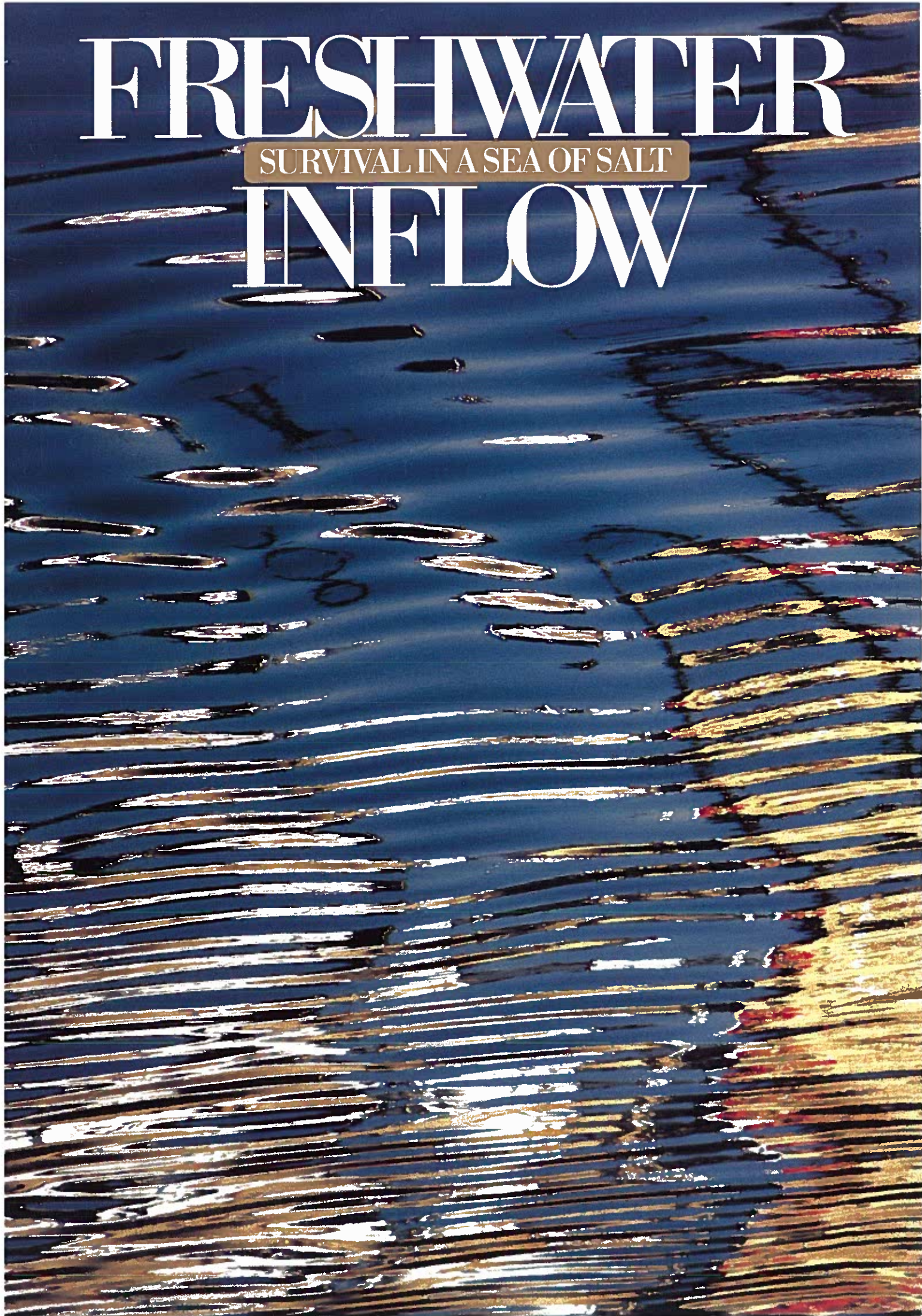


FRESHWATER

SURVIVAL IN A SEA OF SALT

INFLOW




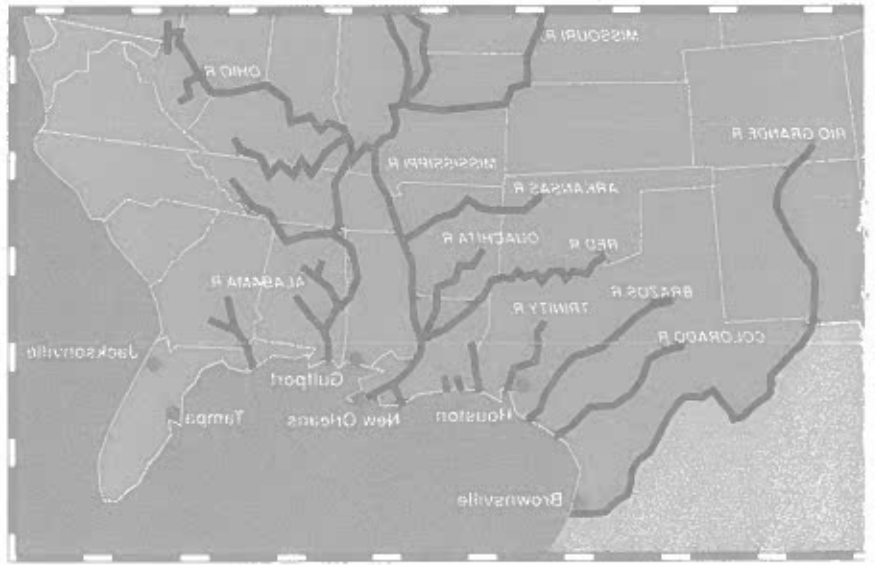
*All that we do
is touched
with ocean,
yet we remain
on the shore
of what we know.*

