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Lost Among the Parts Per Billion

Ecological Protection at the United States

Environmental Protection Agency, 1970–1993

Edmund P. Russell III

Environmentalism at its inception was a grand vision, one that all Americans willingly shared. Somehow that vision of the essential unity of nature and of the need for bringing industrial society into harmony with it has been lost among the parts per billion, and with it we have lost the capacity to reach social consensus on environmental policy.

—William D. Ruckelshaus, 1985

In 1992, the *New Yorker* published a Gahan Wilson cartoon in which four horseback riders greeted a fifth with the comment, "Congratulations, Ecological Disaster—it's not often we admit another horseman into the Apocalypse!" The cartoon illustrated the extent to which fears of ecological problems permeated American culture in the last decades of the twentieth century. These fears influenced not only the way people viewed the world around them, but also the way they spent a great deal of their money. By 1993, citizens of the United States allocated about \$115 billion a year to environmental protection. The U.S. Environmental Protection Agency (EPA) spent about \$6.9 billion of that amount, and groups regulated by EPA spent much of the rest to comply with directives issued by that agency.¹

Because *environment* means *surroundings*, it would be logical to predict that EPA and the groups it regulated spent much or most of those billions to protect the surroundings for human beings rather than human beings themselves. Such surroundings presumably would include land, water, air, and nonhuman species. Many members of the public believed this to be the case. In the 1980 presidential campaign, Ronald Reagan charged that "environmental extremists" at EPA and other federal agencies sacrificed economic growth for "rabbits' holes and birds' nests."²

Some observers argued that EPA focused on human health issues and ignored, or at least paid too little attention to, nonhuman species. The agency's Science

Advisory Board, a group of outside experts, said in 1990 that EPA had displayed a "relative lack of concern" about "natural ecosystems" because it "considered the protection of public health to be its primary mission." Others were harsher: a more accurate name for the agency, they suggested, would be the Environmental Cancer Agency.³

Were these views accurate? Through interviews with past and current EPA employees and the examination of published and unpublished documents, it is possible to determine the extent to which EPA tried to protect nonhuman species between 1970 and 1993 and the factors that encouraged or discouraged such efforts.

This investigation can add to our knowledge about how a key agency has regulated our interaction with other species.⁴ Despite EPA's economic and political importance, historians have written little about the agency. First person accounts by ex-EPA employees, works by political scientists, and short pieces published by the EPA make up the bulk of the literature. Most of these accounts focus on the founding of the agency and its early battles. Few works view the agency over a period longer than five years, and fewer yet address the years since the first Reagan administration.⁵ A new angle of vision can be achieved by focusing on ecological protection (the protection of anything other than human health and welfare), analyzing the role of language in its promotion, noting shifts in judicial stances, tracing the fate of ecological protection from the early 1980s to the 1990s, and describing the history of ecological risk assessment, the framework EPA has used for ecological protection from the mid-1980s to the present.⁶

In the end, both views summarized above—EPA as ecological warrior and EPA as human health agency—are oversimplifications. The agency tried to protect nonhuman species at times, and did so to a greater extent than some observers have suggested, but it focused most of its attention on protecting human health. Why did EPA allocate its resources the way it did? Two popular arguments regarding statutory limits and scientific uncertainty fail to provide a satisfactory explanation. The statutory limits hypothesis holds that EPA did not have the authority to protect nonhuman species. EPA leaders often argued, with good reason, that Congress dictated its priorities, but statutes passed by Congress did not tie EPA's hands on ecological protection. Instead, they seemed to demand that the agency take action. It is true, however, that statutes emphasized human health over ecological protection, and that Congressional committees emphasized the former over the latter in hearings. It would probably be accurate to say that the statutes emphasized the protection of human health and that the agency extended that emphasis. The second hypothesis, scientific uncertainty, argues that lack of proof of harm prevented action. The agency did, however, act on issues before the scientific evidence seemed conclusive.⁷

This paper examines the following six factors that influenced EPA's actions (or lack of action) on ecological protection:

(1) *Institutional culture.* Employees brought to EPA more training, experience, and interest in human health than in ecology, and that background influenced their priorities. The employees who pushed for ecological protection generally had backgrounds in related scientific disciplines (e.g., ecology or wild-

said in 1990 that EPA had displayed a "systems" because it "considered the primary mission." Others were harsher: a suggested, would be the Environmen-

Interviews with past and current EPA staff and unpublished documents, it is clear that EPA tried to protect nonhuman species that encouraged or discouraged such

regulate about how a key agency has regulated despite EPA's economic and political constraints about the agency. First person accounts by scientists, and short pieces published by others. Most of these accounts focus on the early years. Few works view the agency over a long period. Address the years since the first Reagan administration achieved by focusing on ecological protection (rather than human health and welfare), and noting shifts in judicial stances, from the early 1980s to the 1990s, and the assessment, the framework EPA has used to date to the present.⁶

view—EPA as ecological warrior and its obligations. The agency tried to protect to a greater extent than some observers. Its attention on protecting human health the way it did? Two popular arguments of uncertainty fail to provide a satisfactory synthesis holds that EPA did not have the support EPA leaders often argued, with good reason, but statutes passed by Congress did not. Instead, they seemed to demand more. Instead, they seemed to demand more, that statutes emphasized human health. Congressional committees emphasized human health. It would probably be accurate to say that the agency's focus on human health and that the agency's focus on scientific uncertainty, argues that the agency did, however, act on a more conclusive.⁷

factors that influenced EPA's actions (or lack thereof) might lead to EPA more training, experience in ecology, and that background influence pushed for ecological protection from other scientific disciplines (e.g., ecology or wild-

life biology), or were lawyers who came to the agency to be environmental advocates.

(2) *Legal context.* The division of the agency most committed to ecological protection at its creation, the Office of General Counsel and Enforcement, found judges more persuaded by carcinogenicity of chemicals than by threats to non-human species. This interest helped redirect the office's emphasis from ecology to cancer.

(3) *Leadership.* EPA administrators and managers strongly influenced the agency's direction and priorities, including the importance (or lack of importance) attached to ecological protection.

(4) *Knowledge.* Although lack of certainty did not preclude action, lack of knowledge did. EPA tended to regulate on ecological issues more often when it had what it considered to be strong (if not necessarily conclusive) evidence.

(5) *Politics and values.* EPA operated in a politically charged atmosphere, and it took actions that seemed politically realistic. The actions with the greatest chance of success tapped the deep value Americans placed on protecting human health. How much value Americans placed on protecting other species, on the other hand, remained a matter of debate.

(6) *Language.* The rise of risk assessment in the 1980s helped reduce the conceptual gulf between public health and ecological protection. Risk assessment enabled advocates of ecological protection to argue their case using the same terminology and framework as advocates of human health.

Ecology and the Birth of EPA (1970)

A word relatively new to the public and to politicians, *ecology*, found its way into the discussions of a White House task force in February 1970. Charged with drafting a "President's Message on the Environment" for Richard Nixon, the task force proposed the creation of a new Department of Natural Resources that would oversee both use and protection of natural resources. Previous administrations had proposed similar departments, but the 1970 proposal marked the debut of an ecological idea—the need to preserve ecological balance—to justify the creation of a new policy and department.⁸

The term *ecology*, which came from the Greek word for *home*, was coined by a nineteenth-century German scientist to refer to the study of organisms and their surroundings. The term migrated from science to the popular and political lexicon in the 1960s, when a series of widely publicized events left Americans convinced that humans, and especially industry, threatened the well-being of the planet. Rachel Carson's *Silent Spring* (1962) convinced many people that pesticides, like atomic weapons, could "destroy life on earth." An oil spill in Santa Barbara killed sea animals, rivers foamed with detergents and occasionally caught fire, and photos of Earth taken from space made many people pause and think that this one planet was all they had. These concerns culminated on 22 April 1970, when millions of people celebrated the first Earth Day. An estimated ten million school children at ten thousand grammar and high schools, and students

at some two thousand university campuses, participated. Ten thousand people flocked to the mall in Washington, D C , and crowds of up to twenty-five thousand people attended rallies in New York, Philadelphia, and Chicago. *Time* called it the nation's "biggest street festival since the Japanese surrender in 1945."⁹

The term *ecology* seemed tailor-made to the new environmental consciousness. As one observer put it, *ecology* became "the political substitute for the word 'mother'"¹⁰ In popular usage, ecology referred not just to a scientific discipline, but to the interconnectedness of life, the balance of nature, the beneficent aspects of the planet that humans threatened, and the environmental movement, which was sometimes called "the ecology movement." Biologist Barry Commoner popularized four "laws of ecology" in a book titled *The Closing Circle*. His first law stated, "Everything is Connected to Everything Else."¹¹

