

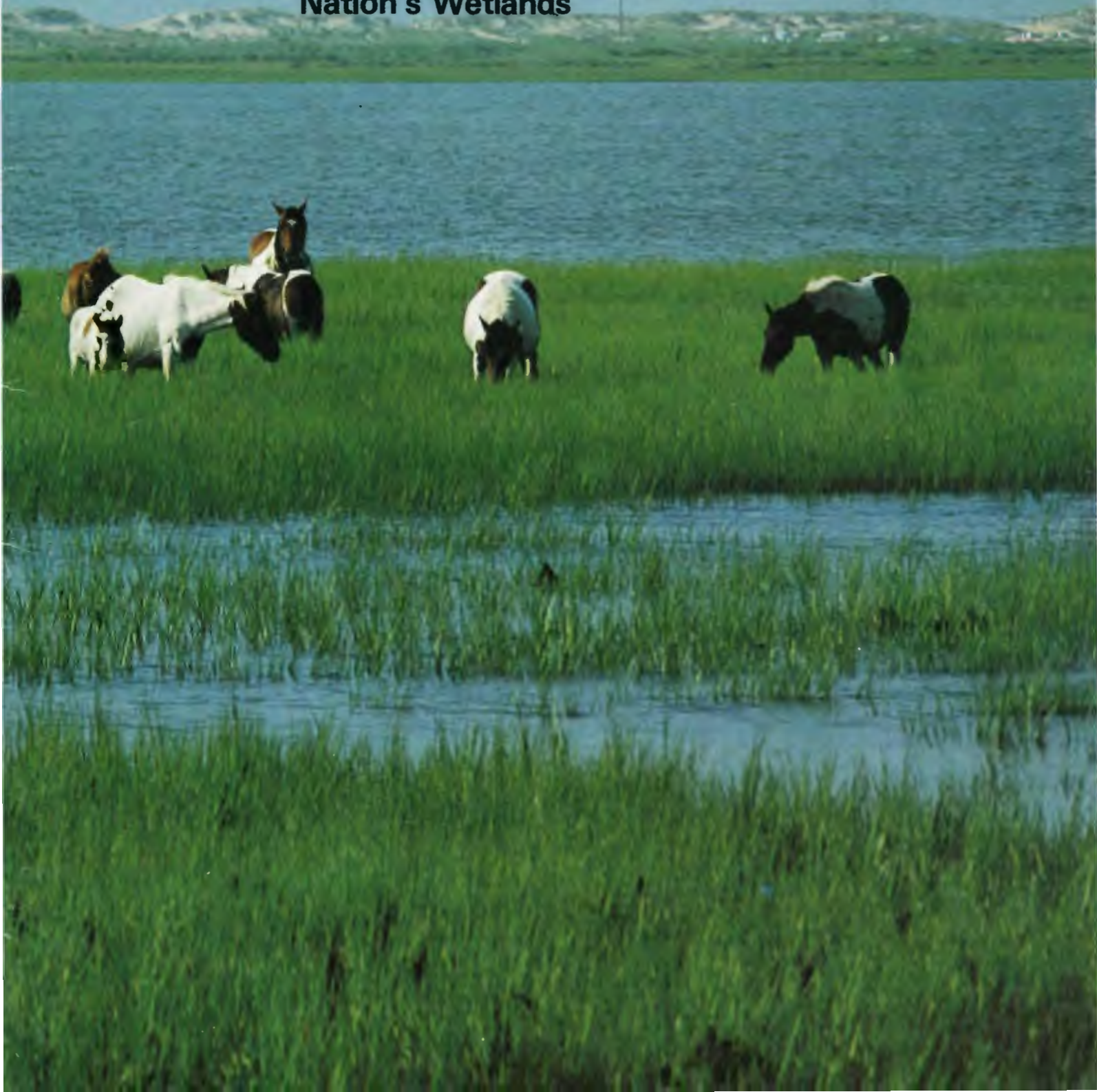
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EPA JOURNAL

**Saving Our
Nation's Wetlands**



Bogs, Swamps and Marshes — And Why We Need Them

In this issue, EPA Journal reports on the importance of wetlands to every human being.

U.S. Sen. John Chafee leads off with an article in which he notes the key role played by wetlands in survival of fish and wildlife, the maintenance of water quality, ground water recharge and flood control.

The Senator, who is chairman of the Subcommittee on Environmental Pollution of the Senate Committee on Environment and Public Works, observes that wetlands provide millions of Americans with recreational opportunities such as boating, birding, hunting, and fishing.

Despite the fact that wetlands contribute \$20 to \$40 billion a year to the nation's economy, the Senator stated that nearly half a million acres are destroyed each year "and the need to conserve wetlands has never been more critical than it is today."

Another article gives a status overview on efforts to restore water quality in Chesapeake Bay which EPA Administrator William D. Ruckelshaus has described as "a national treasure."

A companion piece gives a report on an organization that has learned how to create marshes by planting aquatic grasses. These grasses are of key importance because of their role in such functions as reducing shoreline erosion, providing food for waterfowl and creating a nursery area for fish and crabs.

Leading a major effort in the private sector to preserve wetlands is the Nature Conservancy. An article relates how the conservancy, with the help of a \$25 million grant from the Richard King



Phragmites, a long-stemmed reed plant which grows over most of the world, often thrives in wetland areas which have been drained or polluted.

Mellon Foundation, is striving to raise a total of \$50 million to conserve endangered wetlands.

The use of both natural and artificial wetlands for advanced treatment of wastewater is also reviewed in this issue. The article recognizes the

need to be on the alert for potential ecological problems in using wetlands for renovating wastewater. An article about life at Assateague in the fall season completes the coverage of wetlands.

A significant feature of this issue is an interview with Alvin L. Alm, EPA Deputy

Administrator, about the Agency's future management strategies and goals.

The magazine also reports on some key appointments for EPA and gives a roundup on appointments to the Agency regional administrator posts around the country.

EPA JOURNAL

William D. Ruckelshaus, Administrator
Charles D. Pierce, Editor

Articles

EPA is charged by Congress to protect the Nation's land, air and water systems. Under a mandate of national environmental laws, the Agency strives to formulate and implement actions which lead to a compatible balance between human activities and the ability of natural systems to support and nurture life.

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Front Cover: Wild ponies browsing on Assateague Island wetlands grasses. In background are the sand dunes which help protect island from the ravages of the ocean.

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Saving Our Nation's Wetlands

By
U.S. Senator John H. Chafee



Senator John H. Chafee

When the first European settlers came to North America, they discovered vast stretches of virgin forest, pristine prairie, and wetlands of many kinds. Like the native Americans they encountered, these settlers depended on wetlands for waterfowl, fish, and edible plants.

Unlike the Indian, however, the European settlers and their descendants did not preserve the wetlands that helped to sustain them. The nation's original base of 215 million acres of wetlands has diminished to 99 million acres today.

Much less than half of the original wetlands remain in Rhode Island and other Northeastern states. Nearly a half-million acres continue to disappear annually throughout the United States.

The need to conserve wetlands has never been more critical than it is today. At present, the modification and the destruction of wetland habitat is the single most important factor affecting migratory waterfowl abundance.

