

United States
Environmental Protection
Agency

Office of
Public Affairs (A-107)
Washington, D.C. 20460

Volume 14
Number 5
June 1988

EPA JOURNAL

The Marine Environment





Coming up empty. Lobstermen on the East Coast are reporting slimmer harvests this year. Fritz Hansen, who traps between the Statue of Liberty and the Verrazano-Narrows Bridge in New York Harbor, reports "the worst season in 15 years." It is another puzzle in the growing concern about how seriously marine waters are polluted. Keith Meyers photo. NYT Pictures.

The Marine Environment

Are the oceans polluted? Or are American coasts receiving warning signs that they could become so? This issue of *EPA Journal* focuses on these very current concerns.

In an interview, EPA's Deputy Administrator, A. James Barnes, leads off the issue, answering questions the public is asking. Then a point/counterpoint feature addresses the intense debate about dumping municipal sewage sludge at sea. We hear from Mayor Edward I. Koch of New York City,

Governor Thomas Kean of New Jersey, and Mike Brinker of the Joint Meeting, a group of northern New Jersey agencies.

Christopher Daggett, Administrator of EPA Region 2, explains the Agency's detective work last summer to pinpoint the origin of mysterious wastes washing up on the beaches in the New York Harbor area and the New Jersey coast. U.S. Senator John H. Chafee (R-RI) reports on what Congress is learning in its inquiries into ocean pollution and the legislators' thoughts about solutions.

In a *Journal* Forum, six close observers of the marine environment present diverse views on the question,

"Should the oceans receive special protection?"

Then, an article reviews the action and upcoming challenges on the global marine protection front. In the United States again, Michael R. Deland, EPA Region 1 Administrator, focuses on one of the east coast's most significant and hard-fought water quality situations, the cleanup of Boston Harbor. Shifting to the west coast, a piece describes the choices and tradeoffs that northwestern Orange County, California, faces as it grapples with ocean protection questions.

Next, we present a tale about disappearing coho salmon in a Washington state

river system, probe the underwater feats of EPA divers, and explain a controversial marine opportunity—converting old offshore rigs to reefs for ocean life. An additional water-oriented article tells about the problem of air pollutants tainting the Great Lakes.

On another subject, an article ponders a dilemma of modern-day environmental health.

This issue concludes with a regular feature—Appointments. □

EPA JOURNAL

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Correction: In an article titled "Problems on the Urban Frontier" in the last issue of EPA Journal, the author referred to a favorable outcome of a growth management referendum in Orange County, CA. In fact, the referendum was narrowly defeated.

Correction: In the last issue of the Journal, joint authors Ann Breen and Dick Rigby were incompletely identified. They are the co-directors of The Waterfront Center, a non-profit membership group based in Washington, D.C.

Editor's note: The next issue of EPA Journal will be on Environmental Ethics and Education.

Front Cover: Why we came! Surf fishing at Cape May, New Jersey.
Photo by Bill Weems, Woodfin Camp, Inc.

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It is the sea that holds the great mysteries. There is still much to be learned in the land, to be sure, but it is the third dimension of the oceans that hides the answers to broad elemental problems of natural history. Somewhere out there young salmon lose themselves, and the Pribilof seals go there when they leave the rocks where they were born. Through chance concordance of cryptic forces, the Red Tide brews up and sporadically drifts in to the rich littoral of Florida, killing thousands of fish, sending the tourists scurrying to flee the stink, and then sweeping away again, unchecked and uncomprehended. As long as man has had the wit to wonder, he must have puzzled over the new eels in his pasture pond; and being told they come from the sea where their parents went to spawn them is as preposterous as some theory of

astrophysics. When J.L.B. Smith found a coelacanth fish... it was a living fossil, as stirring a discovery to a biologist, and quite as great a probing of the past, as finding a dinosaur would be. Who can trace the way of the great blue marlin or of Rhineodon, the whale shark, or tell anything worth hearing about the oarfish or the giant squid, or even say for sure where the homely mullet spawns its million or where the gleaming hordes of tarpon come from? □

(Excerpted from Archie Carr, "The Riddle of the Ridley." From John Kieran's Treasury of Great Nature Writing (New York: Doubleday & Co., 1957.) Copyright 1955 by the author in Windward Road; reprinted by permission of Alfred A. Knopf, Inc., New York.)



Steve Delaney photo.

The Offshore Environment: What People Are Asking

An Interview with A. James Barnes

Marine pollution is one of the most hotly debated environmental issues. To get answers to questions the public is asking about this problem, EPA Journal interviewed A. James Barnes, Deputy Administrator of EPA. The text of the interview follows:

Q Recently, we've seen a number of disturbing news reports about pollution of our coastal waters. Are our oceans truly becoming polluted?

A Yes. Over the last few years we've seen indications that our near-coastal waters, in particular, are under a great deal of stress from the waste products that result from population and economic growth.

Q What are the stress factors? What is putting pressure on coastal waters?

A Some of the stresses being felt in estuaries and near-coastal waters originate far inland. Run-off from our farms and cities makes its way downriver and ends up in the estuaries and near-coastal waters, which act as sinks for nutrients and toxic materials.

There is also pressure from population growth and related economic activity. Because more and more of our people are moving into coastal areas, we are filling in wetlands for housing and roads. We're building sewage treatment plants, the nutrients from which build up in local estuaries. Even if we do a good job treating sewage and waste streams, the total loadings of nutrients and toxics are going to increase because of growth.

Q A question that might come naturally to a person sitting on the beach and looking at this massive body of ocean water: could human pollution ever have any impact on this tremendous resource?

A I think the answer is yes. Most of our globe is covered with water, that's true. It would seem to have a very substantial capacity to assimilate human waste.

But I think that view is very short-sighted. We're increasingly concerned about the ocean's micro-layer, where the small organisms at the start of the food chain exist. We should be cautious about doing anything that would interfere with the vital role of that micro-layer in the food chain.

Rather than looking at the ocean as a gigantic new receptacle for our waste, I believe we'd be much better advised to significantly reduce the amount of waste we produce in our everyday lives. We need to minimize the waste burden, whether it's in the air, on the land, or in ocean waters.

Q What would you rank as the most serious threat to the ocean environment now? Would it be debris, sewage, radioactive material, industrial waste, or what?

A That is going to vary from area to area. In some places it's the nutrients that deprive a body of water of oxygen. In other places, toxics are probably the more significant problem.

The issue of debris—such as showed up on the New Jersey beaches last summer, and on Long Island this summer—is more an aesthetic problem. It is of concern—great concern—because it interferes with our enjoyment of the beach. But I'm not sure that debris is really the most serious threat to the viability of that sensitive ecosystem that exists along the coast.

I'm more concerned about the toxics and nutrients that are finding their way into these waters. And the loss of habitat that results from filling wetlands





Summer, 1940: Coney Island, an example of a cherished American tradition—spending the day at the beach. AP Wide World photo.

Summer, 1988: Gregory Garre, a lifeguard for the town of Babylon on Long Island, spends a lonely day cleaning up Cedar Beach. Medical-type wastes and garbage slicks have closed some New York and northern New Jersey beaches off and on this summer and last. AP Wide World photo.

and diverting waterflows in those sensitive areas. After all, the wetlands and estuaries are the breeding grounds for all kinds of fish and wildlife that ultimately make their way to the ocean or farther inland.

Q You're talking about the dredging and filling of habitat. As a result of that—together with pollution—are we seeing a decline in fish reproductivity?

A Apparently yes. Look at the number of shellfish beds that have been closed for public health reasons. Look at the areas where commercial fishing is decreasing—changing a way of life—because species that once were abundant no longer can support commercial fishing.

Q Should we also be concerned about dumping waste at sea, say 100 miles out?

A Studies have indicated effects of dumping at the previous site 12 miles off-shore. EPA is investigating potential impacts at the interim, 106-mile site. Our goal is an end to all dumping of sewage sludge off-shore as soon as possible.

Q An environmental group recently reported that acid rain is speeding the growth of marine algae, which can be a water pollutant. What's EPA's reaction to that?

A While air deposition may indeed be a source of some nutrients, there are other, even more significant sources of nutrients in many water bodies—specifically, sewage treatment effluent and run-off from cities and farms. Even so, we do want to take a look at the data in that study and see to what extent acid deposition contributes to algae bloom.

Q Is the greenhouse effect—climate warming—having an effect on sea level? How concerned is EPA about the possibility of a rising sea level?

A Certainly this is a problem that warrants serious attention in this country and around the world. It's a particular focus of concern for EPA.

At this point there are still a number of questions we have to answer. How much of a rise in the sea level can be attributed to the so-called greenhouse

effect? How much is part of what seems to be a natural cycle of warming and cooling that's taken place on the earth many times over millions of years.

Q How concerned should people be about off-shore oil drilling? Is that a threat to the ocean environment?

A Off-shore oil drilling, like a number of other human activities that might take place in that environment, warrants our close attention. We need to determine in advance of drilling what the potential effects might be, then look at ways we might minimize or mitigate those effects. Finally we need to balance those effects against what we stand to gain from drilling.

We've learned a lot over the last few years about ways to minimize the adverse impacts of off-shore oil drilling on the environment. Some coastal areas are more sensitive—environmentally and ecologically—to drilling than others. Often it is possible to drill in a less sensitive area and achieve the same economic result.

Q Does EPA have adequate authority to address the problems we are talking about, or do you believe we need additional authority?

A For most of the problems we've been discussing, there's adequate authority on the books. At the same time, I believe the American people are going to have to think about making some adjustments in their lifestyles. For example, do we really need to generate all the waste that ends up burdening the environment?

Also, we must be careful that, in our eagerness to live near the sea, we do not destroy some of the very values that attract us there in the first place. For example, we need to refrain from building in ecologically sensitive areas along the coast.

We have laws that control the release of toxic materials into surface waters, or emissions into the air, which may ultimately fall to earth and pose a problem in the marine environment. When the Agency was looking at the question of incineration off-shore, the potential impact of incinerator emissions on the micro-layer was one of our concerns. So the laws on the books that are aimed at protecting a number of different media could ultimately be used to protect the oceans.

At this point, I don't have a sense that we need a lot more legal authority. We

need to have a better scientific understanding of what's happening in the environment. We also need to do a better job, perhaps, of targeting and using the legal authorities we do have. At the same time we need to induce changes in people's behavior—encourage self-restraint—so that we minimize the adverse impacts that population growth and economic activity have on coastal and other ecologically sensitive areas.

Q You are calling for reducing waste at the source, and recycling?

A Yes. That is a theme that I'd really like to emphasize. There was a point several hundred years ago when there were so few people and such limited economic activity that the air, water, and land around us could assimilate our waste.

But as our population has grown, as our economic activity has grown, we're finding that even if we do a relatively good job of controlling our pollutants in the traditional sense, the total loadings of different pollutants from all sources are placing a heavy burden on the environment.

So, as a nation, we really have to work to minimize waste products, and then see whether some of those waste products we do produce can be recycled or reused. We must stop thinking about waste disposal as a linear process where we make something, use it, and then throw it away. Instead, we need to view waste disposal as part of a more circular process where we make something, use it, then look for a way to reuse it and minimize how much of either that product, or the packaging, or associated waste materials ultimately have to become a burden on the environment.

And that's central to our concern about the oceans. It is also important when we're talking about trying to improve air quality in this country, or the quality of our surface waters, or our ground waters.

Q Of course EPA faces a wide range of problems—from pesticide residues on land, to contaminated ground water, to toxic air pollutants. Where would you rank marine pollution on the scale of comparative risk from environmental problems?

A Well, I certainly would rank estuarine and near-coastal waters pollution up near the top of the list. It

may not be number one, but it's in the top three or four. In part, that's because these areas are really the base of the whole ecological system that we depend upon for much of our sustenance.

Many of the problems facing marine areas are related to the ecological well-being of the country as a whole. Some other environmental problems may rank higher in terms of risk to human health, because people are being exposed to them by breathing the air, or drinking water, or being exposed, say, to pesticides.

But when we are talking about the ecological dimension, which is very important, then marine issues have to be ranked very high.

Q In this issue of the magazine, we include a forum in which we have asked a variety of ocean observers and specialists whether the oceans should receive special environmental protection as compared to the air or the land. How would you answer that question?

A We are going to protect the ocean. We're going to generate some waste, but I'd like to see us confine it to limited areas of the land, and not put the ocean resource at risk.

Q What do you sense about the pace of the nation's efforts to protect the marine environment? Are we moving fast enough now? Do we need to move faster?

A Well, I'm torn on that question. On the one hand, we've been very pleased at the response we've seen in a number of areas around the country—the Great Lakes, the Chesapeake Bay program, and some of the other estuary programs, in which local and state concerns are unified and groups are pulling together to protect these resources.

At the same time, one can't help being conscious, again, of the massive movement of the population in this country to the coastal areas, to the increased construction and economic activity that's taking place all along our coasts and is just bound to accelerate the stresses we're placing on these very significant and special areas.

We're not yet near the point where we can feel comfortable about the success of our efforts to protect coastal lands.

Q What role can individuals play in protecting the coastal and marine environment?

A I think there's an essential role for individuals, whether they live far inland or closer to the oceans. Basically, all of us must try to be more conscious of what happens to the waste products of our everyday activity as they leave our property.

Even if you're living 50 or 500 miles from an estuary or coastal waters, the pesticides you spray on your lawn or the fertilizers you spread on your farm can be washed off and find their way into a river—or into a sewer system and then into a river—and can then have a significant impact on coastal areas far downstream.

Then, when you go to the shore for summer vacation, you find there aren't any lobsters because the oxygen has been depleted by nutrients and other waste that flows into the coastal waters, you have to realize that you are part of the problem.

So there are a number of things for individuals to think about, and a number of ways to act. We all are going to have to do a little more, individually and collectively, to protect the oceans.

Q Do you think people really understand that their actions can have a significant impact?

A Some people, yes. Do the bulk of the people reach that conclusion? I doubt it.

Q How does the world community—international action—fit into this picture?

A Well, the world community is going to be increasingly significant when it comes to a global commons like the ocean, in which all people have an interest.

At a number of international meetings, I've been struck by just how intense the feelings are of many government leaders—particularly those of island nations—about the overall health of the oceans. They see the oceans as belonging to all the people on this earth, and not the province of those who happen to be living in highly industrialized or developed countries, and who may be eyeing the ocean as an easy way to get rid of their waste.

I think we're going to see increased pressure and concern from a variety of international organizations to try to protect the oceans. They believe that



EPA's ship, *Peter W. Anderson*, currently located in the Chesapeake Bay, does marine research and monitoring. From a dinghy, crew member Robert Orme checks a buoy which radios data on water temperature, salinity, and dissolved oxygen back to the EPA liaison office in Annapolis, Maryland. Steve Delaney photo.

the ecological chain, but the amount of information we have about the ocean environment is less than our knowledge, say, of inland waterways and lakes. That should make us cautious about moving into the ocean environment for waste disposal until we gain a better sense of the possible effects of what we're doing there.

Q Would you single out any particular areas as needing EPA research attention?

A The Administrator has asked our scientists to focus hard on wetland and estuarine areas because we have seen so much incremental damage there. We need a better scientific understanding of the limits—the tolerance—these regions possess. We also need to learn whether we can restore some of the areas previously damaged or endangered.

Q There is a lot of coverage of marine environmental problems in the media. Do you believe the public is well-informed?

A I think public sensitivity to marine problems has increased lately. As I travel around the country and speak to different groups, I find that the level of concern is significantly higher than it was, say, a few years ago.

people who create waste and benefit economically from actions that create waste should be the ones that carry the burden.

Q Over the long run, do you think any waste can be safely disposed of at sea, near shore, or even in deep water?

A Yes, some waste probably could be safely disposed of at sea, particularly in the deep sea. But that shouldn't be too unqualified a "yes" because the ramifications of using the sea as a significant depository of waste are really not well understood yet. They must be

understood before we act, or we could find ourselves in trouble, discovering after the fact we've created problems that are working their way up through the food chain. A problem of that sort could be very difficult to reverse.

Q How would you describe the state of our knowledge about the ocean environment and the severity of the threat to it?

A We don't have perfect knowledge about any area of the environment or

Note: As EPA Journal went to press, Mr. Barnes announced that he has accepted a position as Dean of the School of Public and Environmental Affairs at Indiana University. Dr. John A. Moore will serve as Acting Deputy Administrator (see *Appointments in this issue*).

Should Sewage Sludge Be Dumped at Sea?

A Point/Counterpoint

Sewage sludge is treated human waste and other sewage produced in the form of a semi-solid residue from waste treatment processes. Despite a widespread public perception that ocean dumping of sludge pollutes the sea and damages marine resources, there is still an active debate on whether such ocean disposal is in fact detrimental to the marine environment and whether other sludge disposal methods are generally more acceptable.

In 1977, Congress voted to end all ocean dumping by 1981 through amendments to the Marine Protection, Research, and Sanctuaries Act (commonly known as the Ocean

Dumping Act). That law was, however, successfully challenged in court by New York City in 1981. The court ruled that ocean dumping of sewage sludge might continue beyond 1981 unless EPA determined, on a case-by-case basis, that dumping would unreasonably degrade the marine environment. As a result, a total of nine sewer agencies in New York City, Westchester and Nassau Counties in New York State, and New Jersey are still dumping their sewage sludge in the ocean at a dump site 106 miles east of Cape May, New Jersey.

Some politicians and environmentalists have demanded a total ban on using the ocean as a sludge

dumping ground. Others believe that ocean disposal is both safe and environmentally sound. They further argue that disposal of sludge in the ocean is the best method available to places like New York City, given the volume it has to handle and the lack of landfill spaces and other alternatives.