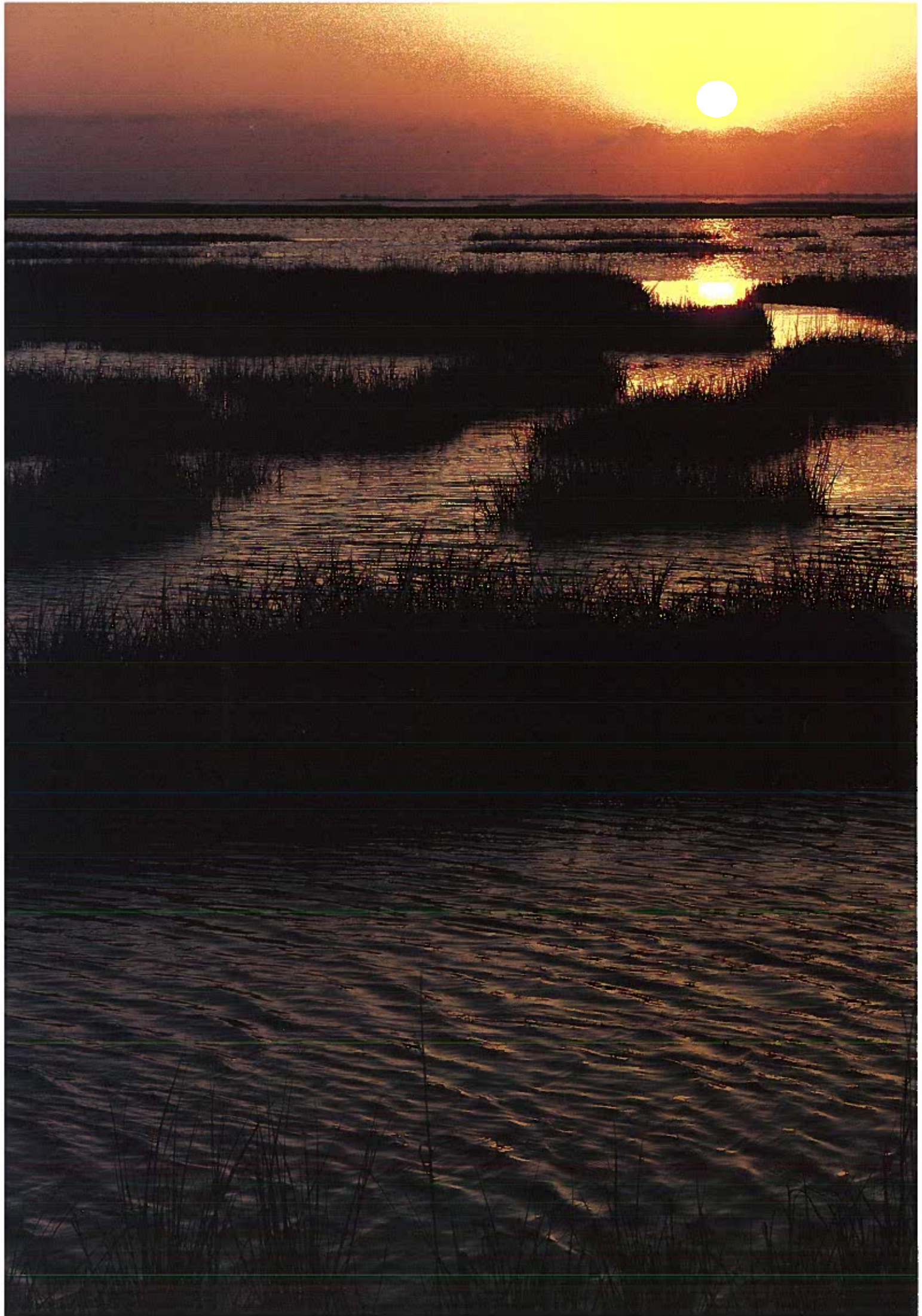
Richard Wilbur

Water drains from all directions into the bays and estuaries bordering the Gulf of Mexico. Some comes down major rivers from as far away as Colorado, North Dakota, Indiana and Tennessee. Some drains down streams from hills and mountains nearer the Gulf. Altogether, thousands of miles of streams and rivers carry freshwater runoff from more than two-thirds of the 48 contiguous states. As a result of this freshwater, the bays and estuaries — reaching from the Texas-Mexico border to southwest Florida — are some of the most productive ecosystems in the United States. 🌿



