DOWNLOAD PDF MARINE ECOSYSTEMS: COASTAL

Chapter 1 : Coastal Areas - The Environmental Literacy Council

We rely on coastal and marine ecosystems, for food, recreation, transportation, and more. And yet, our use of these resources can upset the balance of the entire ecosystem if we aren't careful. NOS is working to understand the science of ecosystems, so that coastal managers and decision makers have the information to make coastal-use decisions.

There are few places on Earth that can match the vibrancy and diversity of life found here. More specifically, the coastal waters of East Africa sustain a great variety of ecologically important species, including species of fish and 40 classes of corals, 5 species of sea turtles, and 35 species of marine mammals, including whales, dolphins, and the endangered dugong. In total, mangroves and other marine ecosystems constitute million acres of coastal East Africa, almost twice the size of the state of California. The coastal communities of Eastern Africa--over 30 million in population--have a strong cultural heritage with rich traditions, and their livelihoods and health are directly connected to natural resources. Pemba, Zanzibar View of coastal forests and rock islands from the ocean, Kenya. Copyright for this video belongs to the copyright owners. The views contained within this video do not necessarily represent the views of Kaskazi Environmental Alliance unless explicitly stated otherwise. Mangroves Mangrove forests literally live in two worlds at once. Growing in the intertidal areas and estuary mouths between land and sea, mangroves are comprised of salt-tolerant trees and other plant species from a range of plant families. They thrive in intertidal zones of sheltered tropical shores, islands, and estuaries. Mangroves have specially adapted aerial and salt-filtering roots and salt-excreting leaves which enable them to occupy the saline wetlands where other plant life cannot survive. Besides the many fish and invertebrates that find refuge, breeding grounds, and nurseries in mangroves, many migratory bird populations rely on the delta and wetlands as stopover and wintering habitat. Any threats to the mangroves, then, endanger the entire ecosystem. The stability that mangroves provide is essential for preventing shoreline erosion. By acting as buffers that catch materials washed downstream, they help stabilize land elevation by sediment accretion, thereby balancing sediment loss. In regions where these coastal fringe forests have been cleared, tremendous problems of erosion and siltation have arisen. Mangroves are important, too, in treating effluent resulting from storms, because the plants absorb excess nitrates and phosphates, thereby preventing contamination of near-shore waters. Moreover, they absorb carbon dioxide and store carbon in their sediments, thus lessening the impact of global warming. Nutrient retention, filtration of pollutants, and sequestration of carbon dioxide: Mangroves absorb carbon dioxide and store carbon in their sediments, therefore lessening the impact of global warming. Also, sea-grass beds and coral reefs depend on healthy mangroves to filter sediments and provide nursery grounds for resident species. Traditional and indigenous coastal populations have depended on mangroves for centuries, collecting products and resources for hundreds or even thousands of years, including construction materials, firewood, medicines, tannin, fibers and dyes, food, and charcoal.

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Chapter 2 : Freshwater & Marine Ecosystems - The Environmental Literacy Council

Coastal and marine ecosystems are among the most productive, yet threatened, ecosystems in the world; they include open ocean marine areas, nearshore coastal areas, areas where freshwater and saltwater mix, and certain terrestrial ecosystems such as sand dunes.