Recently, New Jersey ordered an end to all ocean dumping of sludge by 1991, and the formulation of alternative land-based sludge management plans is now a high priority. Meanwhile, EPA is considering ocean dumping permit applications from the nine sewer agencies and is negotiating phase-out schedules with these authorities. Also, Congress is considering further legislation.

In light of the controversy, EPA Journal asked Mayor Koch of New York City, Governor Kean of New Jersey, and Mike Brinker, Executive Director of Joint Meeting, a group of northern New Jersey agencies, to respond to the question: Should sewage sludge be dumped in the ocean? Their comments follow:

Mayor Edward I. Koch

Sewage sludge is a normal product of daily life. Government does not create sludge, but government has been given responsibility for ensuring its safe disposal. On a strictly scientific basis, sludge disposal in the ocean is the best, most environmentally sound method now available to New York City. Over time, it has been proven safe and reliable. Yet, despite this, arguments are repeatedly put forward in opposition to the discharge of sludge in the ocean.

There are only three ways to dispose of sludge. It can be burned, spread on land, or placed in the ocean. The first two options are particularly difficult for New York City. The city's air quality already falls short of federal standards, and we are working to meet those standards as soon as humanly possible. Emissions from burning sludge would lead to the further deterioration of the city's air quality, which is unacceptable. Placing our sludge on land would cause enormous problems because there is practically no land available on which to spread it.

Contrary to a widely held view, ocean disposal of sludge plays no role in the fouling of coastal areas. Sewage sludge contains neither garbage nor other materials that could float onto a beach. Sludge and garbage are two completely

separate products of modern life. Sludge is 97 percent water. The remaining three percent consists of tiny particles of solids in suspension. As sludge is released into the sea, it disperses quickly, becoming invisible to the eye and undetectable by laboratory analysis.

Ocean disposal does not harm aquatic life. New York's sludge has been singled out by special interests—including the fishing lobby—as being toxic. This is just not true. In fact, the solids in our sludge consist primarily of organic materials, with a lower proportion of industrial pollutants than the sludge produced by many other cities. Under the city's pretreatment program,

increased amounts of industrial pollutants have been removed from sludge over the past two years.

For 50 years, the city has disposed of sludge in the Atlantic ocean without incident. Ocean disposal does not deplete oxygen levels that are needed to sustain marine life. Neither does it introduce toxic concentration of heavy metals or other pollutants into the ocean. Laboratory tests have established that the city's sludge is harmless when diluted by seawater.

Yet accusations against the city persist, especially when there is some need to explain an environmental mishap, and New York looms as a big target. Just recently a respected national newspaper erroneously reported that the city's sludge had harmed lobster beds on the Continental shelf. The article had no byline, and the source for this allegation was unsubstantiated. It turns out that those lobster beds are 70 miles up-current from the city's disposal site, so ocean currents actually carry sludge away from them.

New York City has never claimed financial hardship as an excuse to continue ocean disposal. The city has been required to prove—and we did prove through a scientific study—that ocean disposal is the most environmentally sound method now available.

Smaller cities can farm out their sludge for outside disposal. New York's



Mayor Edward I. Koch

sludge operation, which generates 2.5 million gallons every day, is too massive to be entrusted to a patchwork of private contractors. Last year's spectacle of the Mobro garbage barge wandering helplessly on the high seas clearly warns against this sort of waste management.

Several years ago, the city assessed the relative environmental impacts of ocean disposal and incineration. We concluded that ocean disposal was a safe option. For all the claims made on its behalf, incineration could open a Pandora's box of environmental problems. Few modern incinerators are currently in use anywhere, and none of these are as large as the city would need. Our previous commitment to garbage incineration and our compliance with the federal Clean Air Act could force the city to locate sludge incinerators outside of the city. Wherever they are located, sludge incinerators would have the additional burden of being operated so as not to produce any acid rain effect on the environment.

Ocean dumping may not be the ultimate method of sludge disposal. At EPA's request, we are again examining the relative environmental benefits of all known methods. By studying the alternatives anew and working with state and federal legislators, we may some day devise a process that is even safer than ocean disposal. Unfortunately, we won't find it next year or the year after. It will take time, patience, and cooperation to develop a method that won't replace our 50-year safety record in the ocean with a new threat to the environment.

New York City is firmly committed to pursuing the most environmentally sound method of sludge management that is legally and technologically within our grasp. Given time, we will find such an alternative to ocean disposal. □

(Copyright 1988, Edward I. Koch; used by permission)

Governor Thomas H. Kean

The Atlantic Ocean and the New Jersey shore are something special: no one disagrees with that. How many families look forward to those lazy summer weekends when they can live the good life in cottages in Belmar or Mantoloking? How many romances have been hatched as young couples stroll in the moonlit surf? How many generations have earned a living by fishing our ocean's waters?

Sadly, despite its mysterious beauty and its practical significance, we have often treated the ocean no better than a junkyard or a garbage can. We have viewed it as a convenient dumping ground for those awful substances we do not want on land. In no area is this shortsighted philosophy more apparent than in our reliance on ocean dumping of sewage sludge.

Forty-eight states, along with most of New York state and the southern part of New Jersey, dispose of their sewage sludge without resorting to ocean dumping. Only nine agencies in northern New Jersey and the New York City area send sewage sludge in barges out over the horizon to be dumped into increasingly murky waters.

Since the Ocean Dumping Act was passed in 1973, the amount of sewage sludge dumped by New Jersey towns and cities has increased from 442,000 pounds per day to almost 930,000 pounds per day. Fifty-eight percent of the sewage sludge we produce is now dumped in the ocean.

Why has this increase occurred? Because we have done a good job of upgrading wastewater treatment

facilities. In fact, we expect a 50-percent increase in the volume of sludge produced over the next few years as we continue to provide cleaner water.

Given my state's increased dependence on sludge dumping, it would be convenient simply to argue that the practice should continue. But we must not do what is easy; we must do what is right, both for the environment and for our long-term economic health. We must end all dumping of sewage sludge in the ocean by 1991.

Mayor Koch and others argue that no evidence exists proving that dumping sewage sludge damages the ocean. The truth is, the scientific evidence is too uncertain to answer that question. By choosing ocean disposal over land disposal, we are gambling on the unknown.

If we lose that gamble, the price is incredibly high: tourism is a \$7 billion industry on the New Jersey shore; the regional fishing industry earns more than \$100 million a year. What's more, these numbers don't begin to approximate the cost of lost jobs, ruined vacations, and the degradation of a natural resource we have a moral responsibility to bequeath to the next generation.

No one can argue any longer that the ocean is the only viable disposal option for sewage sludge. We have made dramatic advances in pretreatment to remove toxic metals from sludge, in air pollution control technology to allow us to burn sludge safely, and in source reduction technologies to cut the volume of sludge produced. These technologies are safe and practical. Other states are using them. They are working.

Ending sludge dumping isn't going to be cheap. In northern New Jersey, we estimate we may have to site six new incinerators at a cost of hundreds of millions of dollars. New Jerseyans will see these costs in their sewage bills. Still, this is a price we are willing to pay as one very important step to protect our precious ocean from destruction.

But New Jersey cannot do it alone. New York and New Jersey are as dependent upon each other as a figure skating pair in the Olympic Games. Imagine if only one skater spent long hours training while the other never



Bachrach Studios

Governor Thomas H. Kean

practiced? The result would be failure. The same result will occur if New Jersey ends its sludge dumping while New York continues.

Some have said a five-year deadline is unrealistic. I disagree. New Jersey's experience has proved that this is enough time to permit and site these facilities, and to begin construction. If New Jersey can do it, why can't New York?

Ending sludge dumping has to be a high priority. When that last sludge barge leaves the harbor, it will signify that the years of neglect and callous disregard for the ocean are finally behind us. It will show that we appreciate the ocean's value and fragile nature.

It will signal, in short, that we accept the responsibility of passing on a healthier planet to those who come after us. □

Mike Brinker

Should sewage sludge be dumped in the ocean? This question raises three others:

- Can we afford, environmentally, to discontinue disposing of treated sewage sludge in the ocean without accurately evaluating all of the options available (ocean, air, and land) to determine which would be impacted the least?
- Is the timetable that has recently been decided upon attainable?
- Is the decision to cease ocean disposal political or scientific?

In 1976, when the issue of discontinuing ocean dumping was initially raised, it was determined that sewage sludge disposed in the ocean was detrimental and, therefore, the practice should cease. Nobody, however, has determined that land disposal would be less detrimental than ocean dumping. In fact, it may create more problems.

The decisions being made today—involving fines and fees and the establishment of an unattainable timetable in an effort to force the discontinuance of ocean dumping by March 1991—are political, not scientific. They are based principally

upon the public perception that treated sewage sludge deposited in the ocean—even 106 miles offshore—is environmentally damaging. The treated sludge is confused with raw, untreated sewage or with garbage and its attendant floatables that find their way to the ocean through combined sewer overflows and garbage landfills.

Arguments on both sides point to “irrefutable proof” to support their contentions. The fact of the matter is that EPA is required to de-designate or redesignate the 106-mile site, but only after their complete evaluation has been made. Should EPA decide to redesignate the site, there is no doubt that the decision will be challenged. If the challenge succeeds, whatever timetable is set thereafter would be in the form of a compliance schedule, since cessation of ocean dumping would be a foregone conclusion.

From a practical standpoint, the presently proposed 1991 deadline cannot be met. Therefore, consideration should be given to extending this date with the understanding that those agencies that show good faith efforts in preparing to get out of the ocean shall be exempt from fees, fines, and penalties while their preparations proceed.

The six New Jersey agencies that use the 106-mile site have recently had their effluent discharge permits modified to include a mandated compliance timetable, under which we must submit to the state Department of Environmental Protection, by April 30, 1989, an update of our previously submitted land-based sludge management plans. At that time we

must define the plan (probably incineration) which will be utilized; we must also acquire the site, conduct a Public Hearing and offer responses to same, and submit an application for said plan for review and approval.

The permitting process for sludge incineration air permits will take approximately 12 months, or until April 30, 1990. This leaves only 11 months to fund, design, review, bid, award, construct, and start up (following shutdown) an incineration facility. This just cannot be done within the time frame proposed by the regulatory agencies and the legislature.

And what of the risks to air quality? The northern New Jersey area is one of the most densely populated and industrialized areas in the country. Added to six proposed solid waste incinerators and a hazardous waste incinerator in this area, the five sludge incinerators that have been proposed would only compound the already existing air-quality problem.

The legacy that would be left by those who regulate and legislate might be a cleaner ocean, but at what expense to the air quality, and at what cost to the millions of people who inhabit this densely populated area?

The issues at hand should be resolved by conducting a “multi-media evaluation.” A recent article in the nationally circulated *Water Pollution Control Federation Journal* noted that the ocean should be considered a multi-media disposal environment. Before we remove 55 percent of the total sludge quantity generated in New Jersey from the ocean and bring it onto the land, perhaps we should reconsider and not commit ourselves to a decision that may have land- or air-related repercussions in the future, after the present-day legislators are gone from office.

We are not against the cessation of sewage sludge disposal in the ocean. We do and will support what promises to be scientifically and environmentally proper for the users of our facilities so long as timing and factual data are considered in the decision-making process. But until a proper decision is made, we can only continue to dispose of our treated sewage sludge in the ocean, 106 miles offshore. □



Mike Brinker



Syringes picked up from the shoreline of Staten Island's Midland Beach, on July 11, 1988, are displayed in a child's beach toy. Hundreds of such items have been found this summer on New York-northern New Jersey area beaches along with blood vials, prescription bottles, and medical tubing. William C. Franz photo. *Staten Island Register*.

Whodunit?

by Christopher Daggett

"Nothing ever really goes away." That's what scientist and writer Barry Commoner warned several years ago regarding the environment.

Garbage, one of the less savory fruits of our technological progress, is no exception to that rule: plastic toys, appliances, and packaging; rubber tires and dacron shirts; styrofoam cups. We use them and throw them away. Out of sight, they are out of mind ... for a time, until these "disposable" goods resurface as decomposing ghosts of their former

selves. And they can do it in the unlikelyst of places.

This point was brought home to New York and New Jersey by a mysterious development last summer. Garbage of unknown origin began washing up on shores in the New York Harbor area and along the New Jersey coast. So much garbage was washing up, some of it in giant, floating slicks of coagulated waste, that local health officials had to close beaches on several occasions.

In the most publicized case—in August 1987—a 50-mile garbage slick washed up on New Jersey beaches from Belmar to Beach Haven. The slick contained all types of floatable garbage (often referred to as floatables), including plastics, paper, cans, bottles, wood, and, most alarming to the beachgoers, used hypodermic syringes and other medical-type waste.

The problem quickly became a hot topic to the local news media. Environmental groups and politicians raised public health issues, and the business community voiced concern about the effects of floatables pollution on the beach-dependent summer tourism industry.

Jarring TV footage and newspaper photos of syringes and other garbage blanketing sections of coastline fueled public concern throughout the region. The clamor grew to find the source and stop the pollution.

EPA began its own investigation to help state and local efforts to unravel the mystery. For three months, from November 1987 through the following January, the Agency conducted helicopter surveillance and on-site investigations, photographing and videotaping shorelines and waterways, and tracing possible sources.

The first goal of the investigation was to assess the real extent of the floatables

problem and to see which areas were most heavily affected.

In general, the greatest accumulation was found along natural, undeveloped shorelines, near the New York City metropolitan area, which retain floatables more readily than do heavily developed shore areas. In fact, floatables accumulation was minimal along the developed shorelines, where man-made seawalls and piers that prevent them from washing ashore have replaced beaches and wetlands.

While assessing the extent of the problem was a necessary first step, the overriding goal of EPA's study was to isolate the sources of the floatables. Agency investigators used a number of tools, including special tide-monitoring and surveying equipment, to track possible sources. They turned up several likely sources. They also found that the dynamics of floatables pollution are much more complex than was first suspected.

They found, for example, that floatables pollution takes two distinct forms. First, there is everyday accumulation—dispersed quantities of floating garbage and wood that have been familiar sights in the New York Harbor area for many years. And, there are the large concentrated slicks of waste. Though they appear only periodically, it is these slicks which most alarm people and have forced the widely reported beach closings.

The investigators' most important discovery was that each form of floatables is produced in a distinct way.

Extensive helicopter surveillance and tracking found a wide variety of sources

for daily accumulations of dispersed floatables:

- Litter from pleasure boaters and beachgoers.
- Foreign and American commercial ships and military vessels that dump on-board garbage at sea in order to avoid the requirements of in-port waste disposal.
- Spillage from garbage landfills on the shores of New York Harbor.
- Spillage from garbage barges at marine transfer stations.
- Free-floating wooden beams and planks from decaying piers, rotting wooden vessels, and pier demolition work.

The daily accumulation of medical waste that has so alarmed people has less apparent origins. City and state regulations in New York and New Jersey mandate special handling and, in some cases, incineration of medical refuse. Obviously, some of it has been slipping through the regulatory checks. It remains unclear, though, whether it comes mainly from hospitals and clinics, private practitioners, home IV-users, drug addicts, or some combination of all of these.

If finding all the sources of the dispersed, everyday floatables has been difficult, determining the sources of the floating slicks has proven no less so.

In fact, because the slicks appear only periodically, it has been even harder to pin down the dynamics behind their formation. Certainly, dispersed floatables provide some of the raw material, but slick formation requires some other, more unusual

There is no single villain in this story. As EPA discovered, there are many factors, from garbage handling to the pull of the moon.

circumstances, as well. It appears that they can form in a couple of ways.

EPA investigators found one way slicks formed while studying Pralls Island, an uninhabited piece of land in the waters off Staten Island that was literally covered with garbage.

The investigators had come to suspect that, when heavy rains worked together with the lunar pull of a new or full moon to produce abnormally high tides, something else unusual was happening: floatable garbage previously deposited along the island's shores was resuspended in the harbor waters by the high tide and flushed back offshore. The resuspended garbage, apparently, then gathered in the water with other floatables to form large floating slicks.

To test that theory, and to document it on film, EPA undertook a special study of the island. Monitoring was initiated with the occurrence of a new moon and one day prior to a forecasted rainstorm. Investigators marked off the island's high tide line and painted onshore floatables fluorescent orange in order to track any resuspension. Tide-monitoring bottles were also dropped along the shoreline.

Two days later, after the rainstorm and the gravitational pull of the new moon had produced tides two feet above normal, the investigators found that virtually all the specially painted floatables, as well as the tide-monitoring bottles, had either been resuspended and carried off the island or redeposited elsewhere along its shore. New floatable objects had been deposited in their place. At the same time, floating garbage slicks began to appear in the waters off the island.

EPA also found a second way slicks can be formed when the investigators examined a process called combined sewer overflow. In many older cities of the Northeast, such as New York City and Newark, New Jersey, storm drainage systems and sewer systems are combined in one underground network. During big rainstorms, these municipal systems are often overloaded and have to divert some stormwater run-off directly into the waterways of the New York Harbor complex. The run-off carries with it a good deal of sewage, as well as leaves and street litter that have been swept into storm drains. When this run-off combines with dispersed floatables already in the water, concentrated slicks can be formed.

And when combined sewer overflow and resuspension in the water occur together, the largest slicks appear to be formed.

In fact, a look back by EPA revealed that such a combination occurred only days before the infamous 50-mile slick appeared off the New Jersey coast in August 1987. EPA believes that, together, these events helped to produce the giant slick.