The U.S. Congress responded to interest in ecological issues by passing a number of laws that committed the nation to protect both human and nonhuman species. The National Environmental Policy Act of 1969 made it national policy to "promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of man." Congress said it intended the Clean Water Act "to restore and maintain the chemical, physical, and biological integrity of the Nation's waters" Among other things, the act specified concern with "all identifiable effects on health and welfare including, but not limited to, plankton, fish, shellfish, wildlife, plant life, shorelines, beaches, esthetics, and recreation" The Federal Insecticide, Fungicide, and Rodenticide Act allowed approval of pesticides only if they "will not generally cause unreasonable adverse effects on the environment."¹²

President Richard Nixon also felt it wise to portray himself as protector of the nation's ecology, so he created the Environmental Protection Agency in 1970. Echoing public concerns, Nixon called for EPA to identify the effects of pollutants on "the entire ecological chain," including both "man and his environment."¹³

When EPA began operating in December 1970, it became clear that personnel brought contrasting commitments to protecting "the entire ecological chain." Most employees came to EPA from agencies in the Departments of the Interior, Agriculture, and Health, Education, and Welfare. Training and experience led these workers to focus on human health, not on "ecological chains." Many of these employees felt that the Department of the Interior was the agency that should focus on wildlife and related matters.¹⁴

Members of the one new division of EPA, the Office of General Counsel and Enforcement, brought to the agency an outlook similar to that voiced by Nixon. Influenced by *Silent Spring* and the ecology movement, these lawyers wanted to protect the ecology of America as well as the health of its citizens. As it happened, this office became the de facto policy office for the newborn agency, which pursued aggressive legal enforcement of environmental laws. Some issues, such as pollution from automobiles, lent themselves to a focus on human health effects. Other issues, including the "political hot potato" of pesticide regulation, left room for focusing on effects on both humans and the environment.¹⁵

From Ecology to Cancer (1970-1976)

The contrast between these approaches came to the fore when EPA struggled to decide the fate of several pesticides. Ever since publication of *Silent Spring*, environmentalists had viewed pesticides as symbols of the threat that humans could pose to ecological systems. Rachel Carson had pointed out, for example, that populations of western grebes at Clear Lake, California, plummeted after homeowners sprayed DDD, a chemical compound similar to DDT, to control gnats. She argued that DDD accumulated in ever higher concentrations as it traveled up the food chain, creating a "chain of poisoning" that devastated the grebes. Ecological damage to birds and other species prompted the Environmental Defense Fund to petition the federal government to ban DDT and two of its derivatives, dieldrin and aldrin. The petitions also mentioned that pesticides could cause cancer, but they focused primarily on ecological effects.¹⁶

Lawyers in EPA's Office of General Counsel and Enforcement sympathized with the Environmental Defense Fund's position, which led to a disagreement with the Office of Pesticide Programs that exemplified the contrasting values held by personnel in the two offices. Members of the Office of Pesticide Programs had come to EPA from the Department of Agriculture, and they considered damage to birds and fish not to have been proved, or at worst to have been of minor importance compared to the benefits that pesticides provided by protecting crops from insect pests and humans from disease. They felt that the lawyers pursued the aldrin/dieldrin case for political reasons and as an attempt to grab power. To the lawyers in the Office of General Counsel, the scientists in the pesticide program appeared misguided. Like Rachel Carson, EPA lawyers believed that pesticide manufacturers unduly influenced entomologists and their assessments of the costs and benefits of chemicals.¹⁷

In the end, EPA Administrator William Ruckelshaus sided with his attorneys and their goal of protecting birds. Announcing his intention to cancel most uses of aldrin and dieldrin in 1972, Ruckelshaus devoted but one sentence to health, a reference to tumors that developed in mice given high doses of dieldrin. He emphasized instead dangers to wildlife and the atmosphere. When he banned DDT on crops, Ruckelshaus said that evidence "compellingly demonstrates the adverse impact . . . on fish and wildlife," especially since DDT tended to cause birds to lay eggs with thin, easily broken shells. Ruckelshaus also mentioned, but did not highlight, DDT's carcinogenic potential. Use of DDD was also canceled. Critics charged that Ruckelshaus's decisions callously disregarded human health, for the chemicals that would substitute for DDT and its relatives were even more poisonous to humans.¹⁸

The fight over pesticide bans exemplified the extent to which leaders and values influenced the priority placed on ecological protection at EPA. Although each side questioned the motives of the other, neither proponents nor detractors of ecological protection regarded their actions as cynical. Rather, both felt they promoted the common good. Scientific evidence contributed to both points of view and determined neither. EPA attorneys wanted to protect wildlife and people from pernicious chemicals. They relied on field observations of some species of

birds—carnivores that laid shells with thin eggs—to make their case, even though laboratory experiments on this effect had provided inconclusive data. Members of the Office of Pesticide Programs wanted to protect farmers and the nation's food supply from insects and saw pesticides as important to that effort. Experts from outside EPA argued that the nation did not have to use DDT to produce enough food and fiber. It was the agency leader, William Ruckelshaus, who determined which side would “win” struggles over the importance attached to nonhuman species.¹⁹

Ironically, pesticide cases that entered the legal process as efforts to prevent damage to birds emerged as efforts to protect humans from cancer, reducing EPA's emphasis on ecological protection. Traditionally, courts had deferred to executive agencies in matters of scientific judgment and emphasized procedural, not substantive, matters in judicial reviews. A Court of Appeals decision in the aldrin/dieldrin case, however, pointed out the strength of carcinogenicity as a legal argument: “[C]andor compels us to say that when the matter involved is as sensitive and fright-laden as cancer, even a court scrupulous to the point of punctilio in deference to administrative latitude is beset with concern when the cross-reference [to cancer in EPA's brief] is so abbreviated.”²⁰

EPA lawyers took the hint. They incorporated seven “general principles applicable to determination of carcinogenic hazards” into their final brief in the DDT cancellation hearings. They also argued that no potential carcinogen should be sold. Their final brief in the aldrin/dieldrin case listed nine “established principles of carcinogenicity.” EPA lawyers repeated the principles in subsequent hearings on heptachlor, chlordane, and other pesticides, in which they stood as powerful precedents. Ecological arguments faded into the background.²¹

For birds, it did not matter in the short run whether EPA banned DDT because of its effects on avian endocrine systems or on human cells. But in the long run, this shift had an important consequence: it directed the attention of EPA's strongest advocates of ecological protection, lawyers in the Office of General Counsel and Enforcement, away from birds and toward cancer. Again, scientific evidence contributed to, but did not determine, this tilt. Ecological damage and carcinogenicity were both matters of dispute within the scientific community. In the legal community, it had become clear that judges feared human cancer more than dead birds.

Along with judicial pressure, Congressional politics also led EPA to de-emphasize ecological concerns in at least three ways. First, members of Congress made it clear that the 1970 “mood of crisis” about the nation's ecology had passed. The shift became clear in the confirmation hearings for Ruckelshaus's successor, Russell Train. Whereas questions at Ruckelshaus's hearings in 1970 focused on whether he would be tough enough in enforcement, comments by committee chairman Jennings Randolph to Train in 1973 stressed that protection of public health should be the goal of the agency. EPA should balance regulations against the need for economic growth.²²

Train found it easier to justify limits on pesticides to hostile Congressional committees if he emphasized human health, not ecology. The House Agriculture Committee retained jurisdiction over pesticides even after regulation shifted

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from the Department of Agriculture to EPA, and it retained its allegiance to farmers. Chairman Jamie Whitten believed so strongly in pesticides that he had published a book in 1966 to rebut *Silent Spring*. Its title, *That We May Live*, expressed his belief that human health and welfare should be at the center of considerations about pesticides.²³

Finally, a Congressional scare forced Train to reduce the power of the Office of General Counsel and Enforcement. Angry about pesticide bans, farm and industrial interests lobbied Congress to loosen restrictions by shifting power over pesticides to their longtime ally, the Department of Agriculture. In 1975, the House almost passed a bill that would have enabled the Secretary of Agriculture to veto decisions about pesticides made by the EPA administrator. Train feared that EPA's pesticide program as a whole might be in danger, so he downgraded the role of the Office of General Counsel. Rather than setting policy by going directly to the administrator, agency lawyers would merely counsel the pesticide program. Several lawyers quit in protest.²⁴

Institutionalizing Cancer (1977–1985)

Train's successor, Douglas Costle, increased the agency's public emphasis on protecting human health by portraying EPA as primarily a cancer prevention agency. This emphasis arose for at least three reasons. Public fears of toxic substances became more prominent during the 1970s. The media splashed stories in newspapers and on television about a toxic waste dump under a neighborhood called Love Canal, polybromated biphenyls (PCBs) in food in Michigan, PCBs emitted from a General Electric plant on the Hudson River, and other chemical hazards. Citing the National Cancer Institute, books and news programs announced that environmental factors caused 60 to 90 percent of cancers. Congress responded by passing the Toxic Substances Control Act of 1976, which charged EPA with preventing "unreasonable risk of injury to health or the environment" from toxic chemicals.²⁵