United States.  productive ecosystems in the Florida — are some of the most Texas-Mexico border to southwest and estuaries — reaching from the result of this freshwater, the bays of the 48 contiguous states. As a runoff from more than two-thirds streams and rivers carry freshwater Altogether, thousands of miles of and mountains nearer the Gulf. drains down streams from hills Indiana and Tennessee. Some away as Colorado, North Dakota, down major rivers from as far the Gulf of Mexico. Some comes the bays and estuaries bordering Water drains from all directions into





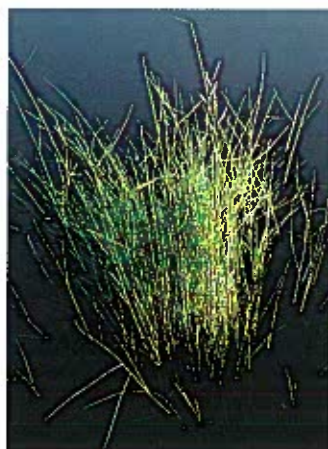
Importance

Freshwater inflows perform three major functions. First, they blend with the Gulf's seawater to provide a range of salt concentrations. Many of the animals that live in the estuary need water with different levels of salt concentrations during the various stages in their life cycles. Many important marine species de-

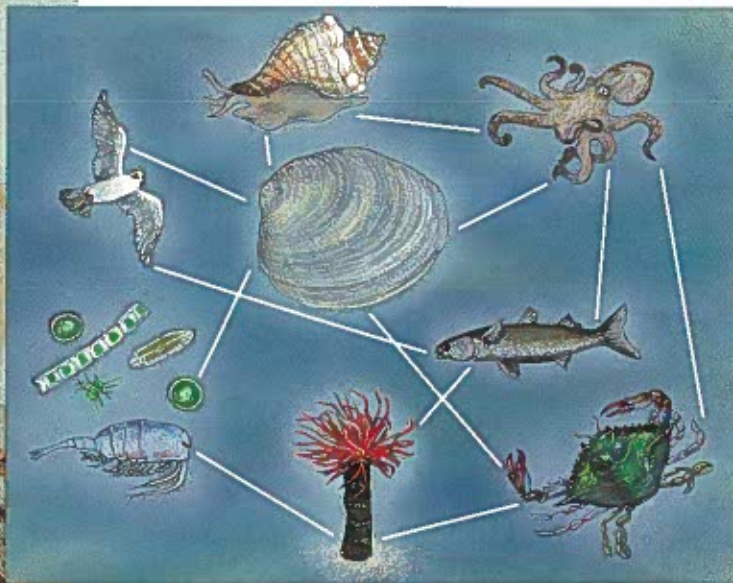
A healthy salt marsh may produce seven times as much protein as a wheat field.

pend on estuaries during at least part of their life cycle. Some can live nowhere else: without estuaries, for example, there would be no oysters. 🐚 Second, freshwater inflows bring the essential nutrients that are the first level of the

food chain of estuary and bay ecosystems. Fertilizers (nitrogen and phosphorus, as well as decomposing organic matter) are carried by rainwater into the rivers and streams, and finally to the bays and estuaries.



Microscopic phytoplankton, the first level of many food chains, needs those dissolved nutrients to survive and multiply. Larger plants that live in the bays and estuaries also need nutrients to grow. Those plants then provide food and breeding, hatching, resting and protective areas for many forms of aquatic and terrestrial animals. Ultimately,



the nutrients are converted into foods and other products that are useful to people. A healthy salt marsh may produce seven times as much protein as a wheat field.

🐞 Third, rivers and streams also bring in sediments. They deposit sand, silt and clay when they slow down as they enter the Gulf. The

Many important marine species depend on estuaries during part of their life cycle.