Another suspected factor in the formation of the big slick is garbage that is believed to have been illegally dumped into the New York Harbor some days before the slick appeared. As of now, however, that is still under investigation.

Now that most of the sources of floatables pollution in the New York-New Jersey area have been identified, EPA is trying to focus

attention on possible solutions. But getting rid of floatables, whether in dispersed or slick form, will be no mean feat.

Writer H.L. Mencken easily could have been talking about floatables pollution when he said: "For every problem there is one solution that is simple, neat, and wrong." The floatables problem is so visible, so obvious, that it is tempting to look for equally obvious solutions. But there is no single villain in this story. As EPA discovered, there are many factors, from garbage handling to the pull of the moon.

Efforts to minimize floatables pollution will have to take all of the contributing sources into account. And they will have to address the dynamics of the floatables problem in all its complexity. But with the major parts of the puzzle now identified, policy-makers should find it less of an exercise in the dark to piece together solutions. □

(Daggett, Administrator of EPA's Region 2 since 1984, will become Commissioner of New Jersey's Department of Environmental Protection this month.)

Editor's note: Similar incidents of beach washups of floatable garbage, most notably including medical-type waste, are occurring this summer in the ocean waters of the New York-New Jersey area. Local, state, and federal authorities are working to address the problem through a variety of legislative, regulatory, and public education measures. Investigations continue into the sources of the waste, particularly the medical-type material. □

With the major parts of the puzzle now identified, policy-makers should find it less of an exercise in the dark to piece together solutions.

What Congress Is Learning

by Senator John H. Chafee

The 100th Congress has heard a disturbing message regarding the condition of our coastal waters, bays, and estuaries. This message has not been carried solely by environmental groups but is echoed by fishermen alarmed by declining catches of fish, by average citizens who are disgusted by the tide of coastal pollution and trash that appears with regularity on our beaches, and by objective researchers at universities and at the Congressional Office of Technology Assessment.

Essentially the message is the same: America's coastal waters are dying. The implicit conclusion is that the panoply of policies and programs at the federal, state, and local levels has not been effective in adequately protecting our marine environment. At a time when the stresses on our coastal waters have never been greater, we are experiencing a decrease in funding for critical marine research and enforcement programs and are witnessing a lack of political will needed at all levels of society to protect our resources at sea.

Perhaps most sobering is the dire warning delivered in a congressionally mandated report by the Office of Technology Assessment (OTA). This report, *Wastes in the Marine Environment*, notes that an enormous amount of pollution ultimately makes its way to coastal waters. Many of these waters, the report notes, have exhibited a variety of adverse impacts, and their overall health is declining or threatened. Without stern additional measures, new or continued degradation will occur in our coastal waters.

This message is unequivocal and poses a serious challenge to lawmakers. Not only do existing laws need to be more stringently enforced, but there is clearly a need for new, forward-looking legislation that offers innovative approaches to the problem. This is

happening at a time when budget deficits are forcing Congress to scrutinize every new dollar that goes out the door.

The Senate Environment and Public Works Committee, in a series of oversight hearings this past year, has heard testimony chronicling individual success stories. For example, EPA's Near-Coastal Program holds promise of providing us with accurate measurements of the total loadings of pollutants in our near-coastal waters. In this effort, EPA is being assisted by the National Oceanic and Atmospheric Administration's national status and trends programs. Despite Administration efforts to cut the data-gathering capabilities of these programs, they have been a useful tool in monitoring the health of coastal waters.

Another major effort under way at EPA is the National Estuary Program, which fosters inter-agency, inter-governmental, and public/private sector cooperation in addressing the total pollution problems of selected estuaries. Under the auspices of this program, a comprehensive master environmental plan is being developed for Narragansett Bay in Rhode Island. Ideally, this plan will address the control of point and nonpoint sources of pollution, and the implementation of environmentally sound land-use practices near the Bay.

Although we are winning some of the battles, it is apparent from the OTA report that we are losing the war. The two major statutes that govern waste disposal in the marine environment—the Marine Protection, Research, and Sanctuaries Act (MPRSA) and the Clean Water Act—in theory provide adequate authority to protect all marine waters and the rivers that flow into them. MPRSA generally regulates the transportation and dumping of wastes on the high seas, and the Clean Water Act covers all discharges into the navigable waters of the United States. The broad authorities of these overlapping bills give government the ability to assess and regulate the total loading of pollutants into the marine environment.

Why, then, are we finding that almost a third of the shellfish beds in the United States are closed due to pollution? Why are half of our nation's coastal wetlands destroyed? Why are beaches from Florida to Maine often closed to swimmers for periods during the summer? Why are some New England lobstermen reporting that their catch is down 75 percent? And why are





Above. New Jersey's Department of Environmental Protection set thousands of bottles free from various locations to determine where they would land. Hundreds washed up on the eastern shore of Staten Island like these in Princes Bay. William C. Franz photo. *Staten Island Register*.

Far right. A scenic shoreline as people like to think of it. Steve Delaney photo.



we still dumping more than a billion pounds of toxic pollutants directly into our waters each year?

The solution to these problems is complex. It involves a significant increase in congressional oversight of the agencies charged with enforcing these statutes, new legislation to bring new approaches to conducting research on the marine environment, and a public education campaign aimed at heightening awareness of coastal zone management issues. Oversight must focus not on issues in isolation, such as successes in regulating point-source pollution, but on a comprehensive picture of why coastal waters are declining in health. The site-specific waterbody management programs initiated by the Water Quality Act of 1987, such as the Chesapeake Bay and National Estuary Programs, must be viewed as part of an integrated national strategy to clean up coastal waters.

The need for comprehensive management of coastal waters will grow more urgent as we approach the next century. Population shifts are placing an increasingly heavy burden on the east and west coasts of the United States. By 1990, a mere two years from now, an astounding 75 percent of America's population—over 180 million people—will live within 50 miles of our

sea or Great Lakes coasts. The intense pressure on the marine ecosystem created by this migration will require government at all levels, as well as the private sector, steadfastly to resist the urge to overdevelop our coastal areas. For example, municipalities that already experience wastewater overflows during rainstorms must tightly restrict development until additional treatment capacity exists to deal with such emergencies. Policies at the federal level should reinforce this kind of approach.

During oversight hearings, lawmakers, including myself, have been frustrated by the lack of definitive answers to seemingly basic questions. Is the shell disease seen in many New England lobsters caused by the ocean disposal of sludge? No one seems to know for sure. Why have oyster harvests in Chesapeake Bay declined by almost two-thirds? What is causing the disorder that results in the beaching of hundreds of dolphins? What is the relationship between the introduction of pollutants to the marine environment and the contamination of marine organisms? What is the impact of extensive new sewage treatment plant capacity on the water quality of Narragansett Bay?

In testimony before the Senate Environmental Protection Subcommittee, Robert Duce, Dean of the University of Rhode Island's Graduate School of Oceanography, lamented that in many coastal areas we simply do not know with any scientific accuracy whether there has been improvement or degradation. He also noted that the necessary measurements and long-term monitoring programs that can give us a standard against which we can gauge water quality, and by which we can measure water quality changes, simply have not been available for most coastal regions.

Before government can act intelligently, it is essential that we develop a thorough scientific understanding of our marine resource and identify threats to its quality. This knowledge is vital if we are to protect the marine environment and act to prevent problems before they become unmanageable. OTA's report on wastes in the marine environment concluded that—monitoring, research, and enforcement are currently inadequate. . . . Information gaps still constrain analyses of marine wastes disposal, partly because of a lack of information gathering in some areas of the country, lack of systematic analyses

of gathered data, and ineffective dissemination of results.

In response to this critical lack of information, Senator George Mitchell (D-ME) and I have developed legislation to expand and strengthen our marine and estuarine research program: the Marine Research Act of 1988. The key provision of the bill authorizes the establishment of 10 multi-state regional marine research centers. The centers would coordinate and support the activities of organizations and agencies in the region, including state agencies,

The need for comprehensive management of coastal waters will grow more urgent as we approach the next century.

universities, and other laboratories. The regional research centers would be designed to complement existing research efforts, such as those being undertaken by the Sea Grant Program. The bill would authorize \$29.5 million annually for each of the next five years.

The regional approach adopted by this legislation will encourage researchers to study specific marine ecosystems, rather than stop at the artificial borders of a particular state. Passage of this bill, which now has close to 20 co-sponsors, will allow us to answer some basic questions about status and trends and help us keep pace with the growing threats to marine environmental quality.

In addition to a critical lack of research, Congress has recently heard about other problems afflicting our oceans. There has been growing concern over discarded plastics in our nation's waters: six-pack holders, packing bands, lost or discarded fishing nets, etc. Entrapment in this plastic debris is known to kill thousands of birds, seals, turtles, sea lions, and fish every year.

The plastic pollution problem has grown to such a point that the average citizen cannot go to a beach or park without encountering plastic litter. Beach clean-up efforts, which have now become routine in many states, result in the collection of tons of plastic debris.

Congress took definitive action to address this problem last year when it approved legislation to implement the international convention for the prevention of pollution from ships, commonly known as MARPOL Annex V. This treaty, when it goes into effect later this year, will make it illegal for ships to dispose of plastic waste overboard. The Senate also has recently

approved a bill I authored to require six-pack holders to be made from degradable materials, a requirement that 12 states have already adopted.

Congress recently held hearings on reports that the nitrates in acid rain may effect the quality of our coastal marine waters. As with many reports of this kind, it raises significantly more questions than it answers. A related issue concerns the potential for global warming to raise sea levels and the catastrophic consequences this could have for our planet.

The combined effect of these issues has been to increase the awareness level of legislators regarding the impending crisis in our marine environment. It is my hope that we are setting the stage for a comprehensive re-examination of marine environmental policy in the next Congress. Such an examination must include a critical look at existing statutes such as the Coastal Zone Management Act, the Clean Water Act, and the Marine Pollution, Research, and Sanctuaries Act, as well as the agencies charged with their implementation. Where gaps are discovered, new legislation must be crafted. Research is clearly an area where more funding and legislation are needed to fill critical gaps.

Finally, if this re-examination is to occur, environmental and citizen groups will have to continue to turn up the heat. Recently, Representative Mike Lowry and I sponsored a breakfast to bring a coalition of environmental groups to Washington to present the findings of a landmark conference entitled "Saving Our Bays, Sounds, and the Great Lakes." The environmental groups attending this conference, which represent more than eight million people, were brought together to help solve the problems that are killing America's coastal waters. Groups such as these will have to use all the political clout they can muster to convince Congress that action must be taken to preserve our coastal environment.

We are very shortsighted if we do not heed the warnings of the Office of Technology Assessment and take steps now to avert what is becoming an environmental crisis. Polluting our coastal waters to the point where marine life cannot exist is not the legacy we should leave to future generations. □

(Chafee (R-Rhode Island) serves on the Senate Environment and Public Works Committee.)

Special Protection for the Oceans? A Forum

Should the ocean receive special protection? EPA Journal asked six respected observers from different vantage points their views on this question. Here are their answers:

Sally Ann Lentz

As noted marine biologist Dr. Sylvia Earle observes, "We know more about outer space than we know about life in the deep ocean." Lacking hard scientific facts about deep ocean ecosystems, it's difficult to quantify the damage done by pollution. Nonetheless, the vital link between healthy oceans and the ability to sustain life on our planet is well known, and that link alone is ample reason for special protection of fragile ocean and coastal ecosystems.

Last year, the World Commission on Environment and Development published the results of a compelling four-year study, *Our Common Future*. As a part of its report, the Commission found that living resources of the ocean "are under threat from over-exploitation, pollution, and land-based

development," and that "sustainable development, if not survival itself, depends on significant advances in the management of the oceans."

Given the importance of the oceans in sustaining life, special protection is needed to safeguard their unique vulnerability—both ecological and political. The oceans' function as a natural sink for wastes from land and air was part of a grand design that functioned extremely well for hundreds of millions of years—before the creation of synthetic products like pesticides, chemicals, plastics, and other toxic wastes. Today, though, the persistence and toxicity of these materials present an untenable challenge to the natural function of the ocean.

At the same time, existing political systems contribute

Raymond Muzika photo.



to the vulnerability of the ocean. The oceans know no boundaries. Yet national and international law sets up artificial boundaries, leaving the oceans at risk at the hands of those individuals, and governments, for whom protection and wise use are not guiding considerations.

So yes, the oceans should have special protection—they must have special protection—to preserve them as the life-givers of our planet and to shield them from abuse by short-sighted special interests. Through education, research, and action, this challenge must be met—individually and collectively. Other challenges may seem more immediate, but few are as pervasive in their implications. □

(Lentz is a Staff Attorney at the Oceanic Society.)



Charles Osterberg

Should the oceans receive more protection than a babbling brook, Walden Pond, a copse of trees alight with redbud, a host of golden daffodils? More protection than the rich black loam of Iowa, the Big Skies of Montana, the mighty Columbia, or a Saguaro cactus forest in Arizona? This oceanographer votes "no."

No matter. The Marine Protection, Research, and Sanctuaries Act (1972) did just that. The Navy's old nuclear submarines must be buried on land despite the recommendations of the Environmental Impact Statement and ALARA (keep radiation levels As Low As Reasonably Attainable) because of the Act and the prohibition against ocean disposal specifically provided in the Anderson Amendment. This amendment sprouted overnight like a toadstool in the barnyard in the rain when the Navy included the ocean in its disposal options. Special protection from a vigilant Congress to make doubly sure!

Now proud, patient old submarines smolder ignominiously in incongruous terrestrial graves, awaiting the slow but tireless geologic forces of wind, sun, water, and gravity to return them inevitably to a just burial in the distant sea.

Yes, the fringes of the ocean are polluted and need protection. But this is because of misguided laws protecting the ocean, which as a consequence of their implementation, leave the land and air vulnerable to misuse. Rain and ground water percolate through waste disposal dumps, septic fields, and landfills, pouring filth into coastal waters. Fumes from fuels, autos, and waste burning climb to the skies, returning as acid rain and chemical crud. All natural

distributive processes carry these downhill to coastal waters, polluting the 2 percent of our oceans that provide 85 percent of our seafood. Meanwhile 98 percent of the planet's water, that in the deepest ocean, contains less man-made pollutants than fresh spring water. Other than remoteness and barrenness, the only thing that the ocean has too much of is Congressional protection. □

(Osterberg, now retired, is a former professor of Oceanography at Oregon State University, director of the International Laboratory of Marine Radioactivity in Monaco, radiation specialist with the Department of Energy, and independent businessman.)



Representative Mike Lowry

For centuries, the vastness, the beauty, and the many potential uses of the oceans have captured the imagination. Human innovation has brought us far, creating technology that has allowed us to adapt to some of the sea's perils, and to shorten the distance between continents. Modern-day vessels now process as well catch much of the seafood that comes to our markets and into our homes. Millions enjoy the coastal regions for their recreational activities. Given the amount of dependency on and enjoyment of ocean waters, special attention must be given to their protection.

Recently, the coastal areas of the United States and their inhabitants have been subject to various forms of pollution. A most prevalent problem for our nation's waterbodies, especially in coastal areas, is the amount of land-based pollution that in various forms continues to invade them, resulting in increased levels of contamination of water-column sediments and living marine resources.

The basic factor underlying the need for special ocean protection is that ocean and coastal waters are a common property resource. Since they are available for public use, many people will take advantage of this availability, risking overuse of this valuable resource. In the case of ocean waste disposal, for example, regulatory policies and limits must be applied that recognize the fact that the ocean is a common property resource and that unless the government specifically intervenes to protect them, the ocean and coastal areas could become the repository of last resort for much of our nation's waste. This is a particular

concern as we continue to limit disposal of waste in landfills and by incineration.

Congress has established policies to protect our oceans and keep them available for the benefits and activities we all enjoy. The Clean Water Act and, to a great extent, the Marine Protection, Research, and Sanctuaries Act (MPRSA) are two such major legislative initiatives. Both are designed to provide special protection of ocean disposal of harmful materials. The MPRSA is presently up for amendment to establish additional research centers to aid in the long-term monitoring and research necessary to clean up our nation's important water bodies.

The ocean is a unique resource in that no other part of our world today offers its public availability for enjoyment and plays such a vital role in energy and life cycles. It is imperative that this resource receive the special protection necessary for its survival. □

(Congressman Lowry (D-Washington) is Chairman of the House Oceanography Subcommittee.)



Charles D. Matthews

The answer to this question is a resounding YES! Speaking from the perspective of the National Ocean Industries Association (NOIA) and our members' activities, the ocean waters surrounding the United States are receiving the protection and the attention they deserve.

Many people are concerned that offshore oil and gas development might harm the ocean environment. However, history has shown that these operations can be carried out in an environmentally safe manner. The record of the domestic offshore industry speaks for itself.

More than 32,000 wells have been drilled in state and federal waters off the U.S. coast with only one spill in which significant amounts of oil reached shore, and that was almost 20 years ago. NOIA does not know of any conclusive scientific data which indicate that permanent damage resulted from that spill. Each day, in fact, some 1.2 million barrels of oil and 13.7 billion cubic feet of natural gas are being produced from offshore wells in an environmentally safe manner.

According to a study by the National Academy of Sciences a few years ago, only a small fraction of the oil in the world's ocean—about 5/100ths of 1 percent of the total—can be attributed to offshore operations under federal supervision. The same study reported that river run-off is the principal source of oil pollution in the seas, accounting for 41 percent of the total. Tankers and other forms of transportation

account for approximately 20 percent. Natural oil seeps—such as those off the coast of California—account for 15 percent of the worldwide total. In fact, during the past 15 years, natural oil seeps off California have contributed 2.4 million barrels of oil to the ocean's waters.