Wetlands, however, are important for many reasons other than the conservation of waterfowl. They are biologically and economically important to the lives of every American.

They contribute to the production of a rich commercial and recreational fishery harvest. Equally important, they provide millions of Americans with opportunities for recreational activities such as boating and bird watching, support a major portion of the Nation's multi-million dollar annual fur harvest, provide savings in natural flood and erosion control, and help to supply the Nation's increasing demand for safe, pure water. In all, wetlands contribute from \$20 to \$40 billion a year to the national economy.

For far too long, wetlands have been considered wastelands. They have been drained or filled and converted to other uses, often with technical and financial assistance through various governmental programs, including those for navigation, flood control, and agricultural development.

Sen. John H. Chafee of Rhode Island is chairman of the Subcommittee on Environmental Pollution of the Senate Committee on Environment and Public Works.

Assateague Island marsh

What Are Wetlands?

"Wetlands" encompass many different types of living communities, including salt marshes, alpine bogs, prairie potholes, bottomland hardwoods, and tundra. The U.S. Fish and Wildlife Service is conducting an inventory of wetlands, and defines wetlands generally as those areas "where saturation with water is the dominant factor determining the nature of soil development and the types of plant and animal communities living in the soil and on the surface." According to the Service, "the single feature that most wetlands share is soil or substrate that is at least periodically saturated with or covered by water."

On May 19, 1983, I introduced S. 1329, entitled the "Emergency Wetlands Resources Act of 1983." S. 1329 contains a definition of wetlands that is similar to that used by the Fish and Wildlife Service:

"wetlands" means land transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water. Generally, wetlands are areas inundated by surface or ground water frequently enough and for long enough duration to support a prevalence of plants or animals typically adapted to life in saturated soil conditions including but not limited to such areas as coastal or inland marshes or estuaries, river-associated, water-saturated areas, inland lakes, potholes, bogs, mudflats, or bottomland hardwood forests.

The definition of wetlands in S. 1329 combines the best features of definitions now in use by the Fish and Wildlife Service for the Wetlands Inventory and by the EPA and the Army Corps of Engineers for the Section 404 program of the Clean Water Act. The wetlands covered by the definition are important. Most are *not* adjacent to open water that can support vessel traffic.

Wetlands Values

The nation's wetlands are critical to the survival of fish and wildlife, the maintenance of water quality, ground water recharge, and flood control.

- Wetlands support, by conservative estimate, a \$12 billion per year commercial and recreational fishing industry. In Alaska, some 24,000 people are employed in the salmon industry and their livelihood depends upon the preservation of pristine streams and wetlands where salmon breed. On the Atlantic and Gulf Coasts, species dependent on wetlands make up two-thirds of the cash value of all fisheries.

Sixty to 70 percent of the 10 to 12 million waterfowl in the lower 48 states reproduce in the "prairie potholes" of the Midwest, and millions of ducks winter in the bottomland hardwoods of the South Central states. Naturalists and sportsmen value these, and many non-game animal and plant species are dependent on the same wetland habitat.

- Wetlands serve as natural pollution treatment plants. The town of Wildwood, Florida (pop. 2,500) has treated its sewage in a 500-acre cypress-gum swamp for the last 19 years. Wetlands also serve as natural filters for removal of suspended sediments, removing silt that otherwise would degrade reservoirs, rivers and harbors.

- Wetlands are natural sponges. For example, a five square-mile bog near Milwaukee, Wisconsin, is key to ground water recharge in a 165 square-mile area. Well water recharged in one year from each wetland acre in Massachusetts has been calculated to save \$6,044 over the least expensive alternate source.

- Because they hold water like sponges, wetlands prolong and moderate runoff after heavy precipitation or snow melt. Wetlands in Minnesota and North Dakota reportedly have significantly reduced flooding in the cities of Grand Forks and Crookston. In Wisconsin, flood levels are 80 percent lower in watersheds with wetlands and lakes than where these features do not occur. In the Boston area, 8,422 acres of wetlands near the Charles River prevent an estimated \$3,193,000 in flood damages each year.

- The examples above illustrate only a few of many wetland values. As Chairman of the Environmental Pollution Subcommittee, I have heard one witness after another testify to the importance of wetlands. I also have gone into these fragile areas personally. I have been awed by the huge ecological

wealth of the Atchafalaya Basin of Louisiana and I have, time and time again, marveled at the beauty of the salt marshes of my own state. About 61,000 acres of wetlands are left in Rhode Island, and I intend to see that they remain and continue to enrich the people whom I represent. I also intend to do all that I can for wetlands throughout our nation.

A Federal role in the acquisition of wetland habitat has been recognized by Congress for many years. The enactment of the Migratory Bird Conservation Act in 1929 and the Migratory Bird Hunting and Conservation Stamp Act in 1934 established the foundation for our present wetland acquisition program. Other programs have also contributed.

The enactment of the Wetlands Loan Act in 1961, as amended, has generated to date some \$145 million in loan money for acquiring wetlands. Contributions from the land and water conservation fund have supplemented wetland acquisition efforts but only to the extent that the area acquired is for a congressionally authorized refuge or is habitat for an endangered species. Although the Federal Government obviously cannot purchase all wetlands, we should, at a minimum, accelerate the acquisition program that was established in the 1950's.

Section 404 of the Clean Water Act enacted in 1972 is the major Federal provision for the protection of wetlands, including such areas as coastal and inland marshes and estuaries, river-associated water-saturated areas, inland lakes, potholes, bogs, mudflats and bottomland hardwood forests. It established a new role in maintenance of wetlands—that of regulator of wetland development.

Permit requirements under the U.S. Army Corps of Engineers' regulatory authority of Section 404 extend to all waters of the United States, including wetlands.

We must strengthen—not weaken—the Section 404 program of the Clean Water Act. We must pass new legislation, such as S. 1329, to provide more money for acquisition of wetlands. We also must take a serious look at all federal subsidies that destroy wetlands. These are my priorities; I expect and look forward to assistance from EPA and others in the Administration to see that the priorities are carried out. □



Key Chesapeake Bay Conference

The comprehensive findings and recommendations of a seven-year study to find ways of regenerating Chesapeake Bay will be considered at a high-level conference scheduled for December 8 and 9 at George Mason University in Fairfax County, Virginia.

At this meeting, co-sponsored by EPA and the Bay States, strategies and funding programs to help restore and protect the water quality of the Nation's largest estuary will be discussed.

The extensive studies have documented significant pollution problems in the Bay. The program has produced 45 scientific reports and five summary reports, including several alternative options for improving the estuary.

Major ecological changes are occurring in the bay, caused, at least in part, by increased pollution, the reports concluded. Three of the most critical problems are the decline of submerged aquatic vegetation, over-enrichment of the water by various nutrients, and the increasing load of toxic materials in the bay.

EPA Administrator William D. Ruckelshaus (center) joined top officials from Maryland, Virginia and Pennsylvania for a recent tour of Chesapeake Bay and reported that the group had agreed that the bay is "a national treasure." From left are U. S. Senator John Warner of Virginia, Lt. Gov. William W. Scranton III of Pennsylvania, Gov. Harry Hughes of Maryland, Gov. Charles Robb of Virginia and Senators Charles Mathias and Paul Sarbanes, both of Maryland.