EPA and other agencies responded with a risk assessment methodology for cancer. Costle and heads of other regulatory agencies, including the Food and Drug Administration, the Occupational Health and Safety Administration, and the Consumer Product Safety Commission, formed a working group early in the Carter administration to develop a way to regulate toxic substances. The working group found it impossible to develop a risk assessment methodology for all problems, so it focused on one of wide interest, cancer, for which risk assessment methods had already been developed.²⁶

Finally, EPA's role in preventing environmental cancer provided an argument for the agency's independence. In his campaign, Carter had promised to eliminate duplication among federal agencies. Much like Nixon's task force several years earlier, Carter's reorganization team proposed to consolidate environmental protection and natural resource management into a large Department of the Environment. If this plan went through, the EPA administrator would no longer

report directly to the President. Delays in implementing reorganization plans gave EPA leaders time to reposition the agency.²⁷

Costle set out to convince the public that EPA was not primarily a "bird and bunny" agency, like the Department of the Interior into which planners wanted to fold EPA, but a public health agency. Costle did not shrink from graphic images in promoting this view. He told the American Chemical Society that EPA could not wait for dead bodies to regulate carcinogens, especially since cancer was the second leading cause of death in the country. Assistant Administrator William Drayton announced that programs to measure effects of pollutants on nonhuman species—trees, crops, and natural systems—would be cut in favor of research on human health effects and that much of the remaining research on ecological effects would be contracted out. The new strategy worked. In its own document, the White House Office of Management repeated Costle's contention that environmental protection existed to protect human health. As a result, EPA's budget grew by 60 percent and its staff by 20 percent between January 1977 and January 1979.²⁸

The arrival of the Reagan administration in 1981 did little to revive interest in ecological protection at EPA. Few EPA employees believed that Reagan regarded ecological protection fondly; he was quoted as saying that trees and other plants caused most air pollution. Under new administrator Anne Gorsuch, EPA cut enforcement actions in half and morale plunged. After Gorsuch resigned, Reagan replaced her with former administrator William Ruckelshaus. Ruckelshaus also focused primarily on human health during his second term as administrator. At the end of this term, Ruckelshaus questioned the priorities of agency leaders, including, by implication, himself: "What is the impact of all this chemical loading over the years on the ecological systems in which human culture is embedded? After decades of so-called pesticide control, we have not even begun to ask this question. Indeed, it is odd how little time is spent at the upper levels of EPA thinking about such things and how much time is spent worrying about tiny increases in the risk of a single human disease [cancer]."²⁹

Risk and the Renaissance of Ecological Protection (1985–1988)

Although, as Ruckelshaus noted, EPA's top leaders had "not even begun to ask" how pollution affected ecosystems, employees lower in the hierarchy had. While in the minority, a number of employees came to the agency with interest and training in ecology. In their view, mid- and upper-level managers shared neither their training nor their interest. Scattered throughout the agency, ecologically minded employees conducted some studies on nonhuman species, but they did not have sufficient influence in any one place to push an ecological agenda. In the mid-1980s, publicity in the popular media about greenhouse gases and destruction of the ozone layer created a level of popular awareness in issues beyond human health that made the time ripe for ecological arguments. Within EPA, employees sensed an openness to ecological issues in Ruckelshaus's successor, Lee Thomas.³⁰

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Ecological Protection (1985–1988)

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Before leaving EPA, and perhaps without foreseeing it, Ruckelshaus had facilitated concern with ecological issues through his promotion of risk assessment as the agency's regulatory approach. Concerned about the cost of pollution control, Ruckelshaus argued that the agency needed to balance costs and benefits of individual regulations and to compare the value of various programs. He promoted risk-benefit analysis as the best way to accomplish these goals. Like cost-benefit analysis, risk-benefit analysis emphasized quantitative measures of tradeoffs. The methodology used to estimate the danger that something, usually a carcinogenic chemical, posed to a population became known as *risk assessment*. The National Academy of Sciences helped advance this approach when it published the Red Book, a 1983 study that codified procedures for risk assessment.³¹

Although developed to help protect human health, risk assessment helped put ecological protection on the agency's agenda by enabling scientists to describe ecological threats in the same language that the agency used to describe threats to human health. Partly under contracts from EPA's Office of Research and Development, Glenn W. Suter and Lawrence W. Barnhouse at Oak Ridge National Laboratory developed *environmental risk analysis*, a method for identifying and quantifying the probability of adverse changes in the environment from human activities. In 1982 and 1986, for example, they estimated risks associated with indirect coal liquefaction, including risks to fish, algae, timber, agriculture, and wildlife.³²

Offices within EPA followed suit. In 1986, EPA's Office of Pesticide Programs published ecological risk assessment guidelines that drew on the methods developed by Barnhouse and others. The Office of Pesticide Programs defined ecological risk assessment as "estimating the probability or likelihood of undesirable events such as injury, death, or decrease in the mass or productivity of game fish, wildlife, etc." The office used the "quotient method," in which one estimated the environmental concentration of a chemical and divided that number by the LC₅₀. LC stood for "lethal concentration," and LC₅₀ referred to the concentration that killed 50 percent of test animals. If the ratio exceeded a specified level, which varied depending on the organism, then the agency conducted simulated or actual field tests. The Office of Pesticide Programs tested chemicals primarily on species considered important for food or recreation, such as fish, aquatic invertebrates, mammals, and birds.³³

Scientists faced large obstacles when developing an ecological risk assessment. Health risk assessments dealt with only one well-studied species, humans, while ecological risk assessment could involve all species on earth. Limits on time and money forced scientists to test chemicals on a handful of species. They usually tested those already identified through legislation as valuable to society. Scientists wondered, but were largely unable to investigate, whether other species would react differently from test species, and whether single-species testing would reveal effects on other levels of organization, such as ecosystems.³⁴

The biggest challenge to advocates for ecological protection at EPA arose from a simple question: "So what?" Americans agreed on the value of protecting human lives. Health risk assessments dealt with dangers already familiar and of

concern to the public, such as cancer or birth defects, but scientists wondered to what extent the public understood or cared about ecological risks. Was it significant if a fish population lost 15 percent of its members? Perhaps so, perhaps not, depending on the species of fish and whether or not it was endangered.³⁵

Despite methodological hurdles, the risk assessment approach facilitated promotion of ecological issues. It provided a common language to describe threats to health and ecology and enabled employees with ecological concerns to develop a critical mass. With Lee Thomas's blessing, seventy-five EPA professionals from across the agency met to discuss the agency's priorities. That gathering revealed a broad interest in ecological issues that led to a 1987 publication called *Unfinished Business*. The report divided EPA's concerns into four categories: cancer, noncancer diseases, ecology, and welfare.³⁶

Although EPA scientists used the language of risk to analyze ecological problems, they found that no general methodology for ranking ecological risks had been developed. So the ecological working group developed its own criteria to evaluate the threats posed by twenty-six "stress agents" to sixteen ecosystems: geographical extent of effect, intensity of effect, length and frequency of exposure, and reversibility of effect. In the end, the group grouped ecological problems into three categories: high, medium, and low priorities. The project as a whole concluded that EPA's distribution of resources closely matched the public's perception of risk, but not the perceptions of scientists. The ecological working group waxed enthusiastic about risk as the organizing concept for ecological protection, and the inclusion of ecological issues as a major category helped legitimize this interest within the agency.³⁷

Advocates of ecological concerns had gained a toehold on EPA's agenda, but they still faced a mountain of work. A 1988 EPA study concluded that most ecological assessment methods addressed threats to populations, but that scientists could not predict effects on communities or ecosystems.³⁸ Soon after, the agency published its *Summary of Ecological Risks, Assessment Methods, and Risk Management Decisions in Superfund and RCRA*, which concluded that ecological issues had not played a significant role in implementation of the Resource Conservation and Recovery Act. Citing the need for more policy guidance, data, training, and methods, it also argued that Superfund sites posed ecological threats, but that efforts to reduce them had varied from site to site. The report attributed this variability to "lack of policy and guidance rather than a lack of ecological expertise among Superfund professionals."³⁹

Leadership, Judicial Standards, and Ecological Protection (1985–1993)

Was the report on Superfund correct when it argued that "lack of policy and guidance," rather than lack of scientific knowledge, posed the biggest challenge to ecological risk reduction? Evidence from another program, the Office of Pesticide Programs, lent credence to this view. The office collected data on ecological effects of pesticides, but it did not propose banning a pesticide for ecological