By comparison to these sources, oil and other pollutants from Outer Continental Shelf (OCS) operations simply fall off the low end of the statistical scale. Since 1970, when new regulations and technologies were implemented in the wake of the Santa Barbara incident, the United States has produced over 5 billion barrels of oil from the OCS, while losing a total of fewer than 850 barrels from blowouts.

Exploratory wells must be drilled to find and delineate oil reserves, but most exploratory wells do not find commercially producible oil reserves. Obviously, if oil is not found, there is no risk of a spill. The discovery of commercial quantities of oil, however, does not mean that a spill will occur. Production of natural gas obviously cannot cause a spill. Industry has developed equipment and procedures to prevent spills, and clean-up procedures to mitigate potential damage if a spill did occur. Fortunately, industry safety practices are such that there has been little need for this equipment.

Concern has also been expressed about the effects of offshore drilling mud discharges on marine life. Drilling fluids ("muds"), drill cuttings, and produced water are either used in or are by-products of the drilling process. Offshore disposal of these materials requires permits under the National Pollution Discharge Elimination System (NPDES) from EPA. Generally, water-based drilling muds

and produced water, which have a low toxicity, are discharged into the environment. And waste waters can only be disposed into the sea if the oil content averages less than 50 parts per million.

A 1987 comprehensive study by the Woods Hole Oceanographic Institute of Georges Bank drilling concluded that drilling in the rich fishing grounds is safe. The study's editor said, "hard evidence that careful development hurts the fisheries is nonexistent. It's mostly a lot of supposition." The study monitored the drilling of eight wells in the North Atlantic in the early 1980s and concluded that no environmental damage had occurred.

This report was the latest in a large and increasing body of scientific data that has established that commonly used water-based drilling muds do not pose a threat to the environment. Current laws, regulation, and practices ensure that all domestic offshore petroleum exploration and production operations are performed in an environmentally sound manner. □

(Matthews is President of the National Ocean Industries Association, Washington, DC.)



J.R. Schubel

Society produces enormous amounts of wastes of all kinds. We must strive to reduce these amounts, to increase the amounts we recycle and reuse, and to render those wastes that require ultimate disposal as innocuous as is appropriate and practical. We must then select disposal strategies which will minimize the risks of adverse impacts on the environment, on living resources, and on human health—or which at least will reduce any risks to acceptable levels.

Should the ocean receive special protection? No. The key word in the question is "special." My dictionary defines special as "unusual or unique, particularly favored, set aside for a particular use." As an oceanographer, I would like to be able to argue persuasively for special protection for the ocean—for favored status—but I cannot. To do so would imply that other segments of our environment should receive less protection.

Selection of disposal methods and sites for each kind of waste should result from a comprehensive analysis of the advantages and disadvantages of the full range of plausible alternatives and of the risks associated with each. The analysis should be across environmental media: air, land, and water. Before a disposal strategy is selected, the best information should be used to forecast the probable consequences of each alternative. The most desirable strategy may vary with class of waste, with location, with time, and with a variety of other factors, all of which need to be considered before making a decision.

All segments of our environment—land, air, and water—should receive far greater protection than they now do. To favor one segment of the environment over others by providing favored status is not the answer, especially if it simply shifts a problem from one part of our environment to another. This has been the situation for far too long, and neither the environment nor society has been well served. Instead of providing special protection to the ocean, or any other segment of our environment, we should use the knowledge we already have to make decisions, and we should be more diligent and imaginative in searching for solutions.

The World Ocean should continue to be a potential disposal site for certain kinds of society's wastes. Perhaps it should be off limits for others. Within the World Ocean, we should ensure that certain segments of the ocean do receive special protection; that certain segments do receive favored status; that certain segments are set aside for particular uses which society considers to be important. □

(Schubel is Provost of the State University of New York at Stony Brook, and Dean and Director of Stony Brook's Marine Science Research Center.)



Donald F. Boesch

The oceans merit special consideration for environmental protection because they transcend national boundaries, are fluid and uncontrollable, and constitute long-term repositories for many of society's wastes—whether these wastes are directly discarded into the oceans or enter by way of rivers or the atmosphere. On the other hand, I do not believe that the oceans should receive "special protection" if that means exclusion of activities and practices, the alternatives to which would have deleterious effects on the land or the atmosphere.

We continue to uncover pervasive and surprising interconnections among the earth's environmental media: the land, air, and fresh and ocean waters. The effects of increased heat retention resulting from the buildup of greenhouse gases on ocean temperature, currents, and sea level is an obvious example. Less obvious is the atmospheric deposition from fossil fuel combustion which has contributed to the increase in nitrate levels in the Ohio River, which in turn may be contributing to oxygen depletion in the Gulf of Mexico. Atmospheric deposition is also apparently contributing to excessive nutrient loading of the Chesapeake Bay.

Clearly our environmental protection strategies need to move beyond the current medium-by-medium management approach to allow comprehensive consideration of the environmental impacts of various alternatives. Does this mean that ocean disposal of wastes should be allowed when other options are more costly or less convenient? No. Certain types of persistent, toxic materials should simply

not be released to the ocean, and rigorous comparisons of the effects of different disposal alternatives, even for non-toxic wastes, should be required. Does this mean that dispersion in the vast oceans is an acceptable alternative to the more costly control of the sources of persistent organic toxicants? Certainly not.

Much of the debate concerning whether the ocean should receive special protection has focused on the permitting of offshore disposal of wastes, including sewage sludge, oil and gas drilling discharges, industrial wastes, and incineration of toxic organics. While these issues of ocean disposal merit our concern and attention, we must be careful not to ignore the more pressing problems of deteriorating quality of coastal environments and the more insidious ramifications of riverine and atmospheric inputs of contaminants on regional and global scales. These latter problems overshadow ocean disposal as serious risks to the health of the oceans. □

(Dr. Boesch is Executive Director of the Louisiana Universities Marine Consortium and a member of the Marine Board of the National Research Council.)



Steps Toward a Global Oceans View

by Alan Sielen

A few years ago, I was looking around an old bookstore in London when I overheard the only other customer—an elderly American woman—inquire about books on Hugo Grotius, the 17th century Dutch international jurist. She was disturbed about being unable to find such works in the United States; her frustration escalated into a tirade on the philistinism of Americans in general.

I approached her: "Ah, so you're interested in the great jurist and statesman." She looked at me quizzically, equal parts loathing and disbelief, "How do you know about Grotius?"

I couldn't resist, and, in my very best American accent, said, "Why, madam, every American schoolchild knows that Hugo Grotius was the father of the law of the sea."

Both of us laughed, and a pleasant conversation ensued, as I explained that many years ago I had worked on the law of the sea negotiations. Finally I left, suffused with the glow of a true patriot.

In few areas has Hugo Grotius' legacy been more fully realized than in the development of international law for the

A famed oil spill that helped raise international consciousness about the ocean environment. Crew members from the *Amoco Cadiz* help clean up the Portsall, France, coastline after an April 1978 accident. American Petroleum Institute photo.



One or two countries prohibiting oily discharges from tank cleaning operations won't make much of a dent in the problem if the rest of the world's tanker fleet doesn't follow suit.

protection of the marine environment. Faced with the fact that ocean pollution does not honor national boundaries, and with highly visible manifestations of such pollution—oil spills, plastics washed up on beaches, fish and dolphin kills—national governments have given marine protection a great deal of attention. Since the historic 1972 Stockholm Conference on the Human Environment, no area of environmental cooperation has received more sustained attention by the international community than the prevention and control of marine pollution.

In the past two decades major global and regional agreements have been concluded for such problems as:

- Ocean dumping (1972 London Dumping Convention) and marine pollution (MARPOL 1973/1978 Conventions on the prevention of pollution from discharges by vessels).
- The special problems encountered in regional areas (United Nations Environment Program (UNEP) Regional Seas Program, which includes action plans for the Mediterranean, Persian Gulf, West and Central Africa, Wider Caribbean, East Asian seas, Southeast Pacific, South Pacific, Red Sea, and Gulf of Aden; with plans being developed for East African and South Asian seas, and the Southwest Atlantic).
- Other concerns such as liability for damage from oil spills; control of land-based sources of marine pollution; offshore oil and gas development; and tanker safety.

Some of these activities, such as dumping and vessel pollution, are subject to binding international rules. Others, for the most part, involve voluntary international guidelines. Implementing these agreements has required the cooperation of individual governments and a network of international organizations ranging from specialized agencies like the

International Maritime Organization (IMO) and International Atomic Energy Agency (IAEA), to UNEP.

Despite this record of negotiation and agreement on difficult issues, it must be remembered that the existence of international environmental law does not guarantee better protection for the oceans. None of the aforementioned agreements establishes a supra-national police force to patrol the seas and ensure that rules are enforced; nor does any provide the resources necessary to mount an effective pollution-prevention campaign. Implementation of international rules is left to the capability and good will of member countries, whose responsible national authorities have different levels of scientific and administrative expertise and varying degrees of commitment to environmental protection.

As the United States has learned in carrying out domestic environmental laws, there are no final solutions; effective environmental protection is a dynamic process involving individual citizens, business, academia, state, local, federal government, and the professional disciplines of politics, science, economics, and law. At the international level, this process becomes even more complex as individual nations compete to advance their own national interests.

If international treaties and other arrangements for marine protection are only a stepping stone to real action, why are they necessary in the first place? This is a valid question, and, indeed, much good work has been done unilaterally by individual governments combating particular pollution problems. History shows, however, that relying on individual governments to act on their own to fight pollution problems with global ramifications usually produces poor results.

Some problems require concerted action for an effective solution. One or two countries prohibiting oily discharges from tank cleaning operations won't make much of a dent in the problem if the rest of the world's tanker fleet doesn't follow suit. Preventing damage to the marine environment by the ocean dumping of toxic wastes will remain elusive unless all countries agree to follow the same rules. Effective spill response in a given region, say the Caribbean, requires that all nations in the area be prepared to do their part in responding to an accident. Also, there are costs associated with the implementation of effective pollution prevention measures, such as segregating ballast tanks on new tankers, or carrying out effective monitoring activities in support of a national ocean disposal program. If all countries accept and carry out needed measures, none will be put at a competitive economic disadvantage. Also, common understanding of the scientific and technical aspects of marine pollution is enhanced by sharing research and technological advances. The free flow of information among countries can prevent wasteful duplication and enable individual countries to target limited resources on those areas most in need of attention.

In the months ahead, the international community's commitment to marine protection will be tested by a number of important efforts:

- Early efforts in implementing MARPOL Convention provisions on tanker design, construction, and ship operation centered on pollution by oil and chemicals. Current work focuses more on the implementation of "optional" annexes governing harmful substances in containerized or packaged form; vessel sewage; and garbage. MARPOL Annex V, which bans the disposal of plastics in the world's oceans and regulates the discharge of other types of garbage, is particularly



Oceans, anyone? Seventy percent of our planet's surface area is water, most of it in the seas. Photographed from the Apollo 17 spacecraft, this view extends from the Mediterranean Sea area to Antarctica's south polar ice cap. NASA photo.

important, and will enter into force at the end of 1988. Entanglement of marine animals in plastic debris is a growing concern, as is the ingestion of plastics by marine organisms. Such debris can also threaten humans by creating hazards to navigation and diving. Fouling beaches and other recreational areas can have serious economic consequences.

- Contracting parties to the London Dumping Convention face issues that will have a significant bearing on the agreement's future effectiveness. These countries are now evaluating the environmental acceptability of the sea disposal of low-level radioactive wastes and the ocean incineration of hazardous chemicals. Reaching consensus on an approach to either of these disposal options will not be easy. Perhaps most importantly, the London Convention Scientific Group is now evaluating alternatives to the agreement's present black list/grey list system of regulation. Whether a new system will emerge—based, for example, on the ocean's capacity to safely assimilate wastes—remains to be seen. There is also the question whether an alternative formulation would uphold the Convention's basic purpose of preventing pollution of the marine environment or would invite more permissive national policies toward sea disposal.

- Most efforts to control sea pollution from land-based sources (e.g., rivers, pipelines, and run-off) has taken place at the national or regional level. Voluntary guidelines were developed by UNEP a few years ago, but they do not have the same force of law that the rules governing ocean dumping and vessel pollution have. The international community must consider whether some International Convention on the prevention of marine pollution from

land is in order, at least with respect to the regulation of some of the most potentially harmful substances (e.g., transuranics, synthetic organic chemicals, oil, and heavy metals).

- Regional conventions, such as those concluded under the UNEP Regional Seas Program, can be one of the most important ways to fight ocean pollution. For the United States, the recent entry into force of the 1983 Convention on the Development and Protection of the Marine Environment in the Wider Caribbean will provide an important opportunity to work with neighboring countries to protect a common and increasingly vulnerable resource. Similarly, activities relating to the 1986 Convention for the Protection and Development of the Natural Resources and Environment of the South Pacific will test the U.S. commitment to a part of the world that is experiencing environmental problems associated with new development and which is of growing political and strategic significance to the United States.

- The recent conclusion of a Convention on Antarctic Mineral Resources should force nations to consider seriously the potential environmental and scientific consequences of mineral exploration and development on the Antarctic continent and Southern Ocean and whether, under the new Convention, serious thought should be given to putting the continent off limits to development before it is too late and its critical global monitoring assets have been destroyed.

- If intelligent decisions on the use of the oceans are to be made, greater emphasis must be placed on the scientific aspects of marine pollution. Finding effective ways to mobilize the international marine scientific community into an effective force for studying the behavior, fate, and effects of pollutants in the marine environment

is a major institutional challenge, especially at a time when many countries are looking at the oceans for increased use as a waste depository. It is especially important to ensure that there are adequate scientific bases for such decisions. Specific scientific problems meriting closer attention include: eutrophication—the effects of nutrient loading in different geographical areas; bioaccumulation—foodchain transfer to marine organisms and to man; pathogens in the marine environment—from sewage discharges, rivers, and agricultural runoff; general ecosystem effects—resulting from, e.g., the disposal of particulate matter; future problems—e.g., the introduction of new, often toxic, chemicals into the marine environment.

This is a full agenda, but one that should be taken seriously if future environmental leaders are to uphold their public trust for a part of the world that affects all our lives—the oceans. Finally, our successes and failures in grappling with the international dimensions of marine protection can assist governments in addressing “non-marine” global environmental issues, such as stratospheric ozone depletion and climate change. Much of the same dynamics of negotiation, compromise, and steadfastness encountered with various marine negotiations over the years are now being relived in other environmental deliberations. Whether governments can learn from the lessons of the past, including the work Grotius began three centuries ago, will have a large bearing on the outcome of future environmental negotiations affecting this small planet. □

(Sielen is Director, Multilateral Staff, EPA Office of International Activities.)

Boston Harbor: No Party After the Tea Party

by Michael R. Deland

There is no honor in the distinction of having the most polluted harbor in the United States. There is only a driving imperative to clean it up. It has taken Boston and other metropolitan area communities involved 10 years of indecision and negotiation to reach an agreement to rebuild the sewerage system that still grossly pollutes the Harbor, but Boston has at long last begun the job.

During the same decade, many other major U.S. metropolitan areas with similar problems have made far greater

progress in curbing water pollution by constructing new wastewater treatment plants. Why did Boston fall so far behind? Hindsight shows that a key factor was that Boston's cleanup was left to "voluntary" efforts, while cleanups in other cities were spurred by successful federal legal actions which put continuing pressure on local administrative and political obstacles. Only today, under a federal court order to meet a clean-up schedule, is Boston moving ahead. Legal enforcement has been a difficult lesson for Boston, but one that, it is hoped, other American cities will readily accept in the future to avoid Boston's pitfalls.

Boston looks environmentally clean. It is not a heavily industrialized city of the kind generally associated with serious environmental problems. Boston is a beautiful urban area, steeped in history and revolutionary landmarks. It is home to some of the most prestigious colleges, medical and research centers, and computer and biotechnology companies in the world. It is the city in which Frederick Law Olmsted, the father of landscape architecture, left a permanent imprint with his "Emerald Necklace" park system. It is a place of culture, the arts, and music.