A technical report noted that submerged Bay grasses are now at their lowest level in recorded history. This has a considerable impact, because these grasses play a major role in maintaining the health of the estuary. The Bay grasses are large primary producers of the basic plant base of the food chain. They provide habitat and nursery areas for many commercially important fish. They protect the shoreline from erosion. And they provide a buffer against negative effects of excessive nutrients, a summary technical report noted.

A major cause of this reduction in submerged grasses is the decline in the amount of sunlight reaching the plants. The report attributes this to increasing levels of sediment and nutrients, which have lowered water clarity.

Recent international studies confirm that reductions in submerged plants are "highly correlated with changing water quality conditions, such as decreasing water clarity" resulting from increases in sewage, agricultural runoff and other sediment discharges.

Other important factors contributing to the loss of bay grasses are the increases in nutrients discharged and in herbicides washing into the estuary. The herbicides alone would not cause the grass declines, but in concert with other stresses, such as the diminished sunlight, they could create "intolerable conditions" for this plant life.

Nutrients, such as phosphorous and nitrogen, have increased significantly over the past 20 years, the Bay studies found. This is believed to be the primary cause for reduction of the Bay's dissolved oxygen supplies in the channel area of the estuary's main stem.

Since reduced oxygen levels can kill or weaken fish and other organisms, there is considerable concern that this pattern may cause changes in fish migration and affect commercially valuable oyster harvests.

Other findings involving nutrients include:

The Upper Bay, Mid Bay and several major tributaries have nutrient levels that are either severely or moderately elevated compared to what they were historically.

Point sources, such as sewage treatment plants, are the major source of phosphorus for over-enriched areas.

Nonpoint sources, primarily fertilizers from agricultural croplands, are a major source for nutrient enrichment, particularly nitrogen.

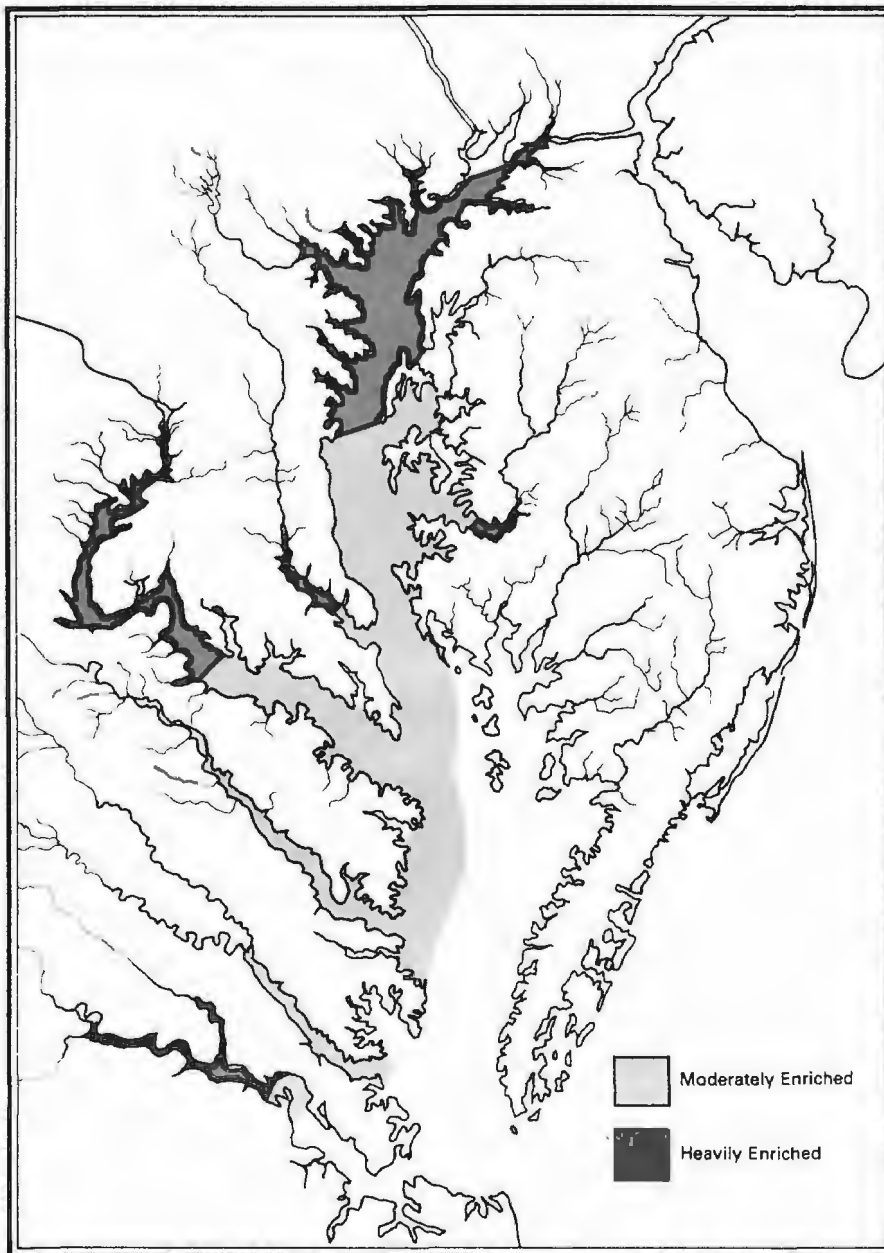
The major rivers, such as the Susquehanna, the Potomac and the James, are significant contributors of nutrients, metals and toxic compounds. The lower Bay has remained relatively unaffected by nutrient enrichment so far.

Major findings involving toxic pollution included:

The highest concentrations of metals and organics were found in Baltimore Harbor and the Elizabeth River.

In the Bay's main stem, the highest metal concentrations in sediment occur in the northern section and particularly on the western shore. At least half of the chromium, cadmium, copper and lead come from human sources.

The Susquehanna contributes a greater portion of metals than the Potomac or the James, but the concentration levels are approximately the same.



Map showing portions of Chesapeake Bay that are moderately or heavily enriched by nutrients such as nitrogen and phosphorous from various waste sources. These nutrients provide

fertilization which results in excessive growth of algae. When the algae decompose they rob the water of its life-giving oxygen.

Toxic chemicals were found in concentrations high enough to cause mortality in test animals.

Despite its water quality problems, the Bay produces the largest oyster harvest in the United States, the largest blue crab harvest in the world and more than half the total soft shell crab catch in this country.

More than 2,000 species of plants and animals are found in the Bay. They live in communities, in marshes or on the bottom, and depend on each other for food and shelter. These communities respond to changes in the environment through changes in diversity and abundance.

Some variations result from seasonal changes, others from long-term fluctuations. Still others are caused by human impact. Tracing the cause of these biological variations to natural or human influences was one of the challenges posed to the scientists who conducted the Bay studies.