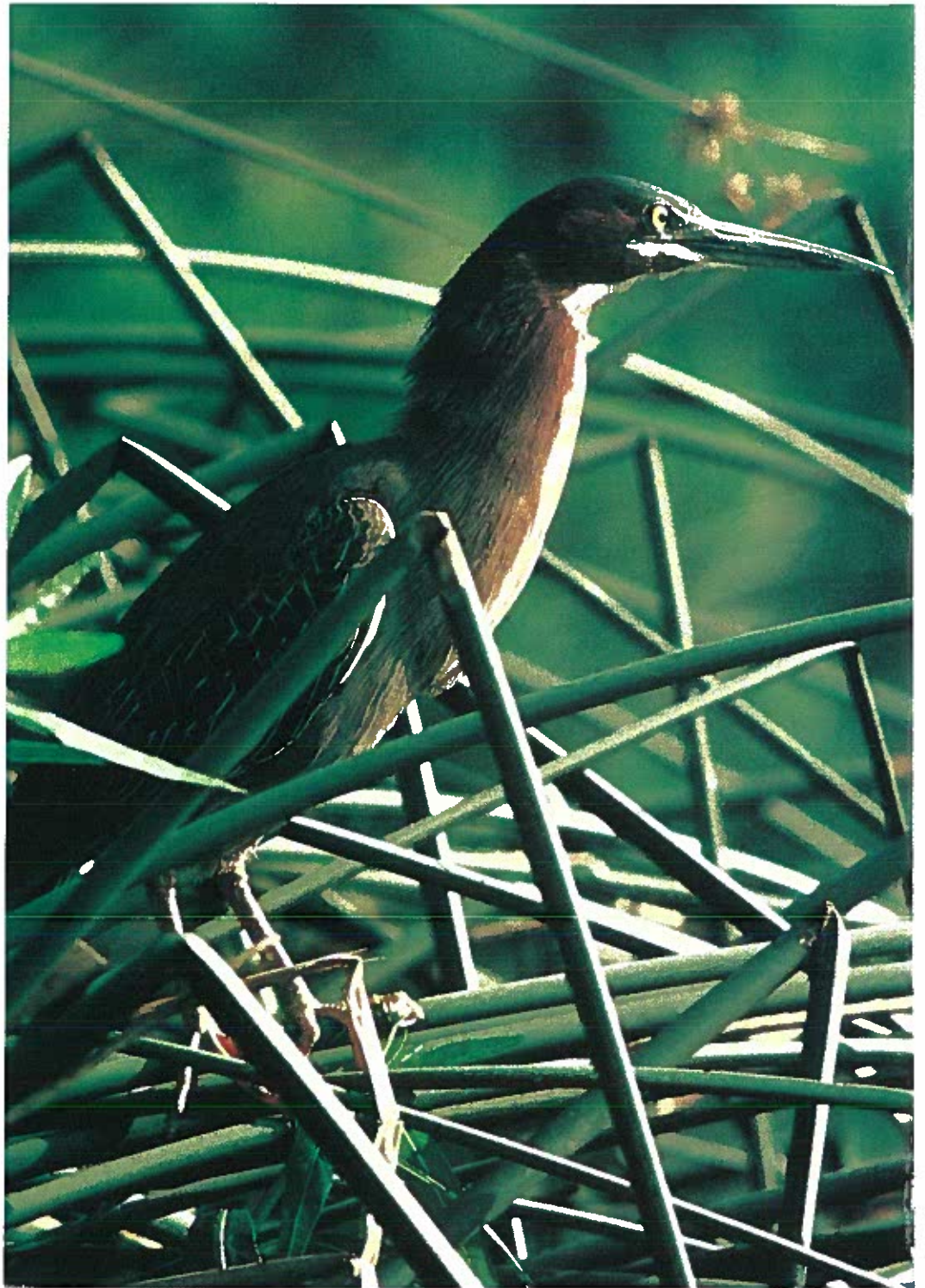
muddy deltas and sandy barrier islands formed by these deposits help create and maintain coastal marshes. The Gulf coastal wetlands thus formed make up half of all coastal wetlands in the United States today. Without the flow of sediments, Gulf wave action eventually would wash away the existing wetlands and begin to wear away the coast uplands. 🐞