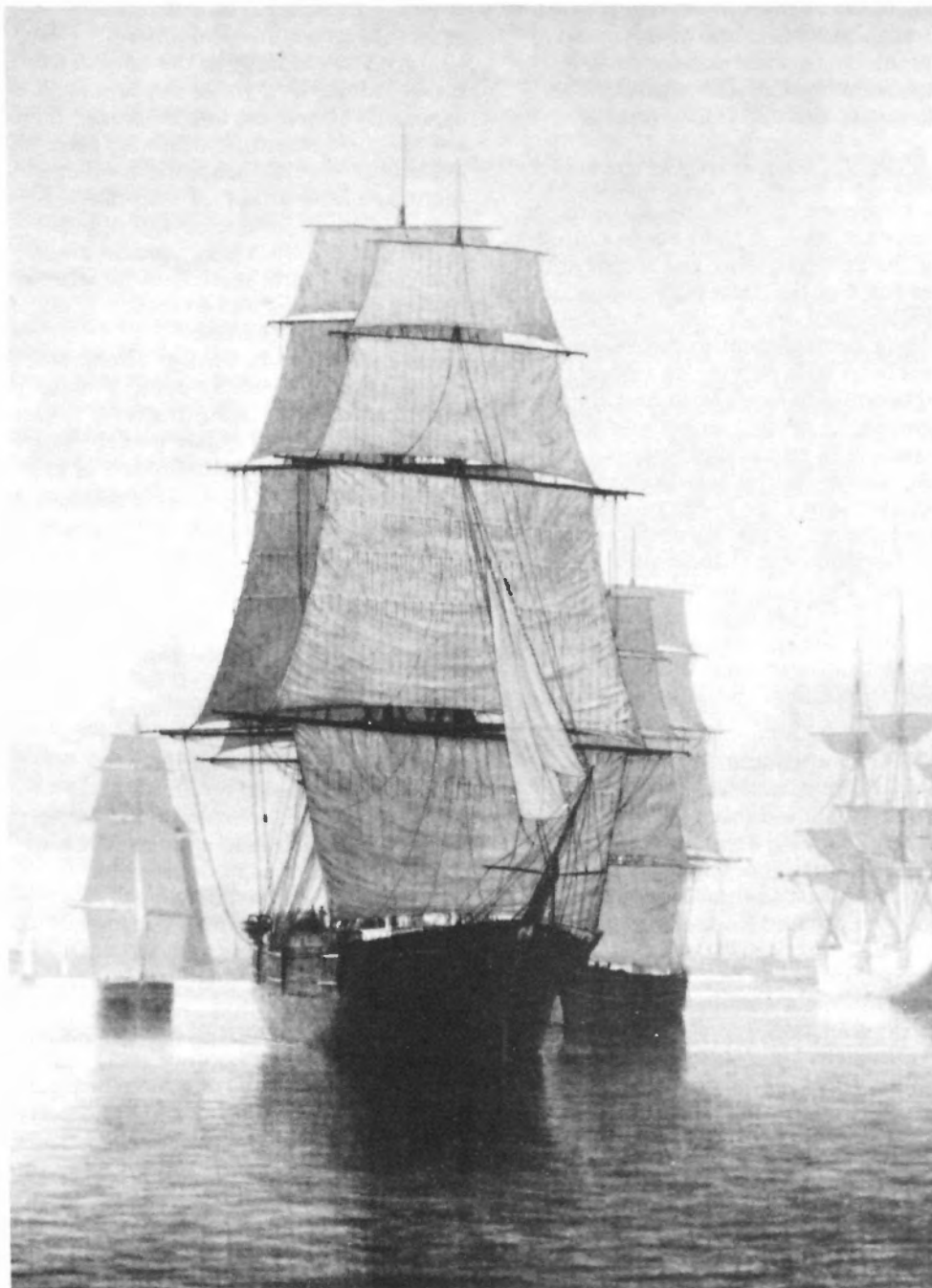
Yet Boston has a harbor—about 50 square miles, with some 30 islands and about 180 miles of irregular tidal shoreline—that is a cesspool, the most polluted harbor in the nation. The harbor is Boston's Achilles heel.

How could the citizens of the Boston area have allowed this pollution to occur?

There is plenty of blame to pass around at all levels—local, state, and federal. To many people, the harbor's pollution was an "unseen" problem, not readily detectable with one quick look at the water. For others, cleaning it up was too expensive; they feared dramatically increased sewer rates. Some did not want a wastewater treatment plant in their neighborhood. Also, concerned citizens and political leaders simply did not fight hard enough for a harbor cleanup, and so the project lay dormant.

But of all the reasons for the failure to do something about harbor pollution, the one that stands out as the principal culprit was the use of a "voluntary" approach rather than seeking a "court-mandated" cleanup.

In the late 1970s EPA launched a national effort to stop water-pollution violations in major metropolitan areas. This effort involved major federal lawsuits in New York, Los Angeles,



The old days: Fitz Hugh Lane's oil painting, *Boston Harbor, Sunset*, which he did between 1850 and 1855. Lane's show, currently in Washington, D.C., will open at Boston's Museum of Fine Arts September 28. Collection of Jo Ann and Julian Ganz, Jr.

Philadelphia, and elsewhere. Many of these areas had pollution problems comparable to Boston's during the 1970s, but have since made greater progress in mitigating them.

In Boston, on the other hand, local, state, and federal officials decided to defer seeking federal legal intervention. They maintained that progress would occur more quickly and be more productive if the courts and lawyers were kept out of the matter. Instead their staff and resources concentrated on a more "cooperative" effort. This did not work. Boston's sewer system became one of the nation's worst violators of the federal Clean Water Act. It fell behind its schedules and deadlines for designing and constructing treatment plants, sludge management facilities, and combined sewer overflow facilities, and the submission of a pretreatment program.

Today, Boston is the only major city on the east coast that has not constructed an advanced (secondary) sewage treatment plant, and it is the only major city in the United States which continues to discharge sludge through a pipe into a waterway. Boston has two outmoded and ineffective sewage treatment plants, serving 43 metropolitan communities.

Each day, those plants discharge approximately a half billion gallons of partly treated sewage and approximately 70 tons of sludge into the harbor. The plants are so limited that their capacity is exceeded every time a good rain falls; as a result, millions of gallons of untreated sewage never make it to the plants. Instead they exit the system through some 100 combined sewer overflows, pipes that act as safety valves by releasing the excess sewage directly into the harbor.

A recent preliminary report by the National Oceanic and Atmospheric Administration (NOAA), based on 1984 data, shows that of all U.S. ocean sites the agency tested, the sediment in Boston Harbor near the Deer Island treatment plant contains the nation's highest levels of bacteria from sewage, toxic PCBs, and pollutants from incomplete fuel combustion.

The report also shows that winter flounder caught near the Deer Island site have the highest concentration of PCBs and the toxic pesticide DDT in the livers of any fish tested from North Carolina to Maine. Half of Boston Harbor is closed to shellfishing, and shellfish taken from the other half must

be run through a special purification plant.

Swimming is prohibited at all of the inner harbor beaches (northwest of Castle Island). During the summer season, other beaches within the harbor

For too long, Boston Harbor has been the backyard in which nearly half the people of Massachusetts dump their waste.

are regularly posted with signs saying that the water is polluted and swimming may be hazardous to one's health. The aesthetic value of the harbor to fishermen, sailors, picnickers, and sightseers is significantly impaired by unsightly floating objects such as grease, fat, and tampon applicators.

For too long, Boston Harbor has been the backyard in which nearly half the people of Massachusetts dump their waste. But the harbor is, in fact, Boston's front yard. It is the harbor of the Bay State's capital city. It deserves to be a glistening, unsoiled centerpiece—clean, alive, and accessible to all. It is unconscionable that city children cannot enjoy the harbor as an unpolluted swimming area.

Just prior to this writer's 1983 appointment as EPA's Region 1 Administrator, the Conservation Law Foundation (CLF), a leading New England environmental group, filed suit for violations of the Clean Water Act against the Metropolitan District Commission (MDC), the Massachusetts state agency then responsible for the Boston-area sewage system, and against EPA for failing to take enforcement action against the MDC. It was dismaying to find EPA a defendant in this suit; CLF was informed that the Agency would prepare a major federal court action to clean up Boston Harbor. Subsequently, the foundation said it wanted to go forward in federal court with EPA as an ally, and would wait a reasonable time for EPA to prepare the federal case; the case would be pursued when EPA filed its own parallel federal court civil action.

In the meantime, a controversy erupted concerning what role, if any, the MDC should play in the harbor cleanup.

It seemed clear that the MDC had to be replaced by a new independent, professional, and adequately financed sewerage authority with the ability to generate its own capital and operating

revenue. The Commission had long been underfunded by the Massachusetts Legislature. EPA promoted the concept of an independent authority and testified in support of state legislation to create a Metropolitan Water Resources Authority.

However, the legislation became stalled in the Legislature. It was opposed by the 43 MDC member municipalities because they accurately foresaw the need for authority to increase sewer-user charges to pay for the harbor cleanup.

To prod the Legislature, state Superior Court Judge Paul Garrity, who had previously presided over a civil suit by the city of Quincy against the Commission for Boston Harbor violations of the state Clean Water Act, reinstituted adversary court proceedings in November 1984 by ordering a sewer connection ban that would have shut down most Boston-area development. A state Supreme Court judge overturned Judge Garrity's order one week later, but EPA immediately announced that it was asking the federal judge to impose the sewer connection ban, and that the Agency was filing a federal court action against the MDC and the Commonwealth of Massachusetts. Soon thereafter, the Legislature approved the creation of the Massachusetts Water Resources Authority (MWRA).

As a result, EPA dropped its proposed sewer connection ban, but did file a federal lawsuit in January 1985 to obtain a firm clean-up schedule under the direction of the Federal District Court in Massachusetts.

In the summer of 1985, Federal Judge David Mazzone entered judgments against MWRA, MDC, and the state, finding them liable for numerous violations of the Clean Water Act. Following negotiations among the parties, Judge Mazzone issued the first remedial order in late December. The order contained an interim, three-year schedule of activities, including immediate improvements to the existing Deer Island primary treatment plant.

Subsequent negotiations have led to the following developments:

- MWRA's withdrawal of its off-the-New-Jersey-shore sludge dumping application.
- The final selection of Deer Island for a \$1.5-billion secondary plant, followed by state legislation to remove the existing prison on Deer Island.

Half of Boston Harbor is closed to shellfishing, and shellfish taken from the other half must be run through a special purification plant.

These youngsters are among 200,000 people who travel to Boston's islands by cruise vessel yearly. Officials expect these numbers to swell to 600,000 by the year 2000 when cleanup efforts, partially directed by EPA, should turn one of the nation's most polluted harbors into one of the cleanest. Greg Supernovich photo.

- MWRA's agreement to barge construction materials to the treatment-plant work-site to mitigate impacts on the neighboring town of Winthrop.
- An agreement to end sludge dumping in Boston Harbor by 1991.
- A court order to complete a new primary wastewater treatment plant at Deer Island by 1995, and a secondary treatment plant by 1999.
- Plans to construct a 7-to-10 mile sewage discharge tunnel to Massachusetts Bay, beyond the harbor.
- The new authority's agreement to accept responsibility for capturing and treating sewage from the storm-caused combined sewer overflows.

More activity has taken place to clean up Boston Harbor since the lawsuit was filed in 1985 than occurred in the 20 years prior to the suit. Although other factors, including the newly created MWRA and greater public interest have made major contributions, there is general agreement that ongoing judicial supervision of the Boston Harbor cleanup is needed for the next 10 to 15 years. No one can guarantee that current good faith efforts will continue in the absence of such pressure.

EPA is fully committed to the cleanup. The Agency has assigned approximately three lawyers and 15 engineers to work on the effort.

In the last two years, the federal court case has helped in other ways. Previously, it was difficult to excite even fishermen, swimmers, and boat clubs about the harbor pollution. Generations of people had become so accustomed to the contaminated harbor, they simply turned to other natural areas for recreation or pleasure. But the federal lawsuit prompted a flurry of publicity and media attention, which fostered public outcry and interest.

The battle to end pollution in Boston Harbor will not be won easily. It will be expensive; MWRA estimates it will cost roughly \$6 billion and take 11 years. It is the biggest public works project ever in New England. Inevitably, the cost and size of the project will mean substantially higher sewer bills for Boston-area people, but that should not deter them. The cost of not cleaning up the harbor is the only price the people cannot afford. It is a harbor of filth.

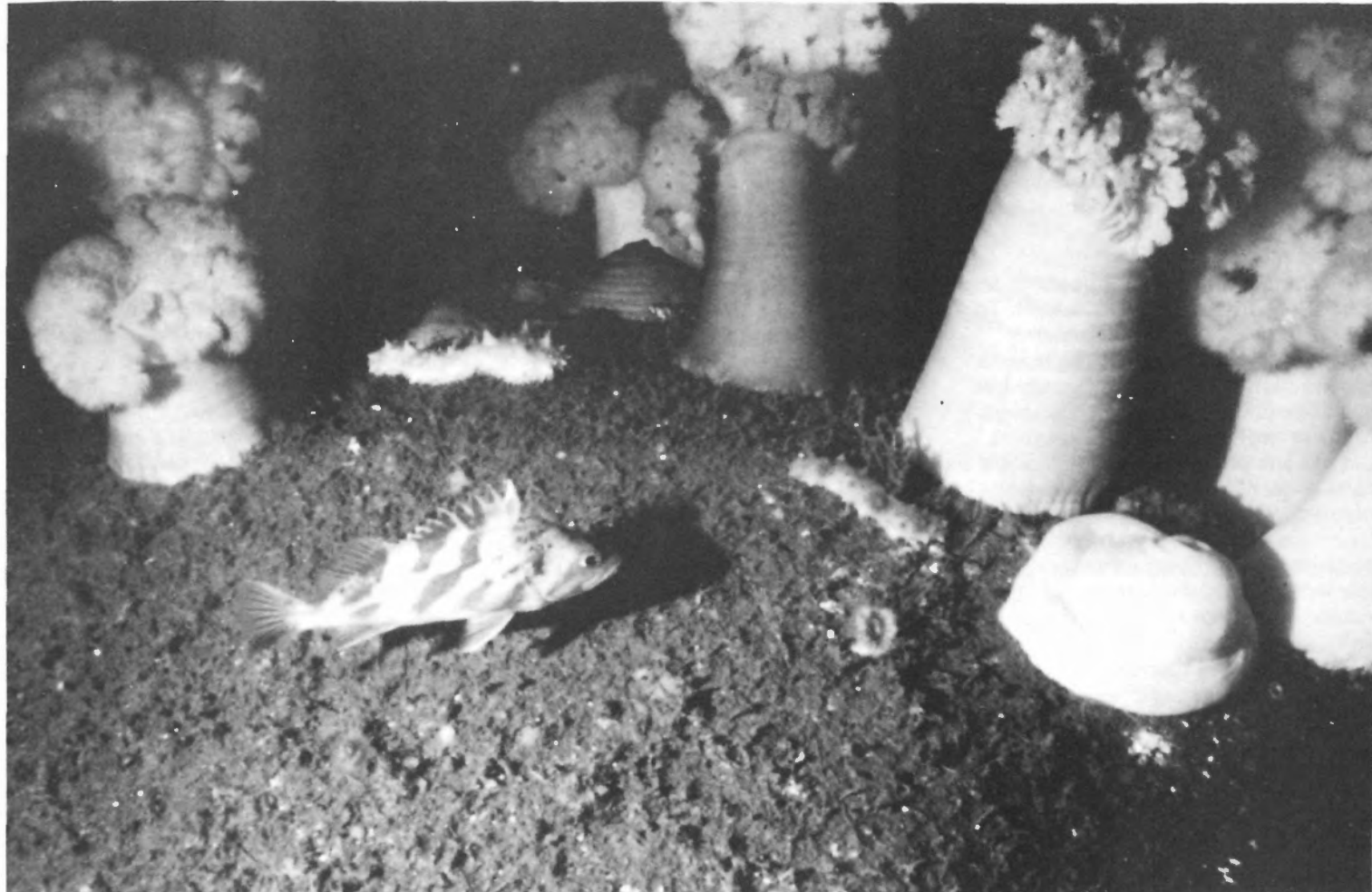
There is a new recognition that Boston's special seascape includes lighthouses, sea gulls, salt marshes, tug boats, and lobster pots—that Boston is an ocean city. It is a place where land and water intermingle, and where a person can sit on a peaceful island while viewing a dynamic city. However, for the city to be livable, its harbor must be clean.

What's more, there are economic incentives as well as moral and environmental imperatives to clean up the harbor. A pollution-free harbor will revitalize the fishing industry and add vigor to other harbor enterprises, including ferries, restaurants, offices, hotels, and homes. It will attract more people. Officials of the Boston Harbor Islands park expect 600,000 people to visit the island parks annually by the year 2000, up from 200,000 people annually today. In addition, the commitment by 2.5 million people to spend billions of dollars on the harbor must be rewarded. That means the state and city must provide sorely needed open space along the waterfront for public access.

The regulatory agencies and public have a responsibility to give a clean and alive harbor to Boston's people and generations to come. Boston Harbor can once again become the crown jewel of New England—not only a thriving center of commercial activity, but also a place to live, work, and enjoy. □

(Deland is Administrator of EPA's Region 1.)





Tough Choices Ahead for a West Coast Discharger

by Corinne Clawson

A Calico Rock Fish swims in a forest of sea animals living on the diffuser section of northwestern Orange County's outfall pipe five miles offshore in the Pacific.

For nearly four decades, the Orange County Sanitation Districts have been working to protect public health and the marine environment through sound management practices and long-term planning. But with a booming population, and increasingly stringent environmental standards, the districts are continuously facing wastewater management challenges. With the expiration of the districts' discharge permit in 1990, some difficult choices involving trade-offs among environmental, financial, social, and engineering impacts must be made.

These decisions must be made at a time when public funds are in short supply, and painful trade-offs are the order of the day. Resources targeted at one pressing problem are almost invariably resources diverted from another—perhaps equally pressing—problem. For Orange County, increased protection of the Pacific Ocean is a priority, but so is continuing to protect the county's own land and air quality. Many believe that upgrading the ocean would mean downgrading the land and air.

Serving the 1.9 million residents of the county's northwestern region, the Orange County sanitation districts operate two treatment plants that process 260 million gallons of wastewater a day. About 80 percent of

the flow is residential and commercial, while the remaining 20 percent is industrial.

The sanitation districts currently operate under the requirements of an ocean-discharge permit issued by EPA and the California Regional Water Quality Control Board. Ground-rules for the permit were set down in a 1977 amendment to the Clean Water Act known as the 301(h) provision.