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 about ecological risks. Was it signifi-
 cants members? Perhaps so, perhaps not,
 whether or not it was endangered.³⁵

A risk assessment approach facilitated pro-
 common language to describe threats
 employees with ecological concerns to de-
 debussing, seventy-five EPA profession-
 the agency's priorities. That gathering
 es that led to a 1987 publication called
 EPA's concerns into four categories:
 welfare.³⁶

A range of risk to analyze ecological prob-
 lemology for ranking ecological risks had
 a working group developed its own criteria to
 "stress agents" to sixteen ecosystems:
 effect, length and frequency of expo-
 sure, the group grouped ecological prob-
 lems and low priorities. The project as a
 resource closely matched the public's
 concerns of scientists. The ecological working
 group's organizing concept for ecological
 risk issues as a major category helped

secured a toehold on EPA's agenda, but
 a 1988 EPA study concluded that most
 threats to populations, but that scien-
 tists' priorities or ecosystems.³⁸ Soon after, the
 report *Ecological Risks, Assessment Methods, and
 RCRA*, which concluded that
 the role in implementation of the Re-
 sponse Act was the need for more policy guid-
 ance. It argued that Superfund sites posed
 a threat because they had varied from site to site.
 The report called for more policy and guidance rather than
 reliance on fund professionals.³⁹

Ecological Standards, Superfund (1985-1993)

It argued that "lack of policy and
 knowledge, posed the biggest challenge
 to another program, the Office of Pes-
 ticide Regulation. The office collected data on ecologi-
 cal risks. The office banned a pesticide for ecological

reasons until the mid-1980s.⁴⁰ Then, for reasons that remain unclear, the assis-
 tant administrator for Pesticides and Toxic Substances, Jack Moore, and the head
 of the Office of Pesticide Programs, Steve Schatzow, decided to look at ecologi-
 cal effects of two chemicals, carbofuran and diazinon.⁴¹

Moore and Schatzow's actions against these two chemicals illustrated the po-
 tential, albeit largely untapped, for EPA leaders to act on ecological concerns.
 According to scientists in the ecological effects branch, carbofuran killed bald
 eagles. Moore did not take action against carbofuran before leaving EPA, but his
 successor pushed for its ban and negotiated a phaseout of most uses. EPA scien-
 tists blamed diazinon for killing ducks and geese that ingested the chemical
 while grazing on grass, and EPA canceled use of diazinon on sod farms and golf
 courses.⁴²

Although the diazinon bans eliminated two relatively minor uses of the chemi-
 cal, they illustrated an important and unsuspected source of support for ecologi-
 cal protection, the judiciary. When trying to ban DDT and its relatives fifteen
 years earlier, EPA lawyers had learned that judges worried more about human
 health than about ecological effects, so the lawyers had shifted their emphasis to
 human health. The diazinon bans rested solely on ecological effects.

Would judges uphold bans for ecological reasons alone? Ciba-Geigy, the manu-
 facturer of diazinon, forced that question when it appealed the chemical's can-
 cellation to the Fifth Circuit of the U.S. Court of Appeals. Ciba-Geigy granted
 that diazinon killed birds, but argued that EPA had to show that diazinon killed
 birds "more often than not." Known for conservative opinions, the court pleas-
 antly surprised EPA lawyers when it rejected Ciba-Geigy's argument. The court
 said that EPA needed to find only "significant probability of unreasonable risk."
 The diazinon case opened the door to more "ecological" regulation at EPA by
 setting a standard potentially persuasive to, but not binding on, courts in other
 parts of the country: EPA would not have to show harm to populations of ani-
 mals, but only to individuals. The latter was an easier task.⁴³

Lee Thomas's successor, William Reilly, was a career conservationist. He ad-
 vanced ecological protection at EPA in at least three ways. First, he announced
 that it would be a "matter of policy" not to tolerate "an unnecessary risk of regu-
 larly repeated bird kills" from pesticides without a countervailing benefit. Sec-
 ond, Reilly vetoed a one billion dollar dam project in Colorado known as Two
 Forks. Beginning in 1981, the city of Denver and forty suburban water agencies
 started planning to dam the South Platte River to supply water to city dwellers
 and suburbanites. Local fishermen and environmentalists opposed the plan, say-
 ing that the reservoir would ruin "the St. Peter's Basilica of trout fishing," scen-
 ery, and hiking sites. Downstream in Nebraska, farmers and conservationists
 worried about having enough water for irrigation and endangered cranes. Within
 the Denver area, public opinion was split. Supporters released a poll showing
 that 47 percent of suburban citizens supported the project while 41 percent op-
 posed it.⁴⁴

Initially, the developers appeared poised for victory. The Army Corps of Engi-
 neers approved the dam. Because the project involved a potential loss of wet-
 land, EPA had the right to veto it, but this did not appear to be a problem. The



EPA administrator for the Rocky Mountain Region, Jim Scherer, announced in 1989 that he was ready to approve the permit for the dam. Then Reilly, only recently appointed by President George Bush, shocked developers by announcing that he would take the decision out of the region's hands. Reilly said that he understood the value of water for Colorado, but that he had to "respect other values important to Coloradans and all Americans: a beautiful free flowing trout stream of the highest quality, wetlands; a downstream habitat of endangered whooping cranes, and other environmental resources."⁴⁵

Reilly's move made the Two Forks debate a national symbol of struggles between developers and environmentalists. Supporters reportedly spent \$150,000 per month in efforts to convince EPA not to veto the project. Even the President felt compelled to address the issue. After proponents and opponents of the project flooded the White House with correspondence and entreaties, Bush announced that he had not told EPA to consider stopping the project and that he would not intervene to save it.⁴⁶

Reilly's decision broke with two traditions. The first was as old as the agency: such decisions had always been made at the regional level. Reilly became the first EPA administrator to take such a decision away from the region. The second tradition was shorter term: the Reagan administration favored development. Scherer, the regional administrator and a Reagan appointee, said, "I don't know if President Reagan ever vocalized any concern about wetlands . . . I guess there's been a shift in emphasis."⁴⁷

Scherer was right. Reilly asked the head of EPA's Atlanta office, Lee A. DeHihns III, to review the case. After a year of study, DeHihns recommended rejecting the permit application. He cited "significant loss of aquatic and recreational values," along with alternative sources of water, as reasons. Reilly accepted the recommendation and in November 1980 turned down the permit. The dam would cause too much damage to fishing and recreation, and Reilly noted that Denver could tap other "less environmentally damaging alternatives" to supply water.⁴⁸

Finally, Reilly asked EPA's Science Advisory Board, a group of outside experts, to evaluate *Unfinished Business*. Like agency personnel, the board found that the risk framework offered a bridge between human health and ecological issues. The title of its report, *Reducing Risk*, expressed the central role of risk in the board's analysis. The board criticized some of the methods used to create the rankings in *Unfinished Business*, but it boosted ecological concerns by recommending that "EPA should attach as much importance to reducing ecological risk as it does to human health risk." It argued that productive natural ecosystems were essential for human health and economic growth, and that they were "intrinsically valuable in their own right."⁴⁹

Advocates of ecological protection below the top levels of the agency focused on developing ecological risk assessment methods. By this time, the agency had developed a formal method for assessing human health risks, and employees adapted that framework for ecological assessments.⁵⁰ EPA employees in several parts of the agency published articles in professional journals describing the agency's activities in ecological risk.⁵¹ They were aided by articles written by

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t the top levels of the agency focused ethods. By this time, the agency had human health risks, and employees ssments.⁴⁷ EPA employees in several professional journals describing the y were aided by articles written by

scientists at other agencies who were also developing ecological risk assessment methods.⁴⁸

In 1991, EPA issued its *Summary Report on Issues in Ecological Risk Assessment*, which suggested changes in terminology from the health framework while retaining the same approach and sequence of steps. For example, the report substituted the term "stress-response" for "dose-response." This report laid the groundwork for a 1992 publication, *Framework for Ecological Risk Assessment*, which formalized the agency's ecological risk assessment procedure. The report defined ecological risk assessment as "a process that evaluates the likelihood that adverse ecological effects may occur or are occurring as a result of exposure to one or more stressors." The report divided ecological risk assessment into three phases: problem formulation, analysis, and risk characterization. The report divided each of those phases into smaller steps, most of which were analogues of steps in health risk assessment.⁴⁹

This effort marked enough of a change in EPA direction that *Science* reported it in a 1992 article: "As if trying to determine human health risks from radiation, dioxin, and other hazards isn't enough trouble, the Environmental Protection Agency (EPA) may soon try its hand at the even more difficult chore of assessing ecological risk." This approach sounded so novel that *Science* put quotes around "ecological risk assessment" in the article title. Difficult or not, ecological assessments had become part of what EPA did. By 1993, various programs at EPA, including the Office of Prevention, Pesticides, and Toxic Substances, Office of Solid Waste and Emergency Response, Office of Water, and Office of Air and Radiation, had undertaken ecological assessments.⁵⁰