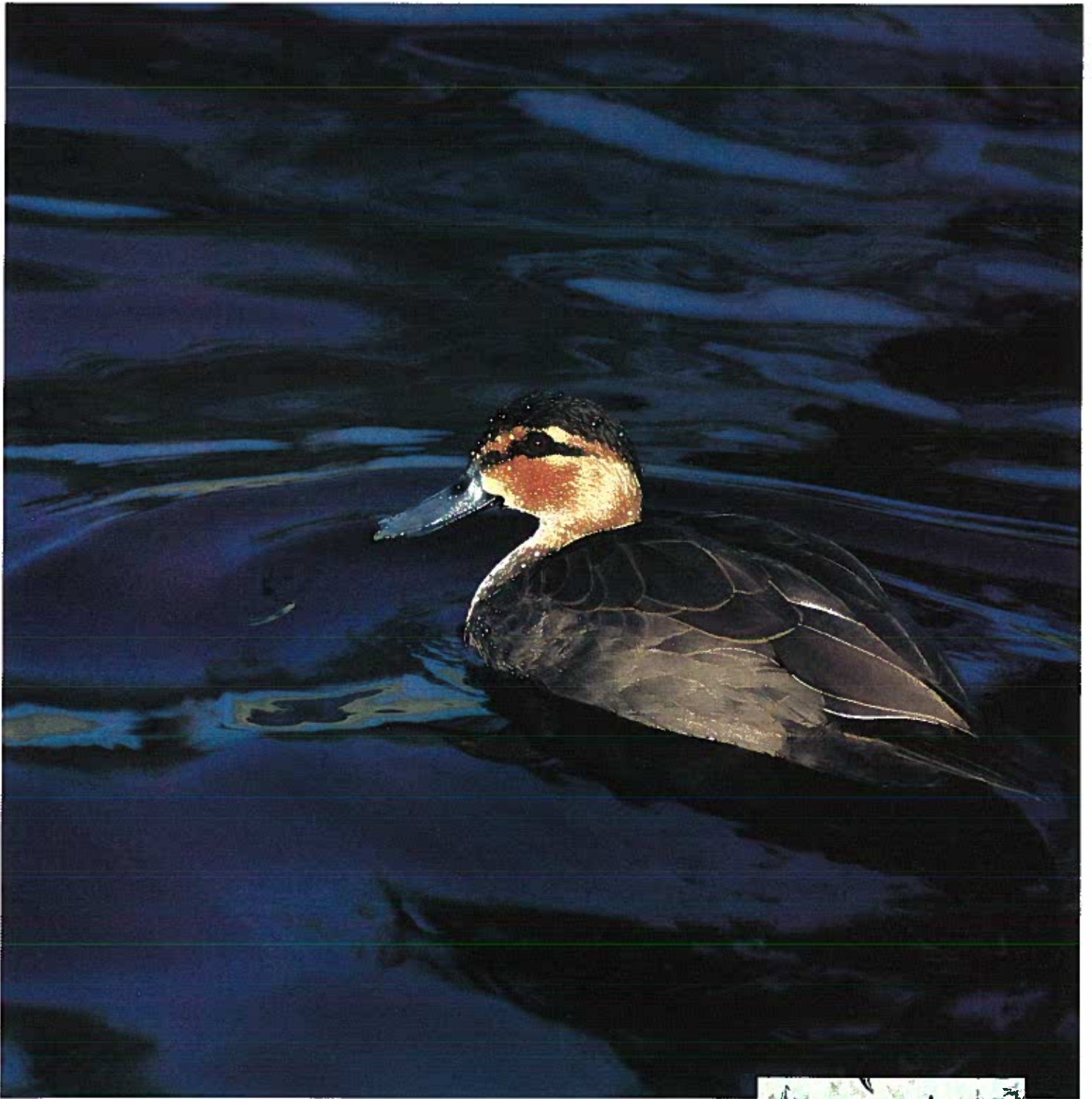
Value



The bays, estuaries and barrier islands provide essential habitat for a host of wildlife and water fowl.



Coastal estuaries, bays and wetlands perform many functions. They provide habitat for fish and wildlife resources, serve as shipping channels, provide sites for recreation, buffer the land from storms, and serve as waste treatment sites for detoxifying industrial, agricultural and municipal runoff. The estuaries, marshes and barrier islands



provide essential habitat for about 75 percent of all the waterfowl that migrate across the United States. In addition, they support large populations of shorebirds, colonial nesting seabirds, and many, many other forms of wildlife. 🦆 The Gulf of Mexico annually produces more than 2.5 billion pounds of fish and shellfish — about