This amendment relaxed 1972 provisions of the Act that had required full secondary treatment for effluent from all municipal treatment plants nationwide, regardless of the receiving waters. The relaxation resulted from a consensus that secondary treatment was appropriate for inland lakes and streams, but the oceans, because of their tremendous assimilative capacity, were a different case. Considerable scientific and technical data supported this belief.

Under conditions of the permit, the sanitation districts are required to meet all other environmental protection regulations imposed by federal and state agencies and to prove that the marine environment is not adversely impacted.

The districts achieve the permit standards by providing advanced primary treatment to all their flow and secondary treatment to a little more

than half their flow. To control toxic pollutants, they enforce an ordinance that requires industry to clean up wastewater before discharging it to a sewer.

An extensive ocean monitoring program is another requirement of the sanitation districts' 301(h) permit. To date, the results of the monitoring program demonstrate that the marine environment near Orange County has been adequately protected. Sediment samples indicate that a balanced indigenous population exists beyond the zone of initial dilution surrounding the ocean outfall pipe. Analyses of fish tissue samples show that measurable chemical concentrations are well below the federal Food and Drug Administration's standards for edible fish.

Findings from the monitoring program will be useful in deciding if the districts' 1989 application for a permit renewal will include a request for another 301(h) ocean waiver.

Other factors will also impinge on that decision. Full secondary treatment of all wastewater would increase energy use, air emissions, and the quantity of sludge that would have to be handled and disposed of. Higher levels of treatment would also require larger facilities, and these would occupy larger tracts of land within an already overdeveloped county.

If the sanitation districts' plants were expanded to provide full secondary treatment of all their flow, the electrical energy needed for the added treatment capacity would nearly double, at great added expense. To meet the energy demands, one option would be increased consumption of fossil fuels, but burning these would increase air pollution. On the other hand, increased use of hydroelectric power would threaten the area's inventory of wild rivers and streams.

The districts currently produce 500,000 gallons of sludge a day. Under full secondary treatment, even without including expected increases in future flows, the districts would significantly increase their sludge production. That extra sludge would have to be disposed of somehow, somewhere. Half of the districts' sludge is now being trucked to a landfill, while the other half is used for beneficial agricultural purposes. Landfill options, however, are difficult to come by, and composting facilities are scarce. As a result of all these factors, it is a constant challenge to develop a long-term sludge disposal plan for northwestern Orange County

that is both environmentally sound and economically feasible.

Of course, these costs—and their accompanying damage to land, air, and inland water resources—must be weighed against reductions that would occur in the quantities of solids and pollutants that are currently being discharged into the Pacific Ocean. This brings us to the fundamental question: What is the optimum level of treatment needed to protect public health in northwestern Orange County and still provide balanced environmental protection? To help answer this question, the sanitation districts have devoted \$4.2 million to developing an unprecedented "Action Plan for Balanced Environmental Management: Preserving Orange County's Coastal Ocean Waters."

The plan, when completed next year, will bring together all available scientific and engineering knowledge regarding environmental impacts, facilities requirements, social and economic needs, and the long-term population trends for Orange County. It will include such long-range components as a 30-year facilities needs assessment and a focused 10-year construction and financing plan that will look at needs for facilities under various treatment and disposal alternatives. The plan will also address the feasibility of expanding water reclamation activities and sludge recycling.

Two of the plan's components will have direct impact on decisions concerning the marine environment near Orange County. The completed plan will include an environmental impact report providing an assessment of the actions that will be necessary to give balanced protection to the county's air, land, and water resources, including those of the nearby Pacific Ocean. The results of that assessment will determine what specific proposals go into the sanitation districts' next application for renewal of their ocean-discharge permit.

While gathering sound scientific data, the districts are also consulting the public. A Public Participation Program has been set up, at a cost of \$260,000, to inform citizens of northwestern Orange County, and to gain insight into their concerns and wishes. This program includes public workshops and hearings as well as brochures and videos.

There are some very tough decisions ahead both for residents of northwestern Orange County and the sanitation districts that serve them. The decisions finally reached must balance concern over the Pacific Ocean with concern for other components of the environment, such as land and air quality, and the financial impact of all alternatives must be carefully weighed. □

(Clawson is a Public Information Officer for the County Sanitation Districts of Orange County.)



Marine monitoring is part of the Orange County Sanitation Districts' wastewater treatment plan. Currently operating under a five-year Section 301(h) waiver to the Clean Water Act, they must weigh and measure fish to monitor population trends near the outfall. Corinne D. Clawson photo.

Where Did Those Salmon Go?

by Matthew Coco

Everyone loves a good detective story. While most whodunits are found in the pages of paperback fiction, an investigation into a real life mystery is under way on the coast of Washington. Dozens of local, state, and federal employees are looking for clues in one of the biggest and strangest disappearances in Washington State history.

This is not a typical undercover caper. The detectives are clad in hipboots and jeans instead of trenchcoats and deerstalker caps. Their search involves not a kidnapped heiress, but thousands of disappearing subjects.

The subjects of this search are coho (silver) salmon. The detectives are fisheries and environmental experts who are seeking reasons for the diminished salmon production in one of Washington's principal river systems. The Chehalis River, long a major source of salmon, now has one of the worst salmon survival rates in the state.

The Chehalis basin drains into Grays Harbor, a major estuary on Washington's southwest coast. It drains a region rich in natural resources. Timber and fishing have long been the region's economic mainstays. Bowerman Basin, at the southern end of Grays Harbor, has been proposed as a national bird sanctuary in legislation pending before Congress. The Basin is a major stopover for birds migrating up the Pacific Flyway to summer nesting grounds north of the Arctic Circle.

Grays Harbor drains the Chehalis and the Humptulips River, two principal river basins south of Washington's Olympic peninsula. Fisheries experts are troubled by the fact that coho from the Chehalis are surviving at only one-half the rate of those from the Humptulips. The "gap" in coho production between the two streams is even more striking because the Chehalis is regarded as superior salmon habitat.

Poor coho survival in the Chehalis has occurred in the past. Low fish



Coho salmon return to their place of birth to breed. Then they die. George B. Kelez photo. U.S. Fish and Wildlife Service.

yields were identified in the mid-1950s. The problem then was the result of low dissolved oxygen levels, and was traced to two wood pulp mills that discharged into the Chehalis near its mouth. Two municipal sewage treatment plants also spilled their effluent into the Chehalis River in the same vicinity. Since then, industry and municipal treatment facilities have invested millions of dollars in pollution controls. Biological oxygen demand has been dramatically improved and salmon runs have improved in the Chehalis, but the

salmon population, in comparison with the Humptulips, continues to show signs of impaired vitality. The lost value to the Chehalis fishery is around \$1 million annually.

The scientists are not probing a massive fish kill, where the "villain" can usually be readily identified. Instead, they are attempting to determine the cause or causes of long-term salmon mortality. The young fish are evidently beginning their migration to the sea, but they are not returning as adults to spawn in the freshwater streams where they were born. While it is tempting to conclude that pulp mills and sewage treatment plants are the culprits, fisheries experts want a more definitive answer, as well as greater insight into the physiological processes governing salmon survival.

Comprehensive studies of salmon, water quality, and marine life in Grays Harbor are now under way. These are joint undertakings by the Washington Departments of Fisheries and Ecology, U.S. Fish and Wildlife Service, EPA Region 10, and a variety of other agencies and organizations that are providing support services. The Grays Harbor Regional Planning Commission functions as a facilitator to marshal these agencies and their technical expertise. Funding has come primarily from the state legislature, with additional contributions from EPA, the Grays Harbor Conservation District, and Weyerhaeuser and ITT-Rayonier, operators of the pulp mills near the mouth of the Chehalis River.

The experts have developed a series of hypotheses to be tested by experiments and data analysis:

- Predators are causing salmon mortality. The study is analyzing both rivers for squawfish, known predators of juvenile salmonids. The fish are collected by electroshocking, a method more reminiscent of spy novels than

detective fiction. A specially equipped boat is used to send an electrical charge into the river. Stunned fish are then gathered and the contents of their stomachs examined for juvenile salmonids.

Preliminary results of this portion of the study show a low incidence of salmonids in the stomachs of the squawfish, indicating that squawfish predation is not a major factor in the salmon losses.

- There is something inherent to the rearing environment that makes Chehalis coho less viable than Humptulips coho. This hypothesis involves two different possibilities: either the watersheds produce coho salmon with differing abilities to survive in sea water, or there are pathogens in the Chehalis river that cause delayed mortality. Both hatchery and wild salmon from the two rivers are being examined for their ability to withstand stress. Fish are analyzed for size, overall health (including the presence of disease and parasites), and hormone levels that indicate stress reactions. Coho will also be placed in seawater pens to observe their long-term survivability.

But preliminary results show that the Chehalis Basin has excellent rearing habitat. Coho leaving tributaries to make their way downstream appear to be at least as healthy as fish from the Humptulips.

- There is a difference in water quality between the Chehalis and Humptulips, either in the main stem of the Chehalis or at Inner Grays Harbor. As they near saltwater in their migration to the sea, coho normally experience an elevation in levels of ATP-ase, a hormone that helps them to acclimatize to the new environment. Scientists want to know

whether water quality changes near the mouth of the river are affecting the fish.

Analysis thus far has examined salmon blood chemistry at various points in the downstream migration route. A pilot study has already demonstrated that ATP-ase levels in Chehalis fish have dropped, not risen, by the time the salmon reach Inner Grays Harbor. These data reflect fish samples taken in the Inner Harbor and at a location 35 miles upstream, with no samples taken in-between. The current study is aimed at determining exactly where in the river's course the drop in ATP-ase takes place.

More precise information about the pace of migration is being gathered through the use of sonic tags placed in the gut of the fish before they begin to

swim to the ocean. Information developed about the speed of migration and the exact pathway will form the basis for the showpiece of the entire analysis, a study using a specially designed barge with juvenile coho salmon penned beneath the water. The barge will attempt to duplicate the cohos' downstream journey. Fish will be

The young fish are evidently beginning their migration to the sea, but they are not returning as adults to spawn in the freshwater streams where they were born.





Seining in the Chehalis River at Grays Harbor to see what marine life is present. Blood, livers, enzymes, and stress levels of captured salmon are analyzed. Photo by *The Daily World*, Aberdeen, Washington.

sampled for blood chemistry at various points on the river and the results compared with water quality readings at the same locations.

A companion study will collect effluent from the Aberdeen sewage treatment plant and the two pulp mills. Fish will be exposed for up to one week to different concentrations of these effluents, mimicking the dilution effect of river and harbor water. After again analyzing enzyme and hormone levels, and the ability of the fish to osmoregulate (maintain constant internal levels of salt and water as they pass from fresh to saltwater), the fish will undergo a seven-to-nine-month period in saltwater pens. This phase of the project will look for delayed mortality or sublethal effects from the earlier effluent exposure.

In addition to the salmon studies, EPA Region 10 is analyzing the bioaccumulation of toxics in fish and shellfish at various sites in Grays Harbor where pollution is suspected.

Scientists hope that the result of all this investigative work will be a clearer picture of the effects of human activities on marine life. They also hope to develop better management of the coho fishery, and to reclaim this valuable commercial and recreational resource, which is so symbolic of the wild and free waters of the Pacific Northwest. □

(Coco is Congressional Liaison, EPA Region 10.)



Fisheries biologist Steve Schroeder, Washington State Department of Fisheries, using electro-shock device in the Humptulips River. The aim is to stun and check squawfish to see if they are eating the salmonids. Photo by *The Daily World*, Aberdeen, Washington.

EPA Divers: Getting Down to the Nitty Gritty

by Roy Popkin

They tell jokes on themselves: "What's a large orange monster from the deep that smells like a hog farm on a hot summer evening? No, it's not the Loch Ness monster. It's just another EPA Region 4 diver completing a routine operation." Or, "That photo looks overexposed because it's solid black, but it really shows EPA divers at work."

Translated, the first "joke" describes an EPA scientist wearing a dry suit and full face gear who has just emerged from a 60-foot, zero-visibility descent into a six-foot bed of bypassed sewage sludge during a sediment oxygen demand study. The second reflects the fact that over 70 percent of the dives made by EPA's underwater teams take them into poor visibility or total darkness created by sediments, underwater growth, and pollutants.

From the "Flower Garden" in the Gulf of Mexico to the polluted bottom of Boston harbor and Seattle's Puget Sound and the site of the "Delaware Wreck" in the Atlantic Ocean, EPA divers are doing a job that is far from the glamour of a Cousteau film or a Barbados TV commercial. They don't find sunken treasure or the remains of privateers, but they do find evidence of illegal dumping, the impacts of on-shore pollution, and, in many ways, a scientific treasure trove.

EPA's divers are not a separate organizational unit, although their role has been formally recognized for at least 10 years. There are a formal certification and training program, "dive masters" in a number of locations, and a diving chapter in the Agency Safety Manual.

Many of the dives made by EPA's underwater teams take them into poor visibility or total darkness. This diving candidate at Gulf Breeze, Florida, uses a modified mask that gets its air supply from the surface. This type of dry suit has been safely used in hazardous environments, such as oil spills. Steve Barsky photo.



Currently, there are about 35 men and women who are EPA-certified divers, an equal number with equivalent certification, and arrangements with a small number of contract divers from such resources as the University of Rhode Island. Even though diving is not an official EPA job category, it is an important activity performed by EPA marine biologists, engineers, technicians, and others whose jobs require underwater sampling, research, or exploration. In fact, only one-fourth of the Agency's divers ever dove for sport or recreation. Most of them learned diving skills because they needed them to better perform their EPA duties. This year three members of the Emergency Response Team assigned to Edison, New Jersey, are being trained as divers.

Says Jonathan Amson, the dive master for EPA headquarters and Regions 2 and 3: "EPA diving is hard work; it's not macho. It's not like sport diving. It's not playing. You may have six to eight things to do on the bottom and only 15 minutes in which to do them. It's a necessary part of the Agency's high quality science. Fortunately, you can make a diver out of a scientist even if you can't always make a scientist out of a diver."

The divers support a variety of EPA programs involving ocean dumping, Section 404 estuary actions, waste management activities related to spills, National Pollution Discharge Elimination System (NPDES) permits, and technical assistance to states. They also perform Superfund reconnaissance, enforcement efforts (where they become underwater detectives), and the collection of data for water quality, oceanographic, and other ecological surveys. About a quarter of the dives are done from the EPA Ocean Survey Ship, the *Peter W. Anderson*, two to 150 miles off-shore. And perhaps another 25 percent are inland in rivers, deep lakes, estuary waters, and quarries—the latter usually part of Superfund investigations to determine if drums of toxic wastes have been dumped there.

According to Amson, who has to approve all dives planned from the *Anderson*, EPA limits diving depths to 130 feet, beyond which decompression chambers would be required. The average depth is between 80 and 90 feet, he says, but Region 4 divers working in estuaries and shallow harbors often dive in six to ten feet of water ("sort of like diving standing on your head").

Perhaps the busiest group is the seven divers in Region 4. The team is led from

the Athens, Georgia, research laboratory. Some of them have done over 500 individual dives on EPA missions; the core group has been diving together since 1976.

Often called "dean" of the diving program is Region 4 dive master Don Lawthorn, an engineering technician who began diving in 1969, while working for the Interior Department, but has never been a recreational diver. He learned to dive in connection with a study of effluents from power plants in the Miami-Fort Lauderdale area. His deepest dive was 18 miles from Tampa, in the Gulf of Mexico, where a team of divers went down over 100 feet to find flat, ecologically safe areas in which to dump the product of dredging operations. One member of that team, Bruce Reynolds, now stationed at EPA's Narragansett, Rhode Island, laboratory, recalls that, in contrast to most dives, "the water was so clear you could see other divers 35 yards away and you could lay out your tools just as you would in a laboratory."

Diver Phillip Murphy credits "the uncertainty associated with collecting bottom samples through remote devices" as an important factor behind the creation of the team. Obviously a water quality model, for example, is only as accurate as the data input to it. New and innovative approaches were developed that required diving for gear deployment and data collection. Today, all sediment oxygen demand chambers in waters deeper than three feet are placed by diving teams to protect the integrity of the samples and resultant models. The lidded chambers used for sediment samples and monitoring the rate at which sediment uses up oxygen, are anchored so they don't leak. Because each operation involves seven chambers, attached to 18 cables,

The worst place Reynolds has worked is the bottom of Long Island Sound, where heavy algae growth and sediments make it so "totally dark you can't tell whether your eyes are open or closed."

deploying them is tricky and necessitates being under water longer than one can breathe without a mask and tank. The danger of becoming entangled in the mass of cables means the divers work in pairs.

Unfortunately for the divers, such studies are usually related to the cleanup of degraded waters. "Dirty water diving" involves chemical and biological hazards such as oil/asphalt spills and bypassed sewage sludge, physical conditions such as zero visibility and currents approaching three knots or more, and a variety of marine creatures.

Amson provides another insight into how divers have improved EPA's underwater science. His first EPA dive, in 1973, was to place monitoring equipment in the "Flower Garden," a coral reef 150 miles southeast of Galveston in the Gulf of Mexico, for the purpose of measuring the results of effluent from the mouth of the Mississippi River. "In those days," he says, "there was a lot of trial-and-error with results that often didn't show what was needed. Since the diving program began, we have done innovative things like using the ship and trailing tape cameras to study the bottom. We can track densities and movement of chemicals because we can return to the exactly the same place time after time to monitor the growth or impact of pollutants on the same groups of underwater plants, which may be only a few inches tall."