An important stamp of approval came in 1993, when a National Research Council committee endorsed the ecological risk assessment approach. In a follow-up to the council's seminal 1983 study, the committee looked at risk assessment in a number of federal agencies, including EPA. It concluded that "an ecological version of the 1983 [risk assessment] framework is desirable and feasible" and promoted the idea of a single framework for human health and ecological risk assessment. The committee found two problems with the framework that hindered its use for ecological risk assessment: the need to account for legal mandates and other policy considerations at an early stage, and the need for communication between risk managers and the public. The committee concluded that these failings applied to human health risk assessment as well and urged revision of that framework.⁵¹

Although EPA may have appeared monolithic to outsiders, EPA programs in fact operated largely independently. In order to develop a wide-ranging view of ecological assessment efforts, the agency launched a survey in 1992. The results confirmed the impression that EPA emphasized human health and that it had done so for many of the reasons that had influenced EPA since its creation. When asked to list the factors that would improve consideration of ecological risks, program offices emphasized the need for policy guidance, technical guidance, ecological expertise, information, and a change in "agency culture."⁵²

In contrast, the survey belied the stereotype that EPA had done little in support of ecological protection. Although unable to survey the entire agency, the

authors found 265 examples of "ecological concerns" in EPA programs. Not all these concerns had led to action, but program offices had taken actions or made decisions to protect biological diversity, fish, water, habitats, forests, ecosystems, streams, wetlands, endangered species, birds, mollusks, estuaries, food chains, benthic organisms, aquatic invertebrates, riparian habitats, and deltas. All program areas considered the impact of chemical "stressors" on the ecology. Some programs had considered biological stressors, such as zebra mussels, and physical stressors, such as dredge and fill activities.⁵⁷

The survey's findings also belied the opposite stereotype that EPA went to extremes to protect all organisms. The authors found no case, except for endangered species, in which the agency tried to protect individual organisms. Rather, EPA tended to focus on loss of populations or aquatic systems at particular sites. The agency rarely focused on ecological dynamics such as predator-prey interactions, but rather focused on acute mortality.⁵⁸

Conclusion

What EPA would do with ecological protection after 1993 remained uncertain. At least three factors suggested that it had a bright future. The lack of a common language or conceptual framework had hindered past efforts to promote ecological protection. In EPA's early years, battles between lawyers and scientists over pesticides had been cast as struggles to protect two different things, birds or humans. Risk assessment built something of a bridge between these concerns. If human health was the mainland at EPA, ecological protection was an occasionally visited island. Risk assessment did not bring these two lands together to form one, for everyone recognized differences between protecting people and protecting other species. But risk assessment did link—precariously, perhaps, but more conveniently than before—the island with the mainland. Because both human and ecological concerns could be described as risks, and because one of the purposes of risk assessment was to compare risks, advocates of ecological protection could make claims for agency resources using the same terms as human health advocates.

New administrator Carol Browner announced in 1993 that ecosystem protection would be one of her top four priorities. Given the historical importance of leadership, an administrator's priorities were likely to have a deep impact on the agency's actions. When William Ruckelshaus wanted to ban pesticides for ecological reasons, the agency did so, albeit shifting the focus in midstream from birds to cancer. When Douglas Costle wanted to emphasize cancer over "birds and bunnies," the agency did so. When Steve Schatzow and Jack Moore wanted to restrict pesticides for ecological reasons, the agency did so. When William Reilly wanted to veto a one billion dollar dam for ecological reasons, he broke precedent to do so. If history was a guide, Browner's support for ecological protection was critical.⁵⁹

Judges may also have become more receptive to ecological concerns. The division of EPA most committed to ecological protection at the outset, the Office

concerns" in EPA programs. Not all offices had taken actions or made decisions about air, water, habitats, forests, ecosystems, birds, mollusks, estuaries, food chains, riparian habitats, and deltas. All practical "stressors" on the ecology. Some stressors, such as zebra mussels, and phytoplankton.

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tion after 1993 remained uncertain. The lack of a common ground between past efforts to promote ecological protection between lawyers and scientists over the subject of two different things, birds or human health, bridge between these concerns. If ecological protection was an occasion for bringing these two lands together to form a bridge between protecting people and protecting the environment—precariously, perhaps, but more so on the mainland. Because both human health and the environment are seen as risks, and because one of the risks, advocates of ecological protection were using the same terms as human health.

Decided in 1993 that ecosystem protection was important. Given the historical importance of ecological protection, it is likely to have a deep impact on the future. Those who wanted to ban pesticides for ecological reasons were shifting the focus in midstream from protecting the environment to emphasize cancer over "birds and the bees." Schatzow and Jack Moore wanted the agency to do so. When William Ruckelshaus did so, he broke the mold for ecological reasons, he broke the mold for ecological protection. Ruckelshaus's support for ecological protection was a positive to ecological concerns. The lack of a common ground at the outset, the Office of

of General Counsel and Enforcement, had shifted its focus away from ecological effects once it found that arguments about cancer were more likely to win cases than arguments about dead birds. In the 1980s, however, a conservative court upheld a pesticide ban because of effects on birds. It would be premature, however, to conclude that a sea change had occurred. One case provided too little evidence for that conclusion, especially since the court ruled on relatively minor uses of a chemical. Courts might have tried to rein in EPA had the agency launched aggressive efforts to protect nonhuman species.

At least two factors stood in the way of ecological protection. Agency culture still emphasized human health. Interest in ecological issues had grown at EPA, but many employees, especially managers, who had critical influence but who often had no formal training in ecological disciplines, still felt most at home with human health issues. The agency also lacked the internal expertise and knowledge that would give leaders confidence to take actions on a wide range of ecological issues.⁶⁰

EPA also had to face Congress and the cultural and political climate in which it operated. Administrators always found it easier to justify EPA actions to hostile Congressional committees when they based actions on human health. Americans agreed that human health deserved protection, but debated the extent to which nonhuman species deserved protection. Perhaps, as one EPA employee suggested, this difference arose from the Western tradition that humans had souls and animals did not. Whatever its origins, the perceived dichotomy between humans and nature undermined belief in what William Ruckelshaus called "the essential unity of nature" and contributed to a focus on human well-being.⁶¹

When EPA employees did argue for ecological protection, they often did so on the anthropocentric grounds that ecosystems provide "goods and services" to humans. Occasionally, like the Science Advisory Board, employees suggested that nonhuman species had "intrinsic value" worth protecting, but the absence of agreement on this value made it shaky ground on which to regulate economic activity. Perhaps, as one employee suggested, the value on which Americans might agree would be the right of each species, but not necessarily all individuals in that species, to survive and reproduce.⁶²

Gahan Wilson's fifth horseman of the apocalypse represented "ecological disaster," which implied a concern for the well-being of nonhuman species. But one should not forget that the original four horsemen of the apocalypse—war, famine, plague, and wild beasts—represented threats to human survival. Fears of ecological problems arose in the United States partly because of altruistic impulses toward other species, but also, and probably more importantly, because of the conviction that human well-being was linked to the well-being of other species. If EPA was to meet Carol Browner's goal of protecting ecosystems, it would need to convince Americans that ecological protection would promote broadly held values, especially those related to human well-being.

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Notes

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1. Gahan Wilson, "Congratulations, Ecological Disaster," *New Yorker*, 24 February 1992, 93; Richard Stone, "Can Carol Browner Reform EPA?" *Science* 263 (1994): 312; Marc Smolonsky, David Dickson, and Elise Caplan, *Annual Review of the U.S. Environmental Protection Agency* (Washington, D.C.: Center for Resource Economics, 1993), 7. For estimates of costs of compliance (in this case, with water pollution regulations) by public and private agencies, see A. Myrick Freeman III, "Water Pollution Policy," in *Public Policies for Environmental Protection*, ed. Paul R. Portney (Washington, D.C.: Resources for the Future, 1990), 125–26.
2. Ronald Reagan, quoted in Henry C. Kenski, "The President, Congress, and Interest Groups. Environmental Policy in the 97th Congress," in *Public Policy and the Natural Environment*, eds. Helen M. Ingram and R. Kenneth Godwin (Greenwich, Connecticut: JAI Press, 1985), 78.
3. U.S. Environmental Protection Agency, *Reducing Risk: Setting Priorities and Strategies for Environmental Protection*, SAB-EC-90-021 (Washington, D.C.: Environmental Protection Agency, Science Advisory Board, September 1990), 9. The derogatory suggestions regarding the agency's name surfaced during personal interviews by the author.
4. For a discussion of environmental regulation, politics, and culture, see Mary Douglas and Aaron Wildavsky, *Risk and Culture: An Essay on the Selection of Technical and Environmental Dangers* (Berkeley: University of California Press, 1982); Sheila Jasanoff, *Risk Management and Political Culture* (New York: Russell Sage Foundation, 1986); Ronald Brickman, Sheila Jasanoff, and Thomas Ilgen, *Controlling Chemicals: The Politics of Regulation in Europe and the United States* (Ithaca: Cornell University Press, 1985); Sheila Jasanoff, *The Fifth Branch: Science Advisers as Policymakers* (Cambridge: Harvard University Press, 1990); Mary Douglas, *Implicit Meanings: Essays in Anthropology* (London: Routledge and Kegan Paul, 1975); and