More than \$27 million was spent on approximately 45 studies in the past seven years. Scientists from a number of universities, institutions and levels of government took part in the studies. □

Conservancy Drive Advances

A \$50 million drive to conserve endangered wetland systems is being conducted by the Nature Conservancy and the Richard King Mellon Foundation.

The start-up funds for the project have been provided in a \$25 million grant from the Richard King Mellon Foundation. It is the largest grant of its kind ever made by a private foundation for conservation purposes.

William D. Blair, Jr., president of the Nature Conservancy, a nonprofit national conservation organization, described the project as "a major effort to preserve significant examples of our threatened aquatic ecosystem from the Atlantic coastal wetlands to the watershed forests of Hawaii as a demonstration of what can be accomplished through joint private and public effort."

The project, Blair explained, has three major objectives:

"The first is to safeguard outstanding examples of a broad, representative array of aquatic systems. By doing so we will insure their continued productivity as wetlands as well as their value as habitat for the diverse communities of plants and animals they shelter.

"The second major thrust will be one of cooperative effort. Wherever possible, we want to work in partnership—and develop new formats for participation—with public and private agencies to bring the resources of both sectors to bear.

"Demonstration projects will include some of the most critically endangered U.S. wetlands. Watersheds, free-flowing rivers, aquifer-recharge areas, marshes, swamps, coastal and estuarine systems are examples of the types of ecosystems that the National Wetlands Conservation Project will seek to protect.

"An element of the cooperative effort may include working with others to help develop legislation on tax and other nondevelopment incentives as well as seeking innovative funding sources for joint private-public conservation programs. We also want to explore with government agencies and other conservation and research organizations new ways to manage aquatic ecosystems.

"The third aspect of the project is public awareness. The Conservancy hopes to promote greater understanding—among private-sector organizations and governments at all levels—of the need to conserve vital water-related systems. The ultimate goal is enhanced public support for the protection of these systems," he said.

The Conservancy's first step, Blair said, is the identification of critical wetland areas to



be included in the project. Once this has been done, a plan for acquiring and managing the areas will be developed, and work will be begun with other private organizations and governments on individual conservation efforts.

The Project will target key sites across the nation with a total estimated fair-market value of at least \$50 million. By encouraging land gifts, matching gifts, and sales at below market value, as well as by reselling non-critical surrounding lands with conservation restrictions, the Conservancy expects to preserve \$50 million worth of wetlands over the next five years.

Under the terms of the grant, the Conservancy must also raise an additional \$25 million in public and private funds, over and above the amount of the Foundation's gift. The original \$25 million can subsequently be

used as a revolving land preservation fund.

The Project's initial focus will be in Escambia and Santa Rosa counties, Florida, where the Nature Conservancy has reached an agreement with the Northwest Florida Water Management District on funding the acquisition of key wetlands along the lower 18 miles of the Escambia River.

"The Nature Conservancy has been involved with protecting endangered ecosystems for the past 30 years," said Blair. "In the process, we've learned that there are innumerable ways in which governments, businesses, and private organizations can cooperate to protect critical land and water areas. It doesn't have to be through purchase alone, and no single body has to bear the burden." □



The Marsh Maker of St. Michaels

by Truman Temple



One of the salient points of the massive, \$27-million report issued by the Environmental Protection Agency on the Chesapeake Bay is that a severe decline has occurred in many aquatic grasses. As the study put it, "The bay grasses are of vital importance, because of their value as high primary producers, a food source for waterfowl, a habitat and nursery area for many forage fish and juvenile blue crabs, a control for shoreline erosion, and a mechanism to buffer negative impacts from excess nutrients."

Little noticed in the widespread publicity surrounding release of the study was an organization that for the past decade has been *creating* marshes. Its name is Environmental Concern, Inc. and since 1972 its crews have ranged up and down the Atlantic seaboard planting marsh grasses for communities, corporations, and private landowners.

The founder, president, and director of this unusual nonprofit organization is Dr. Edgar W. Garbisch, Jr., who gave up a highly successful career as a professor of chemistry to devote his life to the encouragement and propagation of marshes. Garbisch, 50, originally taught and lectured at the University of Minnesota on the arcane subject of confirmational analysis which deals with the arrangement of molecules in space. He published dozens of articles in technical journals and was sought after by other universities. But Garbisch became restless with academic life.

He began looking for something more tangible. As a boy he had spent summer vacations on Maryland's Eastern Shore near Cambridge, and during a sabbatical in 1970, he picked up John and Mildred Teal's environmental classic, *Life and Death of the Salt Marsh*.

"The book and some other writings I came across suggested that wetlands were a renewable resource, unlike coal or oil. I was intrigued with the possibilities." He also felt that the laws being enacted by various states to halt further destruction of wetlands did not go far enough, that something more

positive could be done. He studied the subject and made a momentous career decision to chuck chemistry and switch to marsh grass.

As a first step, he planted an experimental patch of marsh grass on a beach in front of his summer home in St. Michaels, a small fishing village where James Michener a few years later wrote the novel *Chesapeake*. When the patch took root and flourished, Garbisch decided to broaden his approach. In 1971, he joined The Nature Conservancy as director of the Center for Applied Research in Environmental Science and organized the creation of a salt marsh on tidal sand flats at Hambleton Island a mile south of St. Michaels. The site had several advantages for research: It was uninhabited, it was accessible, and it was subject to erosion because of its exposed position where three creeks met. In fact, there was historic evidence of chronic erosion. Maryland Geological Survey records showed that wave and current action had been washing away the shoreline at the site an average of nearly two and a half feet annually for ninety-five years.

Within a few months, Garbisch and his assistants planted 60,000 seedlings on the island. Since there was no precedent for the experiment, the workers had to improvise. They collected seeds from various marsh plants around the Chesapeake and also from the Outer Banks of North Carolina. To keep from sinking into the tidal mud flats, they wore plastic coated snowshoes. To plant clumps of marsh grass under a foot of water, they lay on their stomachs on floating rubber mattresses, their arms immersed.

Encouraged by success in this project, Garbisch in 1972 established Environmental Concern on a ten-acre site overlooking San Domingo Creek in St. Michaels. Offices originally were located in a large antebellum white mansion with decaying white pillars, but this subsequently was torn down and replaced with more functional quarters. The organization also built greenhouses and a small phytotron or growth chamber to simulate the temperature and light conditions found during different times of the year. Outdoor cultivation beds for marsh grasses also were added.

Canadian geese

Edgar Garbisch Jr, collecting marsh grass seeds.



During the past decade Environmental Concern has been involved in scores of projects along the Atlantic seaboard. Section 404 of the federal Clean Water Act requires an environmental review of proposed activities in most marsh areas, and in practice, where wetlands are sacrificed, applicants have developed mitigation plans to reduce these losses. In many cases the plans may involve revegetation or even the creation of new wetland areas. Garbisch explains that much of his organization's work has been in response to this demand for mitigation projects. When construction around Atlantic City for its rash of new casinos began, for example, Environmental Concern was called in to plant new marsh grass.