In addition to having a large influence on global heat transport and precipitation, the oceans are comprised of diverse habitats that support a wealth of marine wildlife. They also provide humans with a wide variety of goods and services including foods, recreational opportunities, and transportation corridors. Based upon current scientific evidence, emissions of greenhouse gases from human activities are projected to cause significant global climate change during the 21st century. Such climate change will create novel challenges for coastal and marine ecosystems that are already stressed from human development, land-use change, environmental pollution, and over-fishing. It details the likely impacts of climate change over the next century on U. Temperature changes in coastal and marine ecosystems will influence organism metabolism and alter ecological processes such as productivity and species interactions. Species are adapted to specific ranges of environmental temperature. Species that are unable to migrate or compete with other species for resources may face local or global extinction. Changes in precipitation and sea-level rise will have important consequences for the water balance of coastal ecosystems. Increases or decreases in precipitation and runoff may respectively increase the risk of coastal flooding or drought. Meanwhile, sea-level rise will gradually inundate coastal lands. Coastal wetlands may migrate inland with rising sea levels, but only if they are not obstructed by human development. Climate change is likely to alter patterns of wind and water circulation in the ocean environment. Such changes may influence the vertical movement of ocean waters i. Changes in ocean circulation patterns can also cause substantial changes in regional ocean and land temperatures and the geographic distributions of marine species. Critical coastal ecosystems such as wetlands, estuaries, and coral reefs are particularly vulnerable to climate change. Such ecosystems are among the most biologically productive environments in the world. Their existence at the interface between the terrestrial and marine environment exposes them to a wide variety of human and natural stressors. The added burden of climate change may further degrade these valuable ecosystems, threatening their ecological sustainability and the flow of goods and services they provide to human populations. The authors and the Pew Center gratefully acknowledge the input of Drs. Executive Summary Since life began on earth, changes in the global climate have affected the distribution of organisms as well as their interactions. If this happens, such high rates of change will probably result in local if not total extinction of some species, the alteration of species distributions in ways that may lead to major changes in their interactions with other species, and modifications in the flow of energy and cycling of materials within ecosystems. The predicted changes may have a significant effect on coastal ecosystems, especially estuaries and coral reefs, which are relatively shallow and currently under stress because of human population growth and coastal developments. Significant environmental factors that affect the structure e. Temperature, in particular, influences organism biology, affects dissolved oxygen concentrations in water, and plays a direct role in sea-level rise and in major patterns of coastal and oceanic circulation. Predictions of the effects of climate change on coastal and marine ecosystems are associated with varying degrees of confidence. There is some confidence in predictions of how increases in temperature will affect plant and animal physiology, abundances, and distributions; aquatic oxygen concentrations; and sea level. There is also some confidence in predictions of the effects of sea-level rise on shallow continental margins, including flooding of wetlands, shoreline erosion, and enhanced storm surges. It is also difficult to predict the effects of climate change on precipitation, wind patterns, and the frequency and intensity of storms. Many species are sensitive to temperatures just a few degrees higher than those they usually experience in nature. A rise in temperature as small as 1oC could have important and rapid effects on mortality of some organisms and on their geographic distributions. Given that temperature increases in the coming century are predicted to exceed 1oC, the major biological change resulting from higher temperatures in U. The geographic ranges of heat-tolerant species such as commercial shrimp on the East