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5. U.S. Environmental Protection Agency, *The Guardian: Origins of the EPA* (Washington, D.C.: U.S. Environmental Protection Agency, 1992); Dennis C Williams, *The Guardian: EPA's Formative Years, 1970-1973*, EPA 202-K-93-002 (Washington, D.C.: U.S. Environmental Protection Agency, April 1993); U.S. Environmental Protection Agency, *U.S. EPA Oral History Interview 1, William D. Ruckelshaus*, EPA 202-K-92-0003 (Washington, D.C.: U.S. Environmental Protection Agency, 1993); Alfred A. Marcus, *Promise and Performance: Choosing and Implementing Environmental Policy* (Westport, Connecticut: Greenwood Press, 1980), John Quarles, *Cleaning Up America: An Insider's View of the Environmental Protection Agency* (Boston: Houghton Mifflin Co., 1976); John C. Whitaker, *Striking a Balance: Environment and Natural Resources Policy in the Nixon-Ford Years* (Washington, D.C.: American Enterprise Institute for Public Policy Research, 1976); National Research Council, *Decision Making in the Environmental Protection Agency: Case Studies* (Washington, D.C.: National Academy of Sciences, 1977); Angus MacIntyre, "Administrative Initiative and Theories of Implementation: Federal Pesticide Policy, 1970-1976," in *Public Policy and the Natural Environment*, eds. Helen M. Ingram and R. Kenneth Godwin (Greenwich, Connecticut: JAI Press, 1985), 205-38. For exceptions, see Sheila Jasanoff, "Science, Politics, and the Renegotiation of Expertise at EPA," *Osiris* 7, 2d ser (1992): 195-217; Marc K. Landy, Marc J. Roberts, and Stephen R. Thomas, *The Environmental Protection Agency Asking the Wrong Questions* (New York: Oxford University Press, 1990); Rosemary O'Leary, *Environmental Change. Federal Courts and the EPA* (Philadelphia: Temple University Press, 1993); Joel A. Mintz, *Enforcement at the EPA: High Stakes and Hard Choices* (Austin: University of Texas Press, 1996).

6. Most of the legislation under which EPA operated divided the world into human beings and the environment, implying that the environment was everything other than humans. EPA employees, however, referred to all of their activities, whether aimed at protecting humans or other species, as *environmental protection*. They used the adjective *ecological* to identify interest in protecting any nonhuman species. Protection of public health and ecological protection thus formed two subsets of environmental protection. The adjective *ecological* referred to concerns about nonhuman species at all levels of complexity—individuals, populations, communities, and ecosystems

By 1993, ecologists hotly debated definitions of *community* and *ecosystem*. My interest here is not in specific definitions but in ecological concerns in general. EPA

employees defined *ecosystems*—protection of which Browner defined as a priority—as “the complex of living and nonliving components that function together as a unit in a given area such as wetland communities, estuaries and prairies” U.S. Environmental Protection Agency, “Ecosystem Protection,” *National Performance Review*, 6 August 1993, 4.

EPA’s terminology is employed here, with one exception—the agency did not seem to use a noun version of the adjective *ecological*. The nearest equivalent was *ecosystems*, but that term did not refer to individuals, populations, and communities. *Ecology* or *nonhuman species* are used as general nouns for the concerns EPA employees referred to with the adjective *ecological*. Outside EPA, the term *nature* was often used for this purpose. EPA employees used newer coinages, such as *eco-risk*, that implied an interest in nonhuman species without specifying a general term for them, the adjective was simply converted into a noun.

For comments on the role that historians can play in current environmental site assessments, see Dale A. Stirling, “Site Histories in Environmental Site Assessments: A New Opportunity for Public Historians,” *The Public Historian* 12 (1990): 45–52. Shelley Bookspan, “Potentially Responsible Party Searches: Finding the Cause of Urban Grime,” *The Public Historian* 13 (1991): 25–34.

The lack of a history of ecological protection at EPA led the agency’s Office of Policy Planning and Evaluation to request the preparation of this study in the hope that the topic would be of interest to policy makers as they charted paths to the future. Angela Nugent (then acting director of the EPA Science Policy Staff of the Office of Policy Planning and Evaluation), Michael Brody (ecologist on the Science Policy Staff), and Dennis Williams (EPA historian) helped design this study. Its historical focus complements the contemporary focus of a study carried out at about the same time by Michael Brody and Michael Troyer, which appeared as U.S. Environmental Protection Agency, *Managing Ecological Risks at EPA: Issues and Recommendations for Progress*, EPA/600/R-94/183 (Washington, D.C.: U.S. Environmental Protection Agency, 1994).

7. U.S. Environmental Protection Agency, *Risk Assessment and Management: Framework for Decision Making*, EPA 600/9-85-002 (Washington, D.C.: U.S. Environmental Protection Agency, 1984), 25. Proponents of this approach noted that scientific certainty was an elusive, often impossible, goal, so the agency had no choice but to make judgments about when to act despite uncertainty. William D. Ruckelshaus, “Risk, Science, and Democracy,” *Issues in Science and Technology* 1 (1985): 19–38; U.S. Environmental Protection Agency, *Risk Assessment and Management*, 2.

Federal courts backed up EPA’s view that it should act despite uncertainty. The Court of Appeals for the D.C. Circuit, for example, declared in 1976 that EPA was “not limited to scientific fact, to 95% certainties.” In another case, the same court concluded that the agency needed substantial, but not conclusive, evidence of harm before it took action. Jasanoff, “Science,” 198. On the other hand, critics charged that regulators acted hastily on the basis of unsubstantiated fears. Efron, *Apocalypics*, 263–64, 267–70.

8. Alfred A. Marcus, *Promise and Performance: Choosing and Implementing Environmental Policy* (Westport, Connecticut: Greenwood Press, 1980), 31–32. On the idea of the balance of nature, see Frank N. Egerton, “Changing Concepts of the Balance of Nature,” *The Quarterly Review of Biology* 48 (1973): 322–50.
9. Rachel Carson, *Silent Spring* (New York: Fawcett Crest, 1962), front cover, John Quarles, *Cleaning Up America. An Insider’s View of the Environmental Protection Agency* (Boston: Houghton Mifflin Co., 1976), 11–13. For a history of ecological ideas,

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Fawcett Crest, 1962), front cover, John F. Kennedy’s *View of the Environmental Protection* (1961), 11–13. For a history of ecological ideas,

see Donald Worster, *Nature’s Economy: A History of Ecological Ideas* (Cambridge: Cambridge University Press, 1977). On the rise of environmental consciousness, see Mary Hays, *Beauty, Health, and Permanence*, and Shabecoff, *A Fierce Green Fire*.