Over the years Environmental Concern has developed numerous and specialized types of equipment for its unusual work. Crews make use of a landing craft barge not unlike those used in World War II, in order to reach mud flats and dredged spoil in waterways not accessible by land. Another vessel, modified and adapted by Garbisch, is a sixteen-foot air boat powered by an aircraft engine. It is capable of carrying a ton of materials, and its propeller wash distributes marsh plant seeds that are mixed into the mud under water by

a large device pulled behind the boat. The organization also uses conventional vehicles such as bulldozers, dump trucks, and flatbeds, and much of the planting still must be done laboriously by hand.

Nor is the learning process ever completed. In one project to plant a five-acre site near Boston's Logan Airport, Garbisch ruefully recalls, crews ran into severe difficulties. After removing landfill rubble from a drive-in that had been laid on top of a dump, they encountered a moonscape of broken chunks of concrete. They broke numerous drilling bits preparing the land for revegetation.

In an earlier project financed by the Maryland Department of Natural Resources, Environmental Concern planted two acres of marsh grass on sand islands that had been created in the upper part of the Chesapeake by Tropical Storm Agnes at the mouth of the Susquehanna River. But a few months later, hungry Canada geese virtually destroyed the marsh by digging for the tasty underground rhizomes of the plants. The first remedy for this was to lay down costly galvanized fencing to protect the grass until it became established. Later, Garbisch discovered a

strange fact: Geese would not touch a planted marsh if he strung inexpensive nylon lines on stakes, similar to a crab fisherman's "trot line," at the water's edge.

Garbisch also discovered that recruiting employees for his organization did not follow conventional paths. "You don't need experienced greenhouse workers here, because what we do is not conventional. In fact, it's contrary to everything a typical horticulturalist has been used to. We work with plants that grow in saturated soil in conditions that would kill most plants. So everything has to be learned on the job."

His crews, which over the years have included scientists and students pursuing graduate work/study programs in ecology, have established marshes from Maine to South Carolina not only for communities, industries, and individuals but also for the U.S. Corps of Engineers. Environmental Concern also is broadening its operations to include freshwater plantings along Lake Erie, in the Philadelphia area, and inland Maryland for organizations and private landowners seeking to establish protected wildlife habitats. Although crews chiefly plant cordgrass—formally known as *Spartina alterniflora*—in salt water to create marshes, a much larger range of plants is used in fresh water. Arrow



Environmental Concern's greenhouses.

arum, pickerel weed, and duck potato—the latter once eaten by Indians in North America—all attract ducks and muskrats and are useful for food and shelter and land stabilization.

As the cost of wastewater treatment has increased in recent years, scientists and engineers have been re-examining the role of vegetation in cleansing waters where the incidence of coliform bacteria is high. Environmental Concern is now involved in a three-year demonstration project with the nearby city of Easton and the Maryland Department of Environmental Resources using aquatic plants for tertiary treatment of sewage. Workers have been experimenting with pickerel weed (*Pontederia cordata*), duck potato (*Sagittaria latifolia*), and American three-square (*Scirpus americanus*), a sedge, to see how well the roots and foliage of these plants can help remove impurities from effluent.

Although the Corps of Engineers is often thought of by environmentalists and conservationists as an insensitive bureaucracy bent on damming every stream in America regardless of consequences, in recent years it has

shown an awareness of the side-effects of its actions. One of the engineers' problems is dredge spoil. In 1981, for example, nearly 360 million cubic yards were dredged from U.S. waterways and harbors at a cost of more than one half billion dollars. Where do you put it all? And what do these endless mounds of raw, unsightly clay and mud do to the environment? In seeking some of the answers, the Corps has pursued extensive research to find ways to recycle dredged material, using it to renew eroded beaches, create recreation areas, and establish new islands for wildlife.

Environmental Concern is carrying out one such project for the Corps, planting vegetation on fifty acres of dredged spoil west of Hooper's Island in the Chesapeake Bay, a few miles southwest of the Blackwater National Wildlife Refuge. To provide a diversity of habitat, crews are planting 40 percent of the site and leaving the rest open for bird nesting. Already least terns have been observed nesting in the higher elevations.

One aspect of marsh grass that is attracting more and more attention by private landowners is its ability to halt erosion, a continuing problem in the Chesapeake. (One study by a Johns Hopkins University geologist estimates that in the past three and a

half centuries, about 145 square miles of Maryland shoreline have been washed away.)

Quite apart from the attractiveness of a natural vegetative border along a shore (as opposed to man-made bulkheads or sterile, grey stone strips of riprap) is its relatively low cost in abating erosion. Contractors in the Chesapeake charge anywhere from \$40 to \$75 or more per foot for stone jetties. By contrast, Environmental Concern's fee for planting a shoreline runs around \$8 to \$12. Garbisch noted that not every shore property has the potential for vegetative treatment, and he encourages landowners to consult with the Soil Conservation Service for a preliminary evaluation.

There is no routine day for Garbisch during the summer, when he may be on the road with his crews 70 percent of the time at various planting projects. A husky six-footer whose own mop of unruly hair sometimes resembles *Spartina alterniflora*, he often is up at 2 a.m. during the warm growing months, moving by boat or truck to the next site. But it is obvious that he has no regrets about dedicating his life to restoration of the marshes.



Work under way to stimulate growth of marsh grasses.

"They are so important indirectly to man," he says. "Not only do they provide a primary food source for animals and a place for nesting and resting, but they function as natural filters in tidal areas. They're nature's own water purifier. They remove nitrates and phosphates, and also suspended sediments. And along with all this, they also stabilize shorelines."

A few miles south of Environmental Concern's headquarters the Blackwater National Wildlife Refuge has mounted some handsome specimens of typical Eastern Shore wildlife in its public museum. The specimens include a Canada goose, a muskrat, and a nutria, and Dr. Garbisch looks at them with affection. "Without the marshes, these animals couldn't exist." □

Truman Temple is a press officer at EPA headquarters. This article was printed recently in the Natural Resources Defense Council's Amicus Journal which has granted permission for its use in EPA Journal.

Autumn at Assateague

In the pre-dawn darkness while the great star constellation of Orion, the hunter, still rides the night sky, you can now often hear on Assateague Island the gabbling of waterfowl above the murmur of the lapping waves.

As the rising sun gradually burns away the mist enshrouding Assateague, one of the great barrier beaches of our Atlantic coast, a skein of Canada geese emerges from a distant cloud and slowly approaches the slender ocean island which serves as a bird sanctuary as well as a seashore recreation area for millions of people.

The geese are part of the immense autumn migration of birds who fly vast distances as they travel between breeding and winter territories. A major attraction for migrants visiting Assateague are the fresh and salt water wetlands that comprise part of this island.

While these wetlands are enormously productive protein factories, they are deceptively quiet and their flat appearance strikes many people as being monotonous.

Rarely appreciated are the salt marshes with their often foul odors from dead plants rotting in the slippery mud bottoms and their clouds of mosquitoes and sizable populations of biting green-headed horse flies.

The wild ponies on the island are sometimes so tormented by the green-headed flies that they charge into the ocean surf to find relief.

Yet scientists have discovered that a salt marsh can be 12 times as productive as a forest. These mixtures of mud, grasses and water can and do provide a rich food supply for birds and all other creatures in the coastal environment.