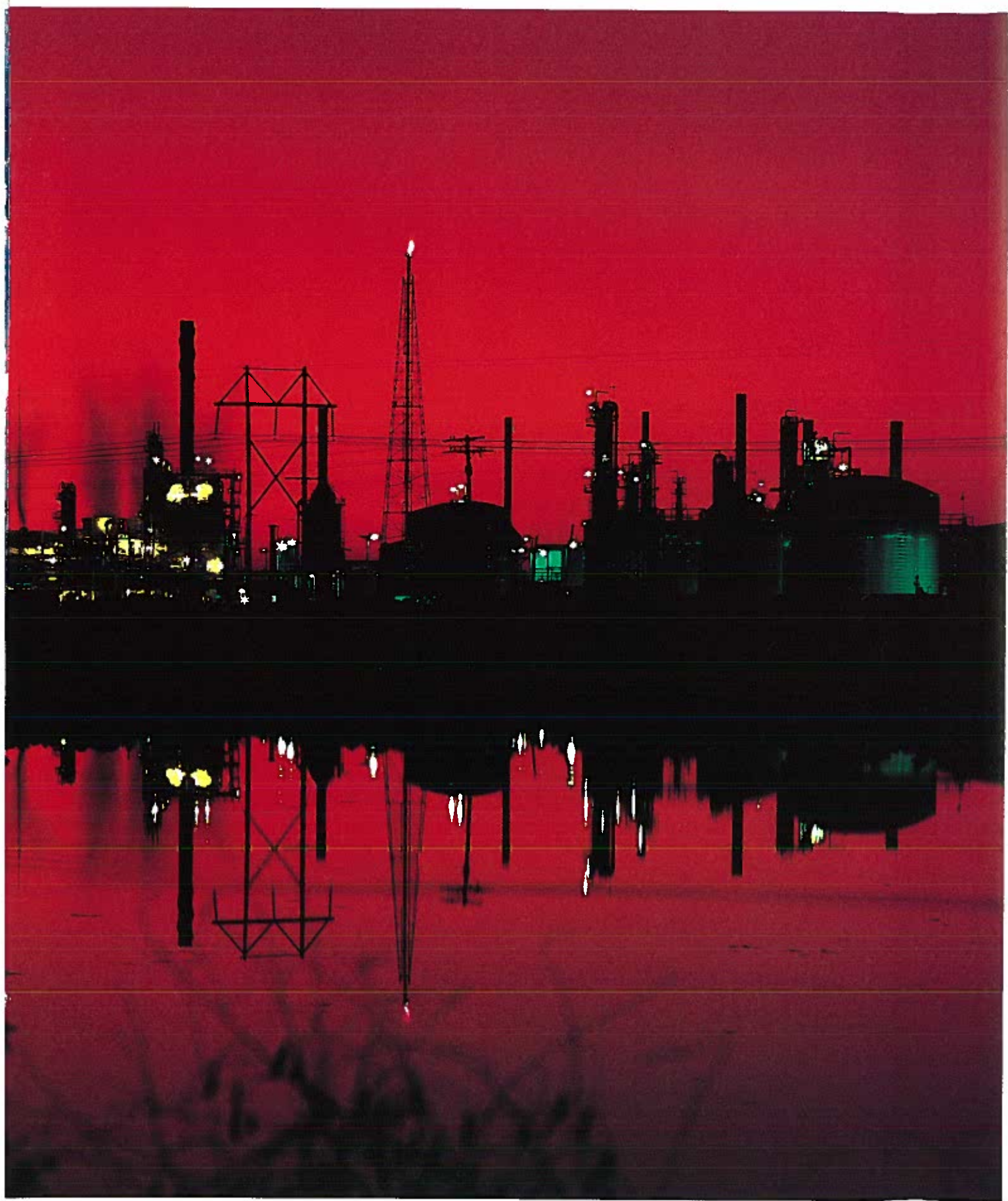


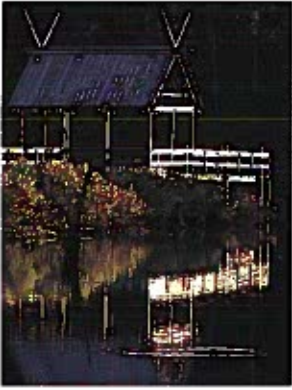


40 percent of all that produced in the United States. Most of these species of fish, shrimp, oysters and other shellfish spend part or all of their lives in estuaries. Many marine species use estuaries as nurseries; they depend on the different levels of salt concentrations to guide them to and from the nursery areas. Shrimp, for example, hatch offshore, but then grow to “table size” in estuaries before returning to the Gulf waters where they are netted for food. 🍷 Estuaries have been used for navigation for centuries. Channels, harbors, docks and other facilities associated with water transportation and shipping are located in estuarine zones. There they are somewhat protected from wave action and coastal storms. Navigation is important to our national security and economy. Nearly half of all U.S. export and import goods pass through Gulf ports. 🍷 Estuaries are also favorite sites for many industries, including paper mills and chemical plants. There they can find the large quantities of water they need for manufacturing and for waste disposal. Their location also makes shipment of goods less costly. 🍷

Each year more than 2.5 billion pounds of fish and shellfish are harvested from the Gulf of Mexico.