Coast may expand northward, while the southern range boundaries of heat-intolerant organisms such as soft clams and winter flounder may retreat northward. The more mobile species should be able to adjust their ranges over time, but less mobile species may not. Such distributional changes would result in varying and novel mixes of organisms in a region, leaving species to adjust to new predators, prey, parasites, diseases, and competitors. Some species would flourish and others would not, and we have no way of predicting at present which species would prevail. Fisheries would also be affected as some species are lost from a region or as others arrive. Warmer conditions would support faster growth or a longer growing season for aquacultured species, but might become too warm for some species in a particular region, requiring a change in the species being cultured. Because water expands and glaciers melt as temperatures warm, higher temperatures would raise sea levels, inundating coastal lands and eroding susceptible shores. In salt marsh and mangrove habitats, rapid sea-level rise would submerge land, waterlog soils, and cause plant death from salt stress. If sediment inputs were limited or prevented by the presence of flood-control, navigational, or other anthropogenic structures, marshes and mangroves might be starved for sediment, submerged, and lost. These plant systems can move inland on undeveloped coasts as sea levels rise on sedimentary shores with relatively gentle slopes, but seaside development by humans would prevent inland migration. Marshes and mangroves are critical contributors to the biological productivity of coastal systems and function as nurseries and as refuges from predators for many species. Thus their depletion or loss would affect nutrient flux, energy flow, essential habitat for a multitude of species, and biodiversity. Some organisms might thrive e. Other organisms would be lost from affected areas if their feeding or nesting grounds disappeared and they could not use alternative habitats e. Climate change may decrease or increase precipitation, thereby altering coastal and estuarine ecosystems. Decreased precipitation and delivery of fresh water alters food webs in estuaries and affects the amount of time required to flush nutrients and contaminants from the system. Although reduced river flow would decrease nutrient input in estuaries with relatively uncontaminated watersheds, there could be different effects in polluted watersheds that contain point sources of nutrients and contaminants that are not a function of river flow. The combined effects of human development and reduced river flow would degrade water quality conditions, negatively affecting fisheries and human health through such changes as increased presence of harmful algal blooms and accumulation of contaminants in animals and plants. Increased rainfall and resultant freshwater runoff into an estuary would increase stratification of the water column, leading to depleted oxygen concentrations in estuaries with excess nutrients. It would also change the pattern of freshwater runoff in coastal plain watersheds, such as along the southern Atlantic coast and in the Gulf of Mexico. In those regions where water resources are managed by humans, the effects of increased flooding would depend on how managers controlled regional hydrology. Wind speed and direction influence production of fish and invertebrate species, such as in regions of upwelling along the U. If upwelling is slowed by changes in wind and temperature, phytoplankton production could be lowered. Where upwelling increases as a result of climate change, productivity should also increase. In some coastal regions, alongshore wind stress and buoyancy-driven density differences help produce water movements that transport larval fish and invertebrates to nurseries, such as in estuaries. Climate-related changes in these circulation patterns that hinder such transport might alter the species composition of coastal ecosystems. Increases in the severity of coastal storms and storm surges would have serious implications for the well-being of fishery and aquaculture industries, as has been demonstrated by the effects of recent intense hurricanes along the U. Most ecosystems can recover rapidly from hurricanes, but the anthropogenic alteration of coastal habitats may increase the ecological damage associated with more severe storms. The immense area and the modest extent of our knowledge of the open ocean hamper predictions of how ocean systems will respond to climate change. Nevertheless, it is clear that increased temperature or freshwater input to the upper layers of the ocean results in increased density stratification, which affects ocean productivity. Because productivity varies regionally, simple extrapolation to particular U. Climate-driven changes in the intensity or timing of any of these phenomena could lead to marked changes in water column mixing and stratification and, ultimately, a reorganization of the ecosystems involved, for better or worse. Increased CO_2 concentrations lower ocean pH, which in turn changes ocean carbonate chemistry. This may have negative effects on the myriad planktonic organisms that use calcium carbonate to build their skeletons. Some of these organisms appear to play important roles in ocean-atmosphere interactions, but we cannot yet predict any effects that might arise from their diminishment. Finally, coral reefs, which are already threatened by multiple stressors such as abusive fishing practices, pollution, increased disease outbreaks, and invasive species, would also be at risk from changes in seawater chemistry, temperature increase, and sea-level rise. Lower ocean pH and changed carbonate chemistry would decrease the calcification necessary for building coral reef material. Increased warming would lead to coral bleaching, the breakdown in the symbiotic relationship between the coral animal and the unicellular algae zooxanthellae that live within coral tissues and allow corals to thrive in nutrient-poor waters and to secrete massive calcium carbonate accumulations. If sea levels were to rise at a pace faster than corals could build their reefs upward, eventually light conditions would be too low for the zooxanthellae to continue photosynthesis. On reefs near low-lying coastal areas, sea-level rise would likely increase coastal erosion rates, thus degrading water quality and reducing light penetration necessary for photosynthesis and increasing sedimentation that smothers and stresses coral animals. Losses of coral reefs would mean losses in the high biodiversity of these systems as well as the fisheries and recreational opportunities they provide.

Chapter 3 : Coastal Ecosystem Science

Maintaining healthy and sustainable coastal and marine ecosystems relies on scientific understanding of how these areas function across landscape scales.