The productivity of a salt marsh is stimulated by the daily tidal flooding and periodic sloshing of storm-whipped ocean waters over the marsh areas. The surges of water pump nutrients into the wetlands areas and dissolve them so they are easily consumed by creatures at the bottom of the food chain.

One of the charms of a salt marsh is the sight of a snowy egret standing in a small water channel, or "gut" as they are called locally, and stirring the waters with one of its yellow feet. After the snowy has poked its "golden slipper" into the shallows and stirred up the bottom it lunges down to eat the small fish and crabs it has aroused.

On the floor of the marsh browsing on algae are many small creatures, including the snails known as periwinkles. Fiddler crabs scuttle through the thick grasses, the male waving one out-sized "fiddler" claw to attract females and threaten other males.

Grasses, particularly the cordgrasses, play a key role in the productivity of marshes. A

high marsh cordgrass, sometimes called salt-meadow hay, was once harvested for domestic animals and is still eaten by the grazing wild ponies.

This saltmeadow hay has a unique ability to survive burial by sands that cover it when ocean waters wash over the wetlands. Sooner or later it thrusts itself up above the surface and continues spreading by sending out underground runners. The success of this grass helps to stabilize the island against the constant assault of wind and waves.

One of the secrets of the survival of the cordgrass is its ability to discharge excess salt through special cells along the edges and tips of blades. This excretion of salt sometimes paints these plants with a frost-like edging which glitters in early morning sunlight.

Fall is a transition period at Assateague when many birds are migrating to the south and others are arriving for the winter.

Gone now are many of the shorebirds such as the red knot, a robin-sized bird,

which left in July for Argentina. It will be back in May to feed on the eggs laid by horseshoe crabs in the sand after they pull themselves from the ocean on a moonlit night.

When the red knots and many other shorebirds disappear, riding the winds into the ocean mists on their migration flight, it signals the ending of another golden summer.

Soon the snow geese will be arriving at Assateague and settling down in great flocks in the sand dunes.

If disturbed by visitors they explode into flight. As many as 20,000 of these geese spend at least part of the winter at Assateague. However, with the approach of colder weather in January and February many of them will move even further south.

The periodic migrations of birds along various inland flyways and up and down the long coastlines of the world are reminders of an observation by Carl Sandburg that in human affairs also "the glory of life is that we never get anywhere. We are always going somewhere." — C.D.P. □



Wetlands for Wastewater Treatment

By Jay Benforado

It looks and smells like a greenhouse. Lush water hyacinths, with their large purple blossoms and stalks that end in nearly round leaves, float on the surface of six covered rectangular tanks. Catfish, mosquito fish, crayfish, snails, duckweed, and other plants and animals thrive in the environment.

This "aquaculture" project, funded by the city of San Diego, is part of a pilot-test advanced treatment facility that treats raw sewage to standards higher than those used for tap water in many cities. A total of \$3.5 million in Federal, State and local funds is being used to construct a larger system which will be able to treat one million gallons per day.

The San Diego project is one of many innovative waste treatment approaches harnessing natural and artificial wetland processes that scientists have been studying for years.

Lagoons filled with water hyacinths are also used to clean domestic and chemical wastewaters at NASA's laboratory at Bay St. Louis, Miss., where the aquaculture treatment technique was developed in 1975.

The wastewater treatment system at Walt Disney World located near Orlando, Fla., is one of the most innovative and sophisticated natural systems in operation. The waste discharge is first given a high degree of secondary treatment and is then treated by one of four different methods. The major portion of effluent is discharged to a cypress swamp, another portion is used for spray irrigation, and overflow from ponds is sent through a cattail marsh. In addition, a water hyacinth system has been constructed for experimental use.

A large state-owned peatland located near Houghton Lake, Mich., provides advanced treatment for discharge from a one-million-gallons-a-day municipal treatment plant at about half the cost of a conventional facility. This removal of nutrients is necessary to protect recreation at the lake.

In addition to providing waste treatment, managed wetlands can also contribute many other benefits. For example, at the Bitter Lake National Wildlife Refuge in New Mexico, wastewater discharged by the local treatment plant supplies water for a marshy area used by migrating shorebirds and waterfowl. A 25-acre artificial wetland constructed by the Mt. View Sanitary District in Martinez, Calif., to receive effluent discharged from a secondary treatment plant is also managed to enhance wildlife habitat in addition to removing nutrients.

Several factors account for the interest in wetlands wastewater treatment: The need for higher levels of effluent treatment prior to discharge into waterways; rapidly escalating costs of treatment plant construction and operation; and emerging appreciation of the esthetic, wildlife and other environmental benefits associated with the preservation and enhancement of wetlands.

How do wetlands "purify" wastewater? Water that enters a wetland is dispersed over a large area through intricate channelization of flow. Physical entrapment of pollutants occurs in the surface soils and organic litter. In addition, many water quality changes occur as a result of biological activity in a wetland; oxygen is both added to the water as a result of photosynthesis and used during respiration and decomposition; decomposers such as bacteria on and in wetland sediments break down organic matter. In some cases, nutrients and other material may be stored in the sediment, woody vegetation, and peat, depending on the type of wetlands, season of the year and other environmental factors.

EPA has recently inventoried and plans to study discharges or municipal effluents into wetlands in two of its regions—Region 5 headquartered in Chicago and Region 4 with headquarters in Atlanta. In the upper Great Lakes States, 96 sites have been identified. Seventy-five percent of these discharges to wetlands are from municipal treatment facilities and the other 25 percent from commercial treatment facilities or other dischargers. In eight southeastern states, 224 sites are recorded. A few dischargers have

operated for nearly 100 years.

The management of artificial and natural wetlands to treat municipal wastewater has been receiving attention across the country. During an era of increasing energy prices and inflation, wetlands appear to offer a promising alternative or supplement to the high energy, equipment, and labor costs of conventional advanced wastewater treatment. Use of wetlands can also help preserve open space and wildlife habitat, increase recreation potential, and stabilize streamflow. Potential problems include inappropriate use of wetlands because of lack of design criteria and ambiguous and often conflicting regulations and standards.

The need to avoid adverse ecological impacts was one reason EPA and the U.S. Fish and Wildlife Service cosponsored a technical workshop last June on "Ecological Considerations in Wetland Treatment of Municipal Wastewater." A group of wetland scientists met at the University of Massachusetts to hear and discuss 30 scientific papers. Conclusions from the workshop included:

- Wetland systems, both artificially created and naturally occurring, can provide measurable renovation of wastewater. However, the ecological understanding and design criteria to take best advantage of these processes on a routine basis for the most part do not currently exist.

- Natural wetlands have highly variable characteristics making it difficult to generalize about research results, especially in considering use of wetlands in different geographical areas.

- Artificial or constructed wetlands appear to offer the greatest promise for general application in wastewater treatment because of reliable treatment results, simpler management techniques, and greater acceptability by the public.

- There are opportunities and substantial interest in creating and restoring wetlands in combination with treatment of municipal wastewater, stormwater and agricultural return flow.

- Future implementation of full-scale wetland treatment systems will depend on additional

(Jay Benforado is an ecologist with the Conservation Foundation, who is currently working for EPA's Office of Research and Development.)