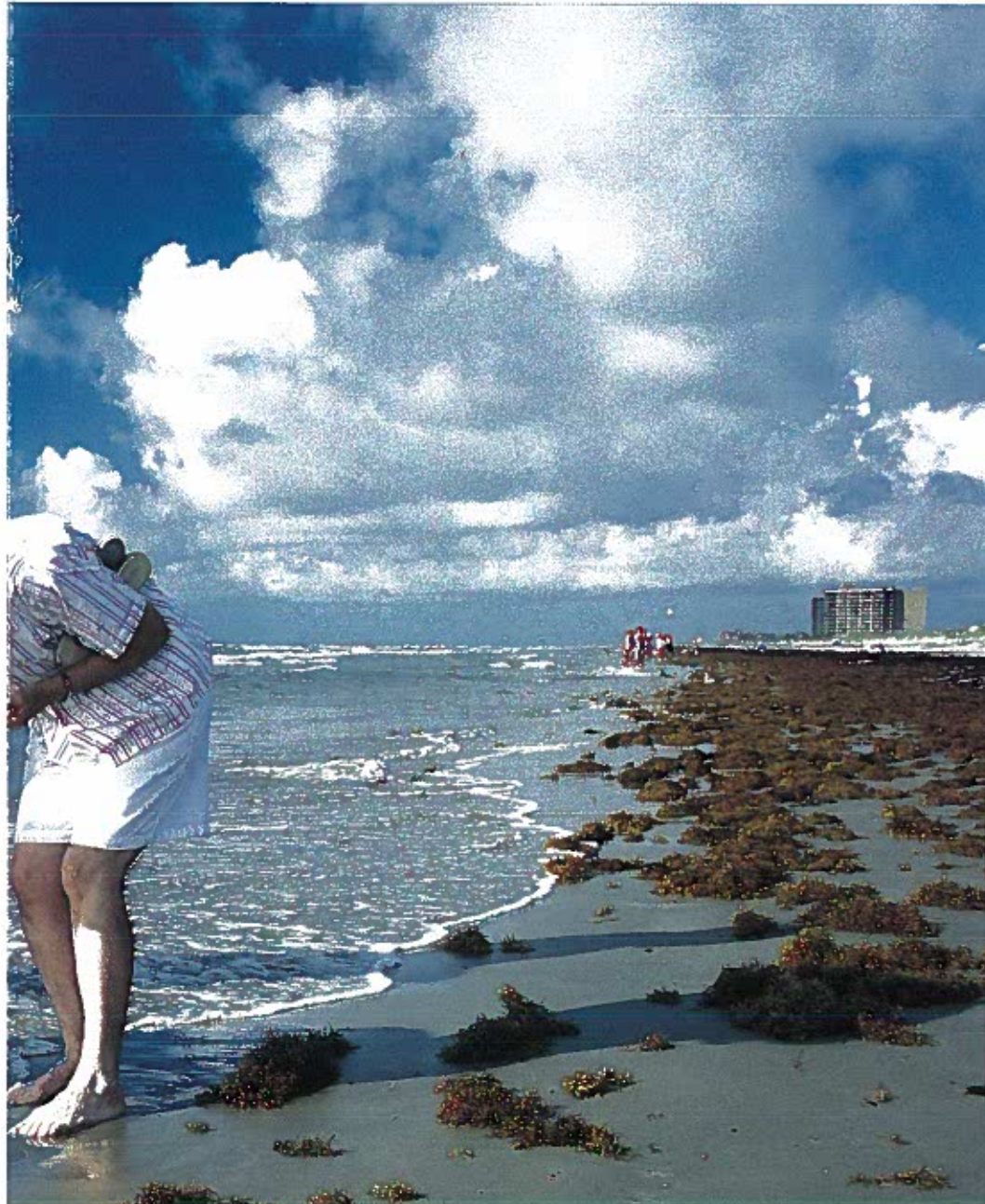




The Gulf coast is so attractive that more and more tourists are deciding to become permanent residents.



Many people use the Gulf of Mexico for recreation and outdoor activity. Fishermen, hunters, boaters, swimmers, water skiers, surfers, bird watchers, beachcombers, sunbathers and nature lovers flock to the coast. The attraction of the beach and the Gulf of Mexico

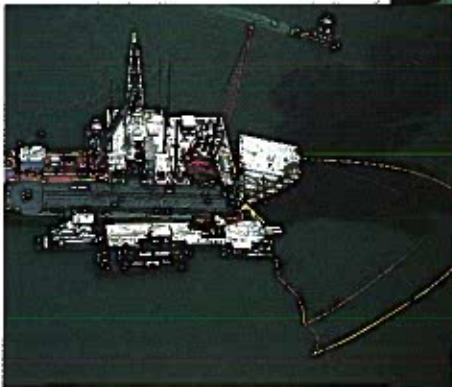


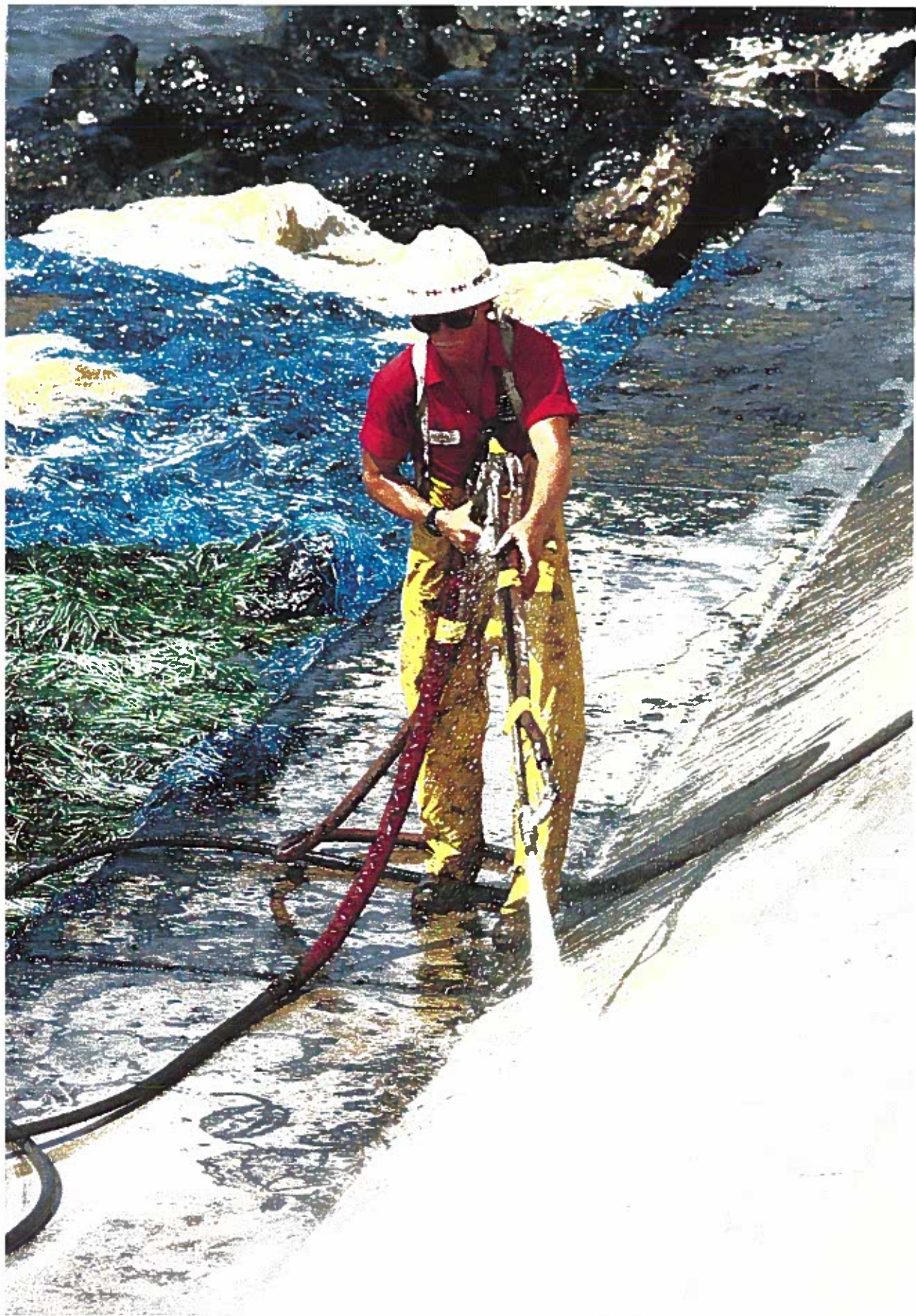
to tourists brings millions of dollars each year to the Gulf states. More and more people like the Gulf Coast environment so well that they are deciding to live there. 🐾