Estuaries, places where rivers meet the sea, are among the most productive environments for supporting commercial fisheries around the world and are vital to the economy. This makes the protection and restoration of these complex ecosystems particularly important. NOS is working to identify the link between human activities and ecological disturbances in estuarine environments. Within any given area, living and nonliving interact with each other. Together, these things form an ecosystem. Because all of the elements within an ecosystem are interrelated, these systems can be quite complex. Changing even one element can impact the entire ecosystemâ€”for good, or for bad. We rely on coastal and marine ecosystems, for food, recreation, transportation, and more. NOS is working to understand the science of ecosystems, so that coastal managers and decision makers have the information to make coastal-use decisions that benefit us and do not harm the environment. Because ecosystems are intertwined webs of living and nonliving things, even the smallest change can impact the entire ecosystem. Things such as climate change and associated changes like increases in sea level and ocean temperature, as well as extreme natural events, such as hurricanes, droughts, and harmful algal blooms , can all impact ecosystems. WE can impact ecosystems, too, by causing pollution, introducing invasive species, or irresponsibly using land and water resources. How does NOS study ecosystems? NOS uses research, monitoring, and assessments to better understand, and manage, things that stress coastal ecosystems. The programs and projects that support this effort are lengthy. They span from broad ecosystem-wide and watershed-scale projects to microbiological and analytical chemistry projects that delve into DNA analysis and bio-chemical reactions. To synthesize the array of many science investigations on an ecosystem scale, NOS develops integrated assessments. These describe the ecosystem, assess its current condition or health, forecast future ecological health based on current management, and evaluate alternative management options and their consequences. Coastal oceans The coastal ocean encompasses a broad range of saltwater ecosystems, from estuaries and coral reefs to rocky shores and mangrove forests. NOS works to understand and anticipate changes in coastal ecosystems as they become stressed. NCCOS is also evaluating different habitat restoration techniques for seagrass beds, oyster beds, and coral reefs. Despite the importance of reefs, these ecosystems are in trouble. NOS coastal ecosystem science is working to understand the extent of and reasons for the decline of coral reefs and to provide managers with more effective ways to protect them. From providing data and models help coastal managers predict the impacts of alternative management decisions regarding marine protected areas, fishing regulations, recreation use, pollutants, and coastal development, to performing inventories, developing maps, and monitoring coral reef ecosystems using computer and remote sensing technologies that inexpensively map coral reef ecosystems with increased speed and accuracy, NOS scientists are helping decision makers respond to changing environmental conditions. Estuaries Estuaries, places where rivers meet the sea, are among the most productive environments for supporting commercial fisheries around the world and are vital to the economy. For example, researchers at the National Centers for Coastal Ocean Science are using remote sensing and physical observation to provide coastal managers with the tools needed to protect public health, restore damaged habitats, and improve community interactions with surrounding ecosystems. National Estuarine Research Reserves The National Estuarine Research Reserve System is a network of 27 protected areas established for long-term research, education, and stewardship. The sites within the estuarine reserve system protect more than 1. These living laboratories are places to conduct long-term research, and monitoring, education and also serve as reference sites for comparative studies. Reserve field staff work with local communities and regional groups on natural resource management issues, such as non-point source pollution, habitat restoration and invasive species. Designated by Congress, these special ocean and Great Lakes areas are designed to protect natural and cultural resources, while allowing people to use and enjoy our oceans and coasts.

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Chapter 4 : Coastal Marine Ecosystems

USGS scientists, in collaboration with key partners, assess ecological patterns and processes within important ecological systems, such as Coastal Marine Ecosystems, to understand the status and trends of organisms and habitats at large spatial scales to support restoration of these important ecological systems.

Chapter 5 : Coastal and Marine Ecosystems - Alaska Nature and Science (U.S. National Park Service)

Coastal and Marine Ecosystems Alaska has nearly 34, miles of shorelineâ€"more than all of the lower 48 U.S. combinedâ€"and 3, miles are protected within parks. The ocean is an integral part of Alaska's aquatic and terrestrial ecosystems, weather, economy, history, and culture.

Chapter 6 : Marine ecosystem - Wikipedia

Coastal and Marine Ecosystems Program, Seaside, California. likes. The Coastal and Marine Ecosystems Program is an education and research program at.

Chapter 7 : Coastal and Marine Ecosystem â€" Caribbean Environment Programme

Center for Coastal and Marine Ecosystems Cooperative Science Centers (Awards) Share This. SHARE. Share to Twitter Share to Facebook Share by email Print.

Chapter 8 : WIOC Home - WIOC

The Coastal Marine Group (CMG) is a specialist niche operator in shallow water mapping and surveying, meeting the needs of researchers, managers, and developers of New Zealand's marine and water resources.

Chapter 9 : Marine habitats and ecosystems - Marine Biodiversity Wiki

Marine ecosystems are essential for the overall health of both marine and terrestrial environments. According to the World Resource Center, coastal habitats account for about one-third of marine biological productivity.