*Harvesting of hyacinth plants grown in
Disneyworld treatment facility at Lake
Buena Vista, Fla.*



pilot and demonstration studies to build confidence in the design and operation of these systems.

Using or creating wetlands to help treat municipal sewage necessitates a shift from a philosophy that wetlands must be totally protected from any human intrusion. Adopting an approach of wetlands management does not conflict with the need for wetland protection. In fact, competent management of certain wetlands for particular human uses could foster a greater understanding and appreciation of the value of these ecosystem, and thus bolster support for protecting wetlands in general. The concept of managing wetlands is not new.

Waterfowl hunters played a key role in the wetland protection movement because they worked to preserve rapidly disappearing waterfowl habitats. Now many of the National Wildlife Refuges wetlands are managed to increase wildlife populations. Control of water levels and establishment of specific types of plants for cover and food used by ducks and other wildlife are important wetland management tools.

Overall, the conservation community appears to be guardedly optimistic about the future of wetland treatment practices. If this technology is carefully developed and appropriately applied, the benefits could outweigh the disadvantages. Many environmentalists view using wetlands for wastewater treatment with mixed emotions. Since they have battled so long for wetland preservation, they welcome any help they can get in "selling" the need for wetlands, but they fear that advanced waste treatment use could destroy the very values they seek to preserve. Potential ecological problems must be identified early in the development of this technology so that adequate controls are used to protect our valuable wetlands. □



Water hyacinths cover surface of large pond in San Juan, Tex., where they are used to help improve water quality.

EPA Management Strategies and Goals

An Interview with EPA Deputy Administrator Alvin L. Alm

Q. Why were you interested in returning to EPA as Deputy Administrator?

A. First, I believe strongly in the mission Congress has given to EPA. A clean environment can no longer be considered a luxury, but rather a necessary part of an industrialized society. Since I last served at the Environmental Protection Agency, the nature of many of the issues has changed. Today, we more clearly recognize the human health threats imposed by environmental pollution. While we have made substantial progress in reducing gross pollution levels, we have not made equal progress in reducing hazardous and toxic materials nor in dealing with some of the more intractable problems, such as nonpoint sources of water pollution. I would like to contribute to achieving the goals and objectives established by the Congress, and believe that my experience will enable me to do that.

Second, I feel strongly about EPA as an institution. EPA has had a reputation for being one of the best managed agencies in Government and one with an extremely talented and professional staff. The turmoil over the last two years has obviously adversely affected morale and productivity, but not the quality of EPA's staff. I would hope to contribute to improving morale and productivity within the Agency so we could reach the standards of excellence that EPA had attained in the past.

Third, I am extremely enthusiastic about working for the current Administrator, William D. Ruckelshaus. I have had the opportunity of working for many great public servants in the past and Bill Ruckelshaus is certainly in that tradition. He is a person of great integrity, vision, and ability. I feel honored that he has chosen me for this position, and am excited about the possibility of working with him as Deputy Administrator.

Q. Is this a good time to be at EPA?

A. This is a particularly exciting time to be associated with EPA—in a sense a period of "bureaucratic camelot." Bill Ruckelshaus has pulled together a team of extremely talented and professional people to provide leadership to the agency. Coupled with what I consider the best career staff in Government, we have a management team that can achieve the objectives Congress and the American people expect us to achieve.

Q. What approaches will you be taking in your new post?

A. I think there are a few management principles that will be important in running the agency. The most important principle is treating the career staff as our most important resource. In approaching this it is important for the appointed officials to trust the career people that have made this agency work effectively over the years. This trust extends to trusting the judgments and motives of the staff and giving them responsibility for performance and holding them accountable for success. Only through teamwork and open dialogue between appointed and career staff can this agency prosper.

A second basic theme is an open decision-making process. Good managers understand that success is heavily dependent on organizations having shared values and achieving consensus on management directions. We are using many techniques for gaining consensus and understanding on agency goals, such as decision-making in open meetings, use of task forces and involvement of headquarters and regional people in reaching decisions. The creation of a career Management Council to advise Howard Messner and me on management issues opens another approach.

Third, we need to delegate more operating responsibility from the 12th floor to the program offices, from headquarters to regions and from EPA to the states. The more we can place decision-making at the

level of operational responsibility, the more effective our programs will be. While delegating day-to-day operational responsibility, top management needs to focus better on the long term goals and operations of the agency. These goals must be developed through an open process of involving people and encouraging wide participation by agency staff.

Q. How do you view your role as Deputy Administrator of EPA?

A. First, the Deputy Administrator will act as the internal manager of the Agency's operations. Essentially, he will be responsible for overseeing the Agency's varied work products—from developing standards and regulations to making inspections, issuing permits, preparing Congressional reports, and most important, achieving compliance with environmental statutes.

The workload of the Environmental Protection Agency is immense. Over 250 major standards and regulations are in progress, 8,000 RCRA permits must be issued and more than 500 Superfund sites are scheduled for removal or remedial actions. Staying on top of this vast volume of work is a major challenge.

Second, the Deputy Administrator will act in the Administrator's absence and will make some decisions in cases where the Administrator has recused himself.

Third, the Deputy Administrator will oversee the policy development process so that the Administrator can make decisions on the basis of good information. The policy development process must not only inform Agency decision-making, but should also lay out for the Congress and the public the choices that are available and their implications for society.

The Deputy Administrator will also be responsible for overseeing task force efforts to address a wide variety of critical issues, such as developing a dioxin strategy, a groundwater operational plan, a compliance strategy, and improved operations through a



Alvin L. Alm being sworn in as EPA Deputy Administrator by Administrator William D. Ruckelshaus. Holding the bible is Eloise Agee, Special Assistant to the Deputy Administrator.

better delineation of federal and state roles in achieving environmental improvement. The development of a policymaking process that brings together better science, economics, and technical work—while encouraging the public and various interest groups to participate actively—is a critical role for the Deputy Administrator.

In a sense, I view the job of the Deputy Administrator as similar to that of the chief operating officer of a corporation. The chief executive officer, who has a role similar to the Administrator, is responsible for policy decisions and overall direction of the corporation. The chief operating officer is responsible for implementing the decisions and direction on a day-to-day basis.

Q. How do you plan to manage the Agency?

A. There are five major tools I plan to use: The first tool is the management accountability system, which provides a mechanism for establishing Agency goals and following up on achievements.

Second, we are establishing a tracking system to check aggressively on the progress being made on the major work products, including all major standards and regulations.

Third, I will use visits to the regional offices to follow up progress and assure achievement of management commitments. Periodic meetings of regional administrators represents another tool for reviewing regional accomplishments.

Fourth, I plan to have weekly meetings with the assistant administrators to review their progress and discuss problems of particular concern.

Finally, we will use the agency's performance standards to encourage achievement of programmatic objectives. Performance ratings and bonuses will be tied specifically to actual accomplishments.

Basically, I will be interested in ensuring that we are actually accomplishing our statutory goals—namely cleaning up and protecting our environment. We are not necessarily interested in whether people are working hard. We are more interested in whether they are working smarter in accomplishing something.