Threats

Historically the human population of the Gulf states has been very small compared to the northeast and west coasts of the United States. This is rapidly changing. Today one-sixth of the U.S. population lives in the Gulf Coast states. This growing coastal population, however, together with rapid growth of cities located along major rivers that flow into the Gulf, is creating problems that threaten the quantity and quality of the Gulf's freshwater supply. 🍷 The innumerable rivers and streams carry industrial and community waste and street runoff to the Gulf from many cities and communities. This causes pollution of bays and estuaries. This pollution, combined with accidental coastal chemical discharges and oil spills, sometimes dumps more wastes into bays and estuaries than the systems can treat effectively. That affects the health and productivity of coastal ecosystems. 🍷

*More
people
means
more
pollution
in the
bays.*







Today, freshwater inflows for bays and estuaries must compete with many other demands of a growing population. While benefitting communities, these activities have also created problems. Damming of rivers and streams to form reservoirs for flood control, communities' use and for recreation has changed water flow patterns and reduced freshwater inflows and the necessary nutrients. Channelization to provide flood control protection for communities built in natural flood plains



Growing coastal populations affect water flow patterns, reducing freshwater inflows and necessary nutrients.

and former wetlands has also caused problems: channelization of water in Florida, for example, combined with drought conditions, resulted in serious fires in the Everglades. 🍷 Diversion of water for community use, construction of dams, channelization, and wastewater discharges all affect freshwater inflows. They change the salinity gradients and can harm the sensitive estuary ecosystem. Just how much freshwater inflow is necessary to maintain healthy bays and estuaries in the Gulf is still a mystery to scientists and government officials concerned with water development and management. 🍷

Research

Scientists have always known that freshwater inflows are vital for our productive ecosystems.



Many Gulf states are studying bays and estuaries to learn just how much freshwater inflow is needed to keep them healthy and productive. This is not easy, though, because the amount of freshwater inflows keeps changing, not only due to people's

activities but also to natural processes — droughts and rainfall patterns. They are also studying which freshwater inflows are most important to the productivity of the Gulf ecosystems. 🍷 Some actions have been taken to protect freshwater inflows and their accompanying wetlands. Most states require that the effect on freshwater inflows be evaluated before they will grant permits for dam construction or water diversion. The Clean Water

Act, passed by Congress in 1972, prohibits dumping of dredged or fill material into wetlands without a permit. States have passed laws or adopted regulations to control coastal development to reduce further loss of wetlands and to control pollution. The Federal Government, as well as several states, has developed programs designed to help preserve and restore coastal wetlands. 🍷 There is still a need for greater recognition of the benefits of freshwater inflows to bays and estuaries. Some people believe that water that



isn't used up before it flows into the Gulf of Mexico is wasted. Government agencies, however, are now recognizing what scientists have known all along — freshwater inflow into bays and estuaries isn't lost at all: it supports bay and estuary ecosystems so they can continue to provide the abundant

resources that our fishing industry and wildlife need. 🍷 Freshwater inflows are essential to preserve their original recipient — our productive coastal ecosystems, the bays and estuaries. 🍷



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