10. Mary Etta Cook and Roger H. Davidson, “Deferral Politics: Congressional Decision Making on Environmental Issues in the 1980s,” in *Public Policy and the Natural Environment*, eds. Helen M. Ingram and R. Kenneth Godwin (Greenwich, Connecticut: JAI Press, 1985), 47.
11. These definitions are based on the author’s interviews with various EPA observers. On the enduring appeal of the idea of balance of nature, see Egerton, “Changing Concepts”; Barry Commoner, *The Closing Circle: Nature, Man and Technology* (New York: Bantam, 1971), 29. The other three laws are “Everything Must Go Somewhere,” “Nature Knows Best,” and “There is No Such Thing As a Free Lunch.”
12. 42 USCA § 4321; Federal Water Pollution Control Act, 33 USCA § 1251 (a); 33 USCA § 1314 (a) (1) (A); 7 USCA § 136a (c) (5) (D).
13. The agencies came from Interior (Federal Water Quality Administration), Agriculture, Atomic Energy, and Health, Education, and Welfare. On these agencies, the political struggles over the creation of EPA, and the influence of environmentalism, see Marcus, *Promise and Performance*, 40–47; Quarles, *Cleaning Up America*, 14–21; U.S. Environmental Protection Agency, *The Guardian: The Origins of the EPA*; John C. Whitaker, *Striking a Balance: Environment and Natural Resources Policy in the Nixon-Ford Years* (Washington, D.C.: American Enterprise Institute for Public Policy Research, 1976). Nixon is quoted in Ruckelshaus, “Risk, Science, and Democracy,” 22.
14. On EPA’s “inheritance” from other agencies, see O’Leary, *Environmental Change*, 5; Russell Train to Edmund P. Russell, 17 August 1994.
15. This point was made by a longtime EPA employee who asked to remain anonymous. It is consistent with the view in Quarles, *Cleaning Up America*. On the organizational structure of EPA at its founding, see Dennis C. Williams, *The Guardian: EPA’s Formative Years*; Russell Train to Edmund P. Russell, 17 August 1994.
16. Carson, *Silent Spring*, 50–54. EPA inherited some of these cases from Agriculture and Health, Education, and Welfare. The Environmental Defense Fund also petitioned EPA to ban dieldrin and aldrin one day after the agency opened its doors. Thomas R. Dunlap, *DDT: Scientists, Citizens, and Public Policy* (Princeton: Princeton University Press, 1981), 206; Lawrence E. McCray, “Mouse Livers, Cutworms, and Public Policy: EPA Decision Making for the Pesticides Aldrin and Dieldrin,” in *Decision Making in the Environmental Protection Agency: Case Studies*, ed. National Research Council (Washington, D.C.: National Academy of Sciences, 1977), 60, 73.
17. Earlier disputes over DDT had brought forth evidence that the Department of Agriculture had not enforced the relevant statute, the 1947 Federal Insecticide, Fungicide, and Rodenticide Act, until 1967, and had done little after that to keep any products off the market. Dunlap, *DDT*, 201; McCray, “Mouse Livers,” 78, 80.
18. McCray, “Mouse Livers,” 74; Dunlap, *DDT*, 223, 234; Shirley A. Briggs, *Basic Guide to Pesticides: Their Characteristics and Hazards* (Washington, D.C.: Taylor and Francis, 1992), 127.
19. In this case, the term *detractors* is used to mean those who thought the position was overstated. Dunlap reviews the heated controversies over scientific evidence in Chapter 9 of *DDT*.

On the competing views of ecological protection within EPA, see Michael Slimak, Deputy Director, Office of Environmental Processes and Effects Research, Office of

- Research and Development, Environmental Protection Agency, interview with the author, 8 July 1993, and Dunlap. *DDT*, 223. Since then, scientists have become much more confident that DDT and its relatives did cause precipitous declines in bird populations. "Eagle Population Soars," *Science* 263 (1994): 922
20. McCray, "Mouse Livers," 76.
 21. Nathan J. Karch, "Explicit Criteria and Principles for Identifying Carcinogens: A Focus of Controversy at the Environmental Protection Agency," in *Decision Making in the Environmental Protection Agency: Case Studies*, ed. National Research Council (Washington, D.C.: National Academy of Sciences, 1977), 132. The validity and appropriateness of these principles were disputed by the principal registrant of heptachlor/chlordane, the Velsicol Chemical Corporation, but EPA successfully argued that the DDT and aldrin/dieldrin cases, including a ruling by the U.S. Court of Appeals that EPA had acted appropriately in suspending uses of aldrin/dieldrin, had turned these principles into policy. Umberto Saffiotti of the National Cancer Institute later said that the principles "were naive and failed to represent the real science to which he alluded in his testimony" *Ibid.*, 133
 22. Quarles, *Cleaning Up America*, 197-200
 23. Russell Tram to Edmund P. Russell, 17 August 1994. On pesticide politics, see Christopher J. Bosso, *Pesticides and Politics: The Life Cycle of a Public Issue* (Pittsburgh: University of Pittsburgh Press, 1987); Jamie L. Whitten, *That We May Live* (Princeton, D. Van Nostrand, 1966).
 24. Luther J. Carter, "Pesticides: Three EPA Attorneys Quit and Hoist a Warning Flag," *Science* (19 March 1976): 1155-58.
 25. Efron, *Apocalypitics*, 69-70; 15 USCA § 2601 (b) (3).
 26. Marc K. Landy, Marc J. Roberts, and Stephen R. Thomas, *The Environmental Protection Agency: Asking the Wrong Questions* (New York: Oxford University Press, 1990), 172-203.
 27. Dick Kirschten, "Reorganizing Natural Resources May Be Tougher Than Carter Thought," *National Journal*, 15 October 1977, 1613-18
 28. Michael Slimak, interview with the author, 8 July 1993; *Environmental Reporter*, 15 September 1978, 914; Dick Kirschten, "EPA: A Winner in the Annual Budget Battle," *National Journal*, 28 January 1978, 140-41, *Environmental Reporter*, 26 January 1979, 1763. In the summer of 1993, several EPA employees told the author that Costle declared that EPA was not a "bird and bunny" agency. Many interpreted the remark as a slight of ecological concerns, others believed that it was Costle's way of distinguishing the agency from others, such as the Fish and Wildlife Service and the National Marine Fisheries Service, that were explicitly concerned with nonhuman species. In general, regulation of nonhuman species was left to states rather than the federal government, with migratory and endangered species being the major exceptions.
 29. Landy et al., *Environmental Protection Agency*, 245-50; Ruckelshaus, "Risk, Science, and Democracy," 37-38. For a critical review of the Reagan administration's policies on the environment, see Jonathan Lash, Katherine Gillman, and David Sheridan, *A Season of Spoils: The Story of the Reagan Administration's Attack on the Environment* (New York: Pantheon Books, 1984). Gorsuch believed that the media unfairly represented her as opposing environmental protection. Anne Burford, with John Greenyea, *Are You Tough Enough?* (New York: McCraw-Hill, 1986).
 30. EPA employees voiced all of these reasons to the author in the summer of 1993
 31. Ruckelshaus, "Risk, Science, and Democracy," 27; William D. Ruckelshaus, "Science, Risk, and Public Policy," in *The American Environment*, ed. Julie Sullivan

Environmental Protection Agency, interview with the author. Since then, scientists have become much more cautious. The decline in bird populations since 1963 (1994): 922

Principles for Identifying Carcinogens: A Report to the Environmental Protection Agency," in *Decision Making in Environmental Risk Assessment Studies*, ed National Research Council of the National Sciences, 1977), 132. The validity and applicability of the principal registrant of hepatic carcinoma, but EPA successfully argued against including a ruling by the U.S. Court of Appeals in suspending uses of aldrin/dieldrin, had been supported by Saffiotti of the National Cancer Institute and failed to represent the real science of carcinogenesis, 133.

August 1994. On pesticide politics, see Christopher Lasch, *The Life Cycle of a Public Issue* (Pittsburgh: University of Pittsburgh Press, 1977); and Robert Whitten, *That We May Live* (Princeton: Princeton University Press, 1977).

Attorneys Quit and Hoist a Warning Flag,"

(b) (3).
Robert R. Thomas, *The Environmental Protection Agency* (New York: Oxford University Press, 1977), 1613-18.

Resources May Be Tougher Than Carter Administration, *Environmental Reporter*, 15 July 1993, *Environmental Reporter*, 15 August 1993, *Environmental Reporter*, 15 August 1993, *Environmental Reporter*, 26 January 1979, *Environmental Reporter*, 26 January 1979. EPA employees told the author that Costle's "agency" Many interpreted the remark as Costle's way of distinguishing the Fish and Wildlife Service and the National Wildlife Service and the National Wildlife Service explicitly concerned with nonhuman species was left to states rather than the endangered species being the major excep-

Environmental Reporter, 245-50, Ruckelshaus, "Risk, Science and Policy: A Review of the Reagan Administration's Environmental Protection Agency," Lash, Katherine Gillman, and David Ruckelshaus, *The Reagan Administration's Attack on the Environment* (New York: McGraw-Hill, 1984). Gorsuch believed that the media's environmental protection. Anne Burford, with the author in the summer of 1993.

Environmental Reporter, 27. William D. Ruckelshaus, "Scientific Environment," ed Julie Sullivan

(New York: H. W. Wilson, 1984), 163-69; National Research Council, *Risk Assessment in the Federal Government: Managing the Process* (Washington, D.C.: National Academy Press, 1983). The two methods differed in the units they used. Cost-benefit analyses usually expressed disadvantages in monetary units, while risk-benefit analyses usually quantified deaths or incidence of disease. At EPA, regulators focused primarily on the risk of cancer, and they assumed that cancers led to death. Various EPA employees, interviews with the author, Summer 1993.

