more of these island territories in their 2004 survey to obtain a more comprehensive perspective on estuarine and coastal resources.