Dive master Jim Patrick at the Gulf Breeze Laboratory was another instigator of the "formal" EPA dive program. "By 1978, there had been a lot of shallow water diving in the south and up at Narragansett. Region 4 had a team. The time seemed right to formalize what was going on. There was a need to get serious about it." Patrick contacted Tony Brown, director of the Agency safety program, who took steps to set up an appropriate training program. Now there are one or two EPA training programs annually, at Gulf Breeze. Initially, the training was provided under a contract with the National Oceanic and Atmospheric Administration (NOAA). Now it is conducted by EPA. Considerable emphasis is placed on the physics and physiology of diving, diving into contaminated waters, and accident prevention.

Safety is a paramount consideration. In addition to the 130-foot depth limit, EPA divers are not allowed to go into

areas with unknown dangers. In Superfund investigations, for example, a remote observation vehicle is often used first to find out what might be in a quarry or deep lake. Divers going into known or suspected pollution wear a double-lined suit specially developed by the EPA and NOAA called the "SUS" (suit under suit). It was designed to provide maximum protection from chemicals in the water. Also, a buddy system is used to protect divers against being trapped, alone, in the dark.

Patrick himself recalls collecting samples for a pathologist in a channel at the bottom of Pensacola Bay. It was dark, and littered with bridge pilings and pieces of steel cable. He and his buddy had to keep each other out of trouble. Actually, the most serious accidents to EPA divers have been ruptured eardrums, but dive master Dwayne Karna of Region 10, whose divers work in heavily trafficked Lake Union and Puget Sound around Seattle, worries about the danger from boats of all sizes whose pilots "often ignore our flags and markings."

On the east coast, EPA divers are involved in a number of biomonitoring research projects, in which they test the effects of pollution on mussels placed in underwater cages. The divers have to collect, replace, and otherwise service the mussels and the cages. They also collect sediment cores for analysis, as well as collect worms and small shellfish with a suction dredge that works like a small vacuum cleaner. They dive into extremely polluted areas like Boston Harbor to study the impact of pumping sewage into the harbor. The worst place Reynolds has worked, he says, is the bottom of Long Island Sound, where heavy algae growth and sediments make it so "totally dark you can't tell whether your eyes are open or closed."

For other regions he has helped check the fate of sewage sludge in the New York Bight, the effluent from a big chemical plant in Toms River, New Jersey, and was part of a diving team that examined a 750- by 150-foot floating drydock deliberately sunk in 120 feet of water 30 miles off the Delaware Coast, at an Atlantic Ocean site informally known as "Delaware Wreck." The team studied the wreck to see how the wooden parts had withstood

submersion, what underwater plants were growing on it, and whether fish had turned it into a habitat.

In another unusual east coast project, Richard Traver, an engineer at the EPA Releases Control Branch in Edison, New Jersey, is coordinating an underwater search the Army is conducting in Chesapeake Bay to locate drums of white phosphorus dumped by the Aberdeen Proving Ground in the early 1920s.

Karna heads the only dive team on the west coast. Its divers, one of whom is stationed in Alaska, do many inspections related to NPDES complaints, generally in locations around company or publicly owned treatment works outfalls. They also do a lot of underwater investigative work for Superfund and did the underwater sampling that located hydrocarbons in Seattle's Lake Union, subsequently posted as unsafe for swimming and fishing. They also check for organic enrichment under floating fish farms in the area.

The divers frequently participate in enforcement investigations. Three years ago, Reynolds was asked to collect samples off a Rhode Island company's outfall to see if the company was dumping pollutants illegally. The "above water" team included the Rhode Island state police and state environmental inspectors. Reynolds and his colleagues found blasting sand in the bottom sediments; the company was ultimately fined for its actions.

There was one Region 10 investigation that could have been especially dangerous. Although most of the companies being inspected are friendly, Karna recalls that in this instance there was a phone call to the regional office in which the caller implied that a lift suspended over the pier would be dropped on the divers. The harbor police boat crew working with the divers donned their guns while the divers continued below, in muck so dark they had to hold hands to keep in contact. They did find, by the gritty feeling, illegally dumped pollutants. The company was convicted.

On the lighter side, EPA divers do run into marine creatures, but to date they have not caused serious problems. Murphy reports that a manatee cub once mistook an EPA diver in a wet suit for its mother and paired with him until driven away, and Amson came up from a dive off the Delaware coast to be asked if he'd seen a six-foot shark close to

him. He hadn't, even though sharks were his special interest when he was in graduate school; the big fish had left him alone during the dive. EPA divers checking effluent discharges from a seafood plant in Petersburg, Alaska, found a giant octopus living in an outboard motor casing.

Light moments, however, are few and far between. Says diver Reynolds, "Sports divers run around, take pictures. It's all fun. Research diving can be dangerous. It's all work ... but worthwhile." □

(Popkin is a Writer/Editor for EPA's Office of Public Affairs.)



EPA Diving Training Director Jim Patrick exits the water during diver certification training. Instruction is given in diving physiology, use of underwater equipment, and safety procedures required to monitor pollution or to document pollution damage.

What to Do With Those Old Oil Rigs

by Clay Fulghum

What's almost twice as tall as the Washington Monument, weighs hundreds of tons, and attracts visitors of both the two-legged and finned persuasions?

Actually, the riddle has multiple answers, all in the form of oil-drilling platforms, most of them in the Gulf of Mexico. These platforms, or rigs, as they are often called, can extend to depths of 1,000 feet and more. They have become popular gathering spots for a variety of sea creatures from barnacles to barracuda—as well as for enthusiastic sport and commercial fishermen.

The platforms—over 4,000 in U.S. and state waters—are susceptible to the ravages of time, not to mention weather. And not only that. The oil fields beneath them are being used up. In fact, over 1,500 platforms will be retired and dismantled between now and the year 2,000 at a cost that the National Research Council has estimated at over \$1 billion.

They'll be retired, that is, unless another use can be found for them.

Enter Villere Reggio, point man for the Rigs-to-Reefs program of the Minerals Management Service (MMS), Department of Interior. He thinks it would be imprudent at best to scrap the 4,000 acres of marine habitat now provided by producing platforms in the Gulf and points to the fact that offshore oil and gas structures can act as excellent artificial reefs, attracting bryozoans, mussels, mollusca, anemones, sponges, corals, crabs, shrimp, red snapper, grouper, and others too numerous to name, to form a complete food web.

So, Reggio says, take advantage of a good thing. Instead of paying millions of dollars to establish artificial reefs out of other materials, as the United States and

other countries are now doing, use the materials at hand. Make the oil companies happy, along with environmentalists, fishermen, and fish. An easy solution; everybody wins.

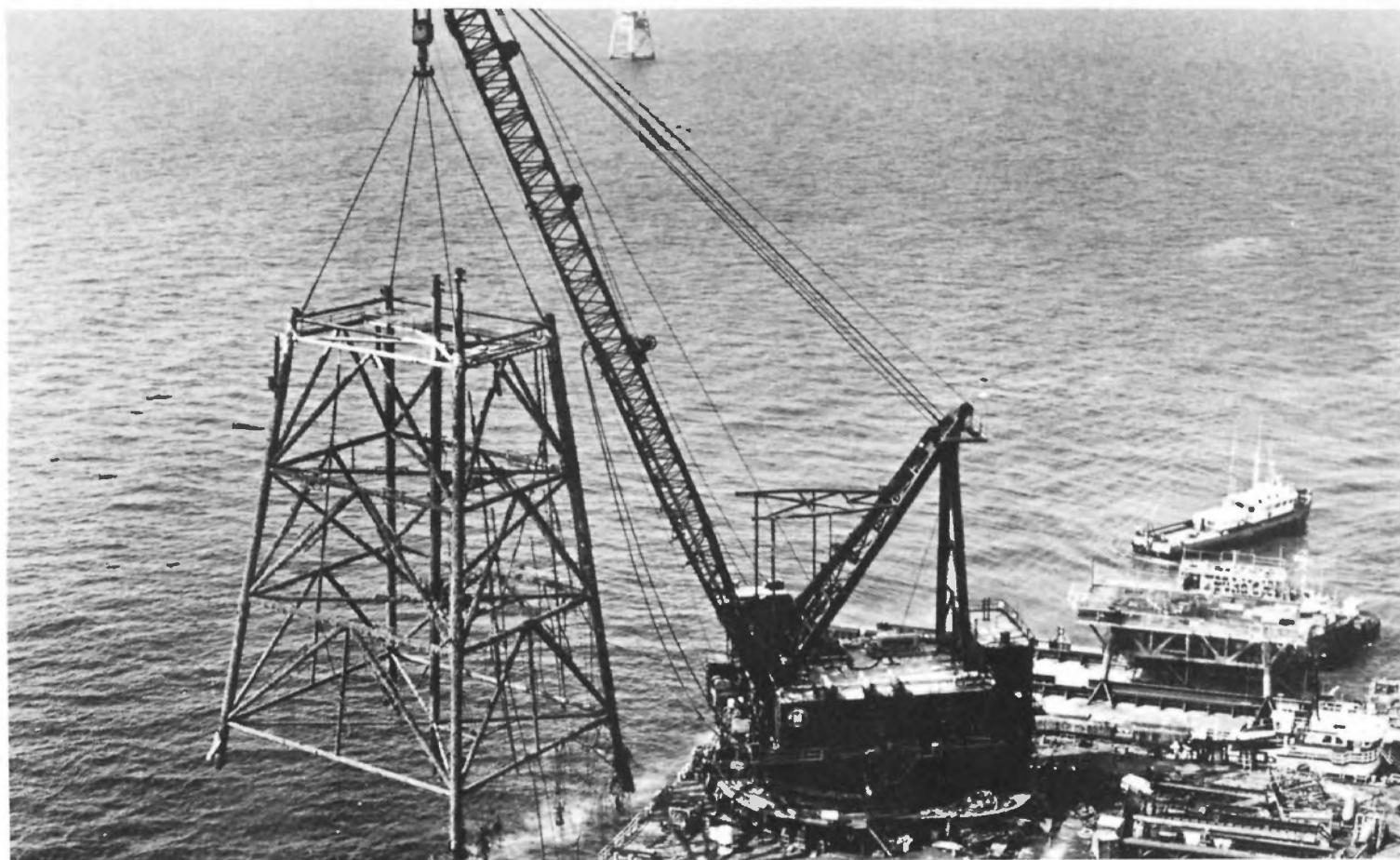
Unfortunately, it's not quite as simple as he suggests; even though the program is gaining momentum with 10 such rigs-turned-reefs already in place and others well on the way to changing from oil producers to fish habitats.

In fact, it might be argued that determining exactly how to deal with aging oil platforms is the really challenging riddle, and there are a variety of answers.

Some charge, for example, that converting oil and gas structure to reefs is a way for oil companies to avoid expensive disposal procedures, which can easily cost \$1-4 million per platform.

Says Sally Ann Lentz, an attorney for the Oceanic Society: "It's an excuse for dumping; it's not based on a scientific need for a structure."

Citing a potential for navigational hazards that could lead to pollution incidents, she contends that oil platforms worldwide should be completely removed when their useful



This 300-ton oil rig platform was barged from Louisiana to offshore Florida to become an artificial reef. It was placed on its side near Pensacola about 175-feet deep in the Gulf of Mexico. Not shown, the platform's upper section was placed nearby. Tenneco Inc. photo.

life is ended, unless there is a demonstrated need for a reef in a specific location.

The Department of Defense (DOD) has similar concerns. "The DOD does not object to making an oil rig a reef if the reef is placed where it is not a navigational problem," says Geoffrey Greiveldinger, Special Assistant for Ocean Policy Affairs. "But we don't want reefs just anywhere, and we don't want large numbers of them on the Outer Continental Shelf. Vast numbers would cause concern."

As a case in point, a West German submarine last March collided with a Norwegian platform in the North Sea.

The DOD also expressed national security reservations, claiming that enemy submarines could hide in the rigs-turned-reefs (as they could hide in producing platforms), escaping efforts to detect them with SONAR.

Some commercial fishermen, notably shrimpers, take issue with the rigs-to-reefs concept too, not just over the issue of possible obstruction of the water column but also obstruction of sea bottoms. They complain that subcontractors hired by the oil industry to clean up after a platform removal don't always do their job.

"We're breaking nets all the time on equipment that should've been brought to land and disposed of properly—pieces of platform, handrailings, iron doors," said Tee John Maljevich, President of Concerned Shrimpers of America. "They don't remove enough of the garbage for the bottom to be trawlable."

He's not against converting rigs to reefs, he says, just against trading trawlable land, where an artificial reef might be established, for untrawlable land where an old platform has been removed.

Proponents of rigs-to-reefs say, however, that every effort will be made not to intrude on shrimpers' trawling areas when establishing new reefs. Moreover, federal regulations require the complete clearing of a site as part of a removal operation; failure to do so is illegal.

Conservationists are another group troubled by the prospect of removing thousands of oil platforms in the next few decades—whether or not they're converted to reefs. They claim that the explosives used to sever the platform legs may damage marine life.

Lynn Davidson, marine habitat coordinator for Greenpeace, says she began to get calls from Gulf Coast

shrimpers about two years ago telling her that recent turtle strandings were not their fault but rather the fault of oil companies that were tearing down offshore platforms.

Indeed between March 19 and April 19, 1986, the National Marine Fisheries Service (NMFS) of the Department of Commerce verified the stranding of 51 sea turtles, primarily the endangered Kemp's Ridley turtle, along with 40 dolphins, on beaches of the upper Texas coast; during the same time period, 22 different explosions took place in

Determining exactly how to deal with aging oil platforms is the really challenging riddle, and there are a variety of answers.

adjacent waters. The NMFS reported "circumstantial evidence suggesting that at least some of the strandings of marine animals may have been due to underwater explosions used to remove oil platforms."

As a result of this incident MMS now consults with NMFS before explosions take place. Attention is also being paid to appropriate sizing of explosive charges and monitoring for sea turtles both before and after demolitions.

The oil companies are attempting to deal with the "potential" problem of turtle deaths by alternate means of severing platform legs—including cryogenics. But, they argue, given the current state of technology, almost the only other option open to them is to send down a diver with a torch, a dangerous procedure. Says Michael Zagata, director of Tenneco Oil Company's environmental and safety department: "We don't want to kill people or turtles."

The oil companies, sea turtle champions, and others could be satisfied if platforms were simply left in place to become fish habitats. There would be neither disturbance of biological communities nor removal expenses. But because the structures would be potential navigational hazards and because there are other legal and liability problems, this option is not likely to be chosen very often, according to MMS's Reggio. However, a new standard is now being negotiated by the International Maritime Organization, of which the United States is a member, which would relax current international strictures against leaving some large oil

and gas structures at least partially in place.

But there is another group with special concerns in the rigs-to-reefs drama: the sport fishermen. They perhaps stand to benefit the most from leaving the rigs in place.

Says Norville Prosser, Vice President of the Sport Fishing Institute: "Well-designed, environmentally sound artificial substrate are very important to recreational fishing because they attract fish and increase the biological community." But in the absence of management, conflict can occur among commercial fishermen, recreational fishermen, and divers. Commercial fishermen, especially those using very efficient traps, can virtually eliminate the fish around a reef, according to Prosser.

"We've systematically overfished most if not all our nearshore finfish stocks of importance to both recreational and commercial fishing," he says. "We have not yet entered the era when marine fishery management is providing for conservation of fish stock. We have a long way to go and a short time to get there."

Despite the thorny issues involved, the rigs-to-reefs program is gaining impetus, and oil platforms will be joining other artificial reefs off the U.S. coastline. Both rigs-to-reefs and reefs composed of other materials were given a boost when Congress passed the Fishing Enhancement Act in 1984 establishing standards and requiring development of a long-term national plan for artificial reefs.

MMS as early as 1983 announced a policy encouraging a properly permitted entity, usually a state, to take responsibility for turning retired platforms in state waters into reefs, thus releasing the oil companies from MMS regulations requiring them to dispose of the structures. Disposal typically involves transporting a structure, often in pieces, ashore to sell it for scrap.

Several states, including Florida, Louisiana, and Texas, now have rigs-to-reefs programs in place or are actively developing them. Naturally, reef advocates think this is great.

Tenneco, which has donated two platforms to the state of Florida, has gotten hundreds of letters from Florida citizens offering thanks, he said. "The public is telling us they (the rigs-turned-reefs) are valuable." □

(Fulghum is a free-lance writer.)

Air Toxics: A Headache for the Great Lakes

by Jane Elder



Imagine visiting friends in Duluth for a late summer picnic: a feast of sweet corn, raspberries, and fresh lake trout straight from the cold depths of Lake Superior. As the plates are passed around, a woman, obviously pregnant, passes up the trout. Her surprised host asks, "Not hungry?" "Yes," she replies, "but I worry about the PCBs." Her host protests, "Honey, there's nothing wrong with that fish. It was caught fresh this morning." "If it's all just the same," she answers, "I'll pass."

It's not surprising that our host was a bit defensive. Lake Superior just doesn't look like a polluted lake. The water is clear and cold, and there are few cities and industries on the shores. Yet even when discharge from industrial sites and sewage treatment plants is isolated or well-controlled, the lakes are still vulnerable to an onslaught of pollution from the sky.

Although PCB levels are slowly declining in all the Great Lakes, sufficient concentrations are present in the water and in the food chain to be of major concern. This spring, the states warned consumers to avoid eating the large lake trout (30 inches and up) from Lake Superior. For the first time, not even Superior's sparkling waters could be assumed safe. (Fish advisories for the other Great Lakes have been issued for many years.) People were surprised because direct discharges of PCBs into Lake Superior no longer exist. The PCBs had to be coming from the air.