Q. Do you think EPA can make significant gains during the next year and a half?

A. I may be an optimist, but I really believe we can accomplish a lot. Most of the issues at EPA are well known. What we have to do now is to engage the EPA staff in preparing analysis and options and then make decisions. Bill Ruckelshaus and I are more than willing to make decisions. In addition to moving ahead on policy and management decisions, we can make a number of improvements in the way the Agency operates. We can improve the timeliness and quality of our work products and strengthen our management procedures. Most important, we can institutionalize a way of dealing with each other that allows for creativity and job satisfaction. By institutionalizing good management practices that place prime focus on the Agency's employees, we can achieve the Agency's substantive goals. Achieving our substantive goal of cleaning up the nation's environment is partly dependent on creating a first-rate management environment for EPA's employees. □

Who's Who in the Regions

Region 10 (Seattle)
Alaska, Idaho, Oregon,
Washington
206-442-1203



Regional Administrator
Ernesta B. Barnes

Region 9 (San Francisco)
Arizona, California,
Nevada, Hawaii
415-974-8023



Acting Regional Administrator
John Wise

Region 8 (Denver)
Colorado, Utah, Wyoming,
Montana, North Dakota,
South Dakota
303-837-5927



Regional Administrator
John G. Welles

Region 7 (Kansas City)
Iowa, Kansas, Missouri,
Nebraska
816-374-5894

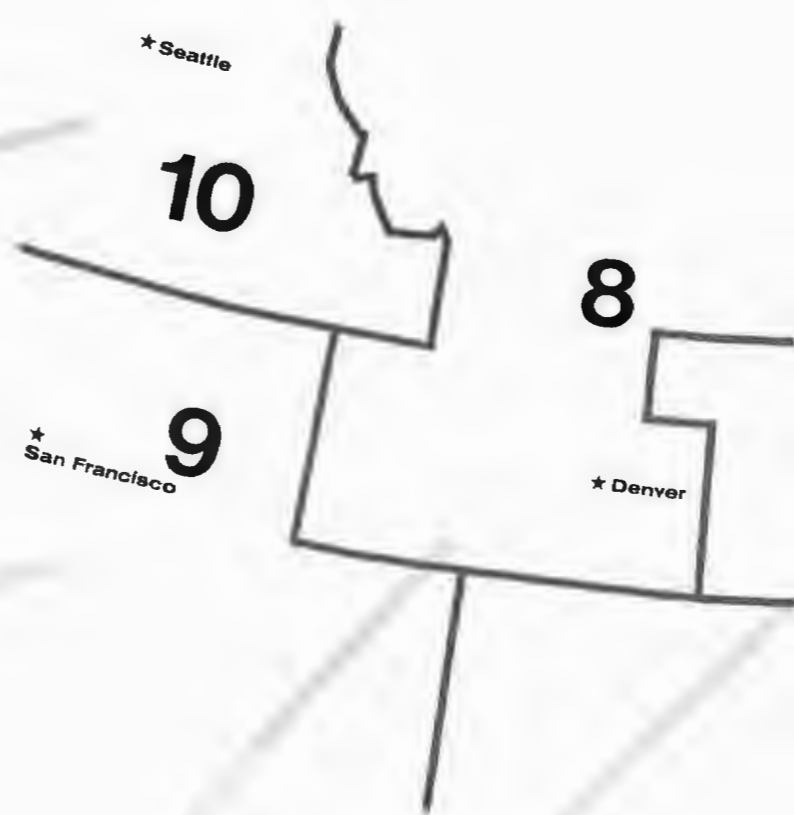


Regional Administrator
Morris Kay

Region 6 (Dallas)
Arkansas, Louisiana,
Oklahoma, Texas, New Mexico
214-767-2630



Regional Administrator
Dick Whittington





Region 1 (Boston)
 Connecticut, Maine,
 Massachusetts, New Hampshire,
 Rhode Island, Vermont
 617-223-7223



**Regional Administrator
 Michael R. Deland**

Region 2 (New York City)
 New Jersey, New York,
 Puerto Rico, Virgin Islands
 212-264-2515



**Regional Administrator
 Jacqueline E. Schafer**

Region 3 (Philadelphia)
 Delaware, Maryland, Pennsylvania,
 Virginia, West Virginia, District
 of Columbia
 215-597-9370



**Regional Administrator
 Thomas P. Eichler**

Region 5 (Chicago)
 Illinois, Indiana, Ohio,
 Michigan, Wisconsin,
 Minnesota
 312-353-2072



**Regional Administrator
 Valdes Adamkus**

Region 4 (Atlanta)
 Alabama, Georgia, Florida,
 Mississippi, North Carolina,
 Tennessee, Kentucky
 404-881-3004



**Regional Administrator
 Charles R. Jeter**

More Key Appointments

President Ronald Reagan has announced his intention to appoint two more EPA Assistant Administrators, a new General Counsel, and a new Inspector General.

They are: A. James Barnes to serve as General Counsel.

Josephine S. Cooper to be Assistant Administrator for External Affairs.

Jack Ravan to serve as Assistant Administrator for Water Programs.

John C. Martin to be EPA Inspector General.

Meanwhile, the Senate has already confirmed the earlier nominations of Alvin L. Alm as Deputy Administrator, Howard M. Messner as Assistant Administrator for Administration and Lee Thomas as Assistant Administrator for Solid Waste and Emergency Response.

Barnes had been serving as General Counsel at the U.S. Department of Agriculture since 1981. Earlier in his career he had been in private law practice and had served as an Assistant to EPA Administrator William D. Ruckelshaus in the Administrator's first term at EPA in 1970-73 and also when Ruckelshaus was Deputy Attorney General at the Justice Department in 1973.

Cooper will be filling a new post consolidating the work of the previously independent Public Affairs, Congressional Liaison, Intergovernmental Liaison and Federal Activities offices. Since 1981 she had been serving on the professional staff of Senator Howard Baker of Tennessee and on the professional staff of the U. S. Senate Committee on the Environment and Public Works.

While serving as an American Political Science Association Congressional Fellow, Cooper was legislative assistant to Senator Baker and Congressman Dick Cheney of Wyoming. Cooper had also been employed previously at EPA as a



Barnes



Cooper

special assistant to the Assistant Administrator for Research and Development in Washington and as an environmental protection specialist and program analyst at EPA facilities in Research Triangle Park, N. C.

Ravan, who will succeed Frederic A. Eidsness after confirmation by the Senate, had previously served as EPA Regional Administrator for the Agency's Regional Office in Atlanta in 1971-77.

A graduate of the U. S. Military Academy, Ravan had served since 1982 as Director of Project Development, Clean Water Group, Wheelabrator-Frye in Atlanta. Earlier he had served in several State and business posts in Georgia.

Martin has been serving as Assistant Inspector General at the Department of Housing and Urban Development since 1981. Previously, he was Supervisory Special Agent for the Federal Bureau of Investigation in 1976-1981; Special Agent, FBI, in 1971-1976; Assistant to the City Manager, City of Rockville, Maryland in 1968-1971; and Deputy City Manager, City of Wilkes Barre, Pennsylvania in 1967-1968.



Ravan



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