Thus, PCB contamination of Lake Superior fish adds to the growing concern over the impact of toxic air

A Great Lakes scene. The lakes were once thought to be immune from pollution effects. Progress has been made in learning about and dealing with their environmental problems. One of the latest concerns about the lakes' water quality centers on toxic air pollutants. Mike Brisson photo.

***Concerns about toxic pollution
in Great Lakes waters have
been heightened by the effects
on Great Lakes fish.***

pollution on the Great Lakes. With the largest surface area of all the Great Lakes, Superior is perhaps the most vulnerable to airborne pollution. Research dicates that atmospheric sources are responsible for perhaps 80 percent of the PCBs entering Lake Superior.

Toxic pollution in the Great Lakes emanates from many sources, including direct discharge from waste pipes, runoff from land, and even from exchange with contaminated ground water and lake sediments. However, growing evidence indicates that airborne sources may be the single largest contributor of new toxic pollution to the upper Great Lakes, and a significant source—perhaps 20 percent—in the lower lakes.

Atmospheric contributions to Great Lakes pollution were first identified in the late 1970s when land-based sources of phosphorus couldn't account for total phosphorus levels in the lakes. The atmosphere turned out to be the culprit for a significant portion of the phosphorus. More troubling was the discovery of toxaphene in fish samples in an inland lake on Isle Royale National Park. Toxaphene was used primarily as a boll weevil pesticide in the South and also in stockyards in the West. It was rarely applied in the Great Lakes region. Isle Royale, in the northern reaches of Lake Superior, could only have been contaminated through atmospheric inputs. Furthermore, Isle Royale was not the only site contaminated in this way. Today, although banned from use, the pesticide remains one of the substances of greatest concern throughout the Great Lakes.

The huge surface area of the Great Lakes watershed—94,000 square miles—provides an enormous catch basin for rain, snow, and dry deposition. From lead particles in the

heart of an ice crystal to a chemical soup in a rain drop, pollutants find their way easily into the lakes.

Concerns about toxic pollution in Great Lakes waters have been heightened by the effects on Great Lakes fish. Over 25 species of fish are either banned or discouraged for human consumption in the Great Lakes. Concentrations of bioaccumulative toxics (chemicals that concentrate in living tissue) are the primary reason for concern. Bioaccumulative contaminants in the Great Lakes include PCBs and dioxin, as well as toxaphene, DDT, and other pesticides. While many of these substances are now banned from use in the United States, they are still present in the upper atmosphere and continue to reach the lakes from the sky. Some of these materials are still used in other countries or reach the atmosphere through careless incineration practices. Thus, they come from sources as nearby as the local waste incinerator or as far away as Mexico and Asia.

In addition to contamination of the food chain, another phenomenon—widespread evidence of cancer in fish—has raised concerns. Some pollutants are not passed up the food chain, but instead are easily metabolized by living organisms. PAHs (polynuclear aromatic hydrocarbons) fall in this category. One PAH in particular, benzo-a-pyrene, is a known human carcinogen also linked to the high incidence of fish cancers in the lakes. PAHs are emitted in numerous combustion processes and are a particular concern in coke oven emissions, for which EPA has recently proposed new regulations.

In spite of what we are learning about contaminated food and cancers in fish, the United States continues to regulate only a handful of toxic chemicals as air pollutants. Current regulations address only seven of the most deadly air pollutants (over 800 toxic substances have been identified in trace amounts in

the Great Lakes), and the procedure for regulating more substances is slow and complicated. Currently, EPA must prove that a chemical is hazardous to human health from direct exposure before it can regulate it under the Clean Air Act; secondary exposures through food and drinking water are not considered under regulatory criteria. Thus, hundreds of toxic air pollutants that endanger human health and the environment go unregulated in the United States, whereas Ontario, for example, regulates almost 100 toxic air pollutants.

These problems are not unique to the Great Lakes. As one of the world's more studied ecosystems, however, the Great Lakes often indicate the emergence of new environmental problems first.

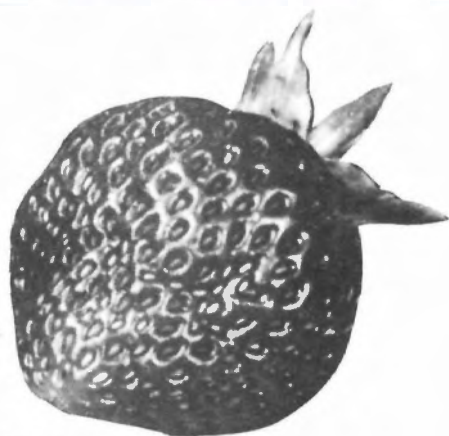
By and large, what goes up must come down. Each year, millions of tons of toxic pollutants go up into the atmosphere from tall stacks, tail pipes, open factory vents, evaporation from waste ponds and landfills, and many other sources. Every day, untold tons of toxics mix in the atmosphere or fall back down to earth in the form of rain, snow, or dry deposition. And so we live with them every day in our lungs and tissues, in the water we drink, and in the fish we eat. Airborne toxics present the Great Lakes region and the nation with important environmental and public health problems which need to be faced and resolved. □

(Elder is the Midwestern Representative for the Sierra Club.)

Editor's note: In November, the U.S. and Canada signed a series of annexes and amendments to the 1978 water quality agreement to protect the Great Lakes. Annex 15 of the agreement focuses specifically on toxic air pollution and both countries pledged to develop control programs for persistent toxic substances which reach the Great Lakes from airborne sources.

On Another Subject: To Eat or Not to Eat

by Carole Sugarman



USDA photo.

Amazing how eating strawberries may both prevent cancer and cause it. Same for eating cabbage, broccoli, and carrots. At least that's the conclusion one can draw from two new books—one of which raises fears that certain foods contain disease—causing pesticides, the other that raises hope that some of those same foods may combat illness.

It's enough to drive you to drink. (Which, of course, may either help your heart or cause cirrhosis.)

"Pesticide Alert: A Guide to Pesticides in Fruits and Vegetables," by Lawrie Mott and Karen Snyder (Sierra Club Books, \$6.95), discloses that pesticide residues were found more often on strawberries than any other fruit or vegetable listed among the 26 in the book. One of the pesticides used on strawberries is a "probable human carcinogen," according to the authors, and there is "some evidence of carcinogenicity" with another chemical used on the fruit.

Flip to page 282 of "The Food Pharmacy: Dramatic New Evidence that Food is Your Best Medicine," by Jean Carper (Bantam, \$18.95). One of the "possible therapeutic effects" listed for strawberries is that the fruit has been linked to lower rates of cancer deaths. Carper cites Italian investigators who have recently noted that strawberries can block the formation of cancer-causing nitrosamines in the intestinal tract. Strawberries also capped a list of eight foods most linked to lower rates of cancer deaths among a group of 1,271 elderly individuals in New Jersey, Carper adds.

The books are written in similar formats—alphabetized guides to foods from apples through watermelon (yogurt in Carper's case) and their risks (Mott) or benefits (Carper). Both books are written by reputable individuals well known in their fields. Mott, a senior staff scientist with the National Resources Defense Council, is a leading environmentalist who regularly testifies in Congress for stronger pesticide laws. Carper, a former senior medical correspondent for CNN, is the author of 15 nutrition and health guides.

Yet the books come to opposite conclusions. Whom, then, does a reader believe? Is the risk of eating produce greater than the risk of not eating it? Are organically grown fruits and vegetables the only answer?

It's a conundrum, this modern dilemma caused by science's ability to detect minute amounts of pesticide residues or natural chemicals in foods. Channeling this data to the supermarket shopper is even a trickier business,

since scientific findings don't necessarily translate into practical information.

But consumers want answers. They want to know whether to buy strawberries or to ban them. They want magic bullets, yes-or-no responses. Unfortunately, there aren't many.

In this context, neither book should be taken to its practical extreme. That means that foods such as strawberries shouldn't be eliminated from the diet, nor should shoppers buy them up like loaves of bread before a snowstorm.

Rather, readers should realize that both authors have to overestimate their case, making logical leaps based on inconclusive information, simply to make a point. The specifics are not as important as the residual message.

For Carper's book, the message is that science is on the threshold of some pretty provocative findings in regard to food as medicine. For Mott's book, it is that there are serious flaws in the way that pesticides are regulated and that consumers' power in the marketplace could be the driving force behind change.

Realize, also, that while both books rely on facts, their prescriptions are a matter of each author's own view of risk.

Carper admits that her book is on the "revolutionary side of conventional nutrition," but that "clues, as we know from the past, often precede by decades establishment blessings, and waiting for more knowledge can be a mistake." For Carper, there is little risk in eating foods such as apples, kale, and garlic even if they don't end up preventing any diseases. What we don't know can't hurt us.

Mott does not suggest that consumers stop eating fresh produce, but she does suggest that they wash all produce, peel it when appropriate, grow their own food or consider buying organically grown. Many of her fears seem to center around a lack of information on pesticide residues—"unfortunately, the overwhelming majority of pesticides used today have not been sufficiently tested for their health hazards," she writes. For Mott, what we don't know can hurt us.

We live in a world of risks. That doesn't mean we can't or shouldn't do everything we can to reduce them.

But in the meantime, enjoy the strawberry season. Just go easy on the whipped cream. □

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Appointments

by André Freeman



John Arthur Moore has been named Deputy Administrator of EPA, replacing A. James Barnes who will be leaving the Agency this month.

Since 1983, Dr. Moore has served EPA as Assistant Administrator, Office of Pesticides and Toxic Substances. In that capacity he was responsible for administering the Toxic Substances Control Act and the Federal Insecticide, Fungicide, and Rodenticide Act.

Before joining EPA, Moore spent 1969 to 1983 working at the National Institute of Environmental Health Sciences. There he served as Associate Director of Research Resources, and as Director of Toxicology Research and Testing Program; and then Deputy Director, National Toxicology Program. From 1963-1969 Dr. Moore was Assistant Director, School of Medicine, at Western Reserve University and later became Assistant Professor at Michigan State University in the department of Veterinary Surgery and the Center for Laboratory Animal Resources.

Among his many honors and achievements, Moore received the Honorable Presidential Rank Award—Distinguished Executive of 1986.

Martha G. Prothro has recently been named Director, Office of Water Regulations and Standards, Office of Water.

Prothro joined EPA in August of 1973, as a staff attorney, Enforcement Proceedings Branch, Division



of Stationary Source Enforcement, Office of Enforcement. Until 1980, she worked with the stationary source air enforcement program, serving as a Section Chief beginning in October 1975, and as Chief of the Enforcement Proceeding Branch from January 1977 to March 1980, when she became Director of the Noise and Radiation Enforcement Division. From April 1981 until her recent appointment, Prothro served as Director, Permits Division, Office of Water Enforcement and Permits.

Elaine G. Stanley was recently appointed to the position of Deputy Director, Office of Waste Programs, Office of Solid Waste and Emergency Response (OSWER). Stanley's duties will include assisting in implementing the solid waste and emergency remedial response enforcement policies for the Superfund and Resource Conservation and Recovery Act (RCRA).

From April 1987 to July 1988, Stanley was the Director of the RCRA Enforcement Division in the Office of Waste Programs Enforcement. She was responsible for the National



Program of Compliance and Enforcement under RCRA.

Prior to that assignment, Stanley served as the Deputy Director of the Hazardous Site Control Division which was responsible for managing the billion-dollar, long-term site cleanup program under Superfund. From 1981 to 1986, she served as a Special Assistant to the Director of OSWER. In that capacity, she provided advice and analysis on legislation, program management, and external affairs issues. Stanley was a key manager of the effort to re-authorize the Superfund legislation in 1985-1986, as well as overseeing initial efforts at its implementation.



C. Marshall Cain has been named Deputy General Counsel for Litigation, Legislation and Regional Operations.

Cain was a trial lawyer for the law firm of Richardson, Plowden, Grier, and Howser in Columbia, South Carolina, from 1984 until the time of his appointment as Deputy General Counsel.

From 1981 to November 1984, he served as Deputy Assistant Attorney General in the office of Legislative Affairs at the Department of Justice. During the 21-year period that Cain practiced law, he served eight years in the state legislature and two years as Executive Assistant to the Governor.



William Farland has been named Director, Office of Health and Environmental Assessment (OHEA), in EPA's Office of Research and Development.

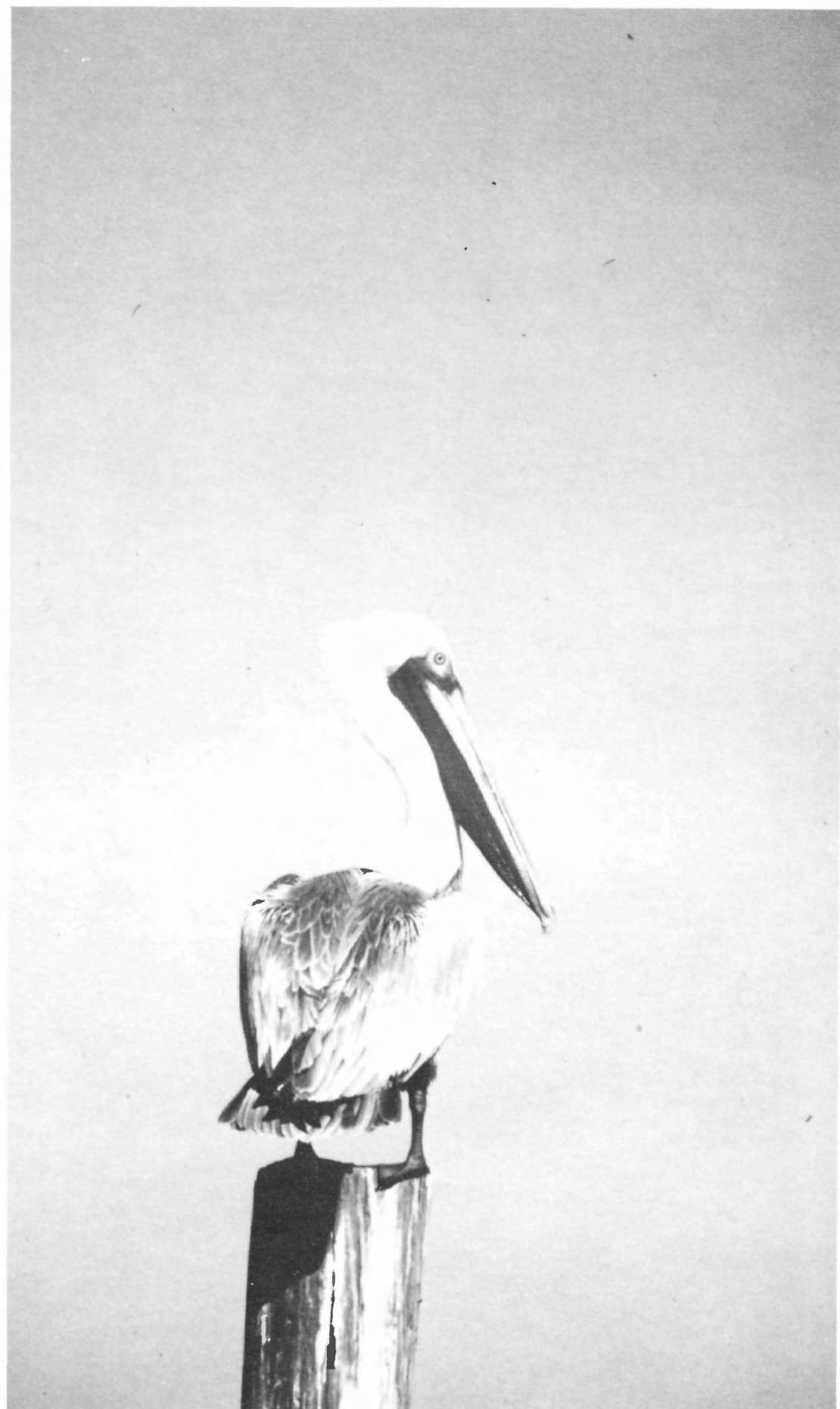
In 1979 Dr. Farland came to Washington on a joint appointment with George Washington University Medical School and EPA's Office of Toxic Substances (OTS). Among a number of positions at OTS, Farland served as the Deputy Director of the Health and Environmental Review Division, with major responsibilities for assessing the effects of new chemical substances.

In 1986 Farland was appointed Director of the Carcinogen Assessment Group in OHEA, while serving at the same time as Acting Director of the Reproductive Effects Assessment Group. He was also appointed a charter member of the EPA's Risk Assessment Forum. From October 1987 to July 1988, Farland served as the Acting Director of OHEA. □

(At press time, it was also announced that Victor J. Kimm, Deputy Assistant Administrator for Pesticides and Toxic Substances, would be Acting Assistant Administrator, replacing Moore. Susan Vogt, Deputy Director of the Office of Toxic Substances, would be named Deputy Assistant Administrator. Reports on these shifts will be in the next Journal.)

(Freeman is an intern for EPA Journal.)

And that is that!
Raymond Muzika photo.



Back Cover: A lot of us are here!
Aerial view of Cape May. In spite
of population growth along the
Cape May shore, officials there
are proud of the fact that the
area hasn't had the pollution
washups troubling some
beaches in northern New Jersey
and New York. Popularity and
population pressures are fast
becoming an environmental
challenge along the U.S. coasts.
It is estimated that by 1990,
more than 70 percent of our
entire population will live within
50 miles of the nation's
coastlines, including the Great
Lakes. Photo by Bill Weems,
Woodfin Camp, Inc.