32. Lawrence W. Barnhouse et al., *Preliminary Environmental Risk Analysis for Indirect Coal Liquefaction*, Report to the Office of Research and Development, U.S. Environmental Protection Agency (Washington, D.C., 1982); Glenn W. Suter et al., *Environmental Risk Analysis for Oil from Shale*, ORNL/TM-9808, Environmental Sciences Division Publication No. 2605 (Oak Ridge, Tennessee: Oak Ridge National Laboratory, 1986); Lawrence W. Barnhouse et al., *Methodology for Environmental Risk Analysis*, ORNL/TM-8167 (Oak Ridge, Tennessee: Oak Ridge National Laboratory, 1982).
33. U.S. Environmental Protection Agency, *Hazard Evaluation Division Standard Evaluation Procedure: Ecological Risk Assessment*, EPA-540/9-85-001 (Washington, D.C.: Environmental Protection Agency, Office of Pesticide Programs, 1986), 1. The Office of Toxic Substances carried out similar studies using similar methods under the Toxic Substances Control Act. For more on the quotient method and efforts in other parts of EPA, see John Bascietto et al., "Ecotoxicity and Ecological Risk Assessment: Regulatory Applications at EPA," *Environmental Science and Technology* 24 (1990): 10-15.
34. U.S. Environmental Protection Agency, "State of the Practice: Ecological Risk Assessment Document," 14 March 1990, unpublished document prepared by the Office of Pesticides and Toxic Substances, 5-6. Donald Rodier of EPA graciously provided a copy of this document.
35. *Ibid.*
36. Landy et al., *Environmental Protection Agency*, 256-57; U.S. Environmental Protection Agency, *Unfinished Business: A Comparative Assessment of Environmental Problems*, vol. 1, *Overview* (Washington, D.C.: Environmental Protection Agency, February 1987), i-ii, xiv. It is important to note that risk assessment was developed as a *quantitative* procedure, but the method used for *Unfinished Business* was *qualitative*. This seems to indicate the extent to which the risk mindset had spread throughout the agency; its language was used even when the formal methodology was not.
37. *Ibid.*
38. The study reviewed twenty ecological assessment methods. U.S. Environmental Protection Agency, *Review of Ecological Risk Assessment Methods* (Washington, D.C.: Environmental Protection Agency, November 1988), 1-3. A 1987 review paper by an outside contractor found that there was little agreement about the definition of *end-point* and called for the agency to make such a definition a priority. American Management Systems, Inc., "Review of the Literature on Ecological Endpoints," Work Assignment WA-87-45 for the Science-Policy Integration Branch Under Contract #68-01-7002, 30 September 1987, 1-3 (copy in author's possession).
39. U.S. Environmental Protection Agency, *Summary of Ecological Risks, Assessment Methods, and Risk Management Decisions in Superfund and RCRA*, EPA-230-03-89-046 (Washington, D.C.: Environmental Protection Agency, June 1989), I, 37; II, 18-22.

- 40 The agency proposed banning chlorinated hydrocarbons (DDT and its derivatives) largely for ecological reasons in the 1970s, but the agency did so over the objections of the Office of Pesticide Programs.
- 41 EPA employees and ex-employees interviewed for this study remembered that Moore and/or Schatzow said, paraphrasing, "Let's do something about ecological effects," but they did not know what prompted Moore and Schatzow's concern. Anne Barton, interview with the author, 25 June 1993; Edward Gray and Edwin Tinsworth, interview with the author, 28 June 1993. At the time of the interviews, Barton was Director of the Environmental Fate and Effects Division, Office of Prevention, Pesticides and Toxic Substances at EPA, and Gray and Tinsworth worked for a consulting firm, Jellinek, Schwartz, and Connolly. Gray and Tinsworth previously worked on pesticide issues in the Office of the General Counsel and the Office of Pesticide Programs, respectively, at EPA.
42. Gray and Tinsworth, interview with the author, 28 June 1993.
- 43 On a quantitative level, the question of significance seemed to favor the manufacturer. Populations of geese were growing, and hunters legally killed geese in the United States. Edward Gray, interview with the author, 28 June 1993; *Ciba-Geigy v. U.S. Environmental Protection Agency*, No. 88-4361, U.S. Court of Appeals, Fifth Circuit, 2 June 1989, 874 F. 2d. 277. Without more cases, it is impossible to know whether courts would continue to rule in the same manner.
44. U.S. Environmental Protection Agency, *Managing Ecological Risks at EPA*, 6; Michael Weisskopf, "EPA's Chief Blocks Dam's Approval; Decision on Colorado Project Marks Sharp Break from Reagan Era," *Washington Post*, 25 March 1989, A4; Michael Weisskopf, "EPA's Reilly to Veto Dam; Effects of Denver Project 'Unacceptable,'" *Washington Post*, 23 Nov 1990, A1, "2 Forks Backers Say Public Favors Project," *Denver Post*, 8 Oct 1989, B7.
- 45 Weisskopf, "EPA's Chief."
46. Mark Obmascik, "Two Forks Backers Spend Big. Won't Quit," *Denver Post*, 18 June 1989, A1, Gary Schmitz, "Bush Says He Won't Intervene in EPA Decision on 2 Forks," *Denver Post*, 1 April 1989, A1.
47. Weisskopf, "EPA's Chief"
48. Weisskopf, "EPA's Reilly", Tom Graf, "EPA Officially Gives Two Forks Thumbs Down," *Denver Post*, 24 Nov 1990, B2.
49. U.S. Environmental Protection Agency, *Reducing Risk: Setting Priorities and Strategies for Environmental Protection*, SAB-FC-90-021 (Washington, D.C.: Environmental Protection Agency, Science Advisory Board, September 1990), 6. See especially Appendices A-C.
50. EPA published risk assessment guidelines for environmental carcinogens, mutagens, developmental toxicants, chemical mixtures, and estimating exposures in 1986. 51 *Federal Register*, 33992-34064.
51. Dexter Hinckley, "EPA's Ecological Guidance Activity," *Bulletin of the Ecological Society of America* (1989): 126-29; Frederick W. Kutz et al., "Ecological Research at EPA New Directions," *Environmental Science & Technology* 26 (1992): 860-66; Bascietto et al., "Ecotoxicity and Ecological Risk Assessment," 10-15; Wayne G. Landis, Jane S. Hughes, and Michael A. Lewis, eds., *Environmental Toxicology and Risk Assessment*, ASTM STP 1179 (Philadelphia: American Society for Testing and Materials, 1993); John H. Gentile et al., "Ecological Risk Assessment: A Scientific Perspective," *Journal of Hazardous Materials* 35 (1993): 241-53.
52. See, for example, James T. Maughan, *Ecological Assessment of Hazardous Waste Sites* (New York: Van Nostrand Reinhold, 1993); David James Stout and Robin A.

hydrocarbons (DDT and its derivatives) that the agency did so over the objections

for this study remembered that Moore "said something about ecological effects," and Schatzow's concern. Anne Barton, Edward Gray and Edwin Tinsworth, interviewed in the interviews, Barton was Director of the Office of Prevention, Pesticides and Environmental Health, Office of Prevention, Pesticides and Environmental Health, Office of Prevention, Pesticides and Environmental Health. Tinsworth worked for a consulting firm, and Tinsworth previously worked on pesticide registration and the Office of Pesticide Programs, 28 June 1993.

importance seemed to favor the manufacturer and hunters legally killed geese in the case of the author. 28 June 1993, *Ciba-Geigy v. EPA*, 88-4361, U.S. Court of Appeals, Fifth Circuit. In more cases, it is impossible to know the facts in the same manner.

in *Managing Ecological Risks at EPA*, 6, Michael J. S. Smith, Decision on Colorado Project Marks, *Denver Post*, 25 March 1989, A4, Michael J. S. Smith, Decision on Denver Project "Unacceptable," *Denver Post*, "Checkers Say Public Favors Project," *Denver Post*, 18 June 1993.

"Big, Won't Quit," *Denver Post*, 18 June 1993. "Intervene in EPA Decision on 2 Forks," *Denver Post*, 18 June 1993.

"Officially Gives Two Forks Thumbs Down," *Denver Post*, 18 June 1993.

in *Managing Risk: Setting Priorities and Strategies*, EPA/600/3-90/021 (Washington, D.C.: Environmental Protection Agency, September 1990), 6. See especially

environmental carcinogens, mutagens, and estimating exposures in 1986-51

Activity," *Bulletin of the Ecological Society of America*, V. Kutz et al., "Ecological Research at EPA," *Science & Technology* 26 (1992): 860-66; "Risk Assessment," 10-15, Wayne G. Landis, *Environmental Toxicology and Risk Assessment*, American Society for Testing and Materials, *Risk Assessment: A Scientific Perspective* (1993): 241-53.

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Streeter, "Ecological Risk Assessment: Its Role in Risk Management," *The Environmental Professional* 14 (1992): 197-203; John Cairns Jr. and Paul V. McCormick, "Developing an Ecosystem-Based Capability for Ecological Risk Assessments," *The Environmental Professional* 14 (1992): 186-96.

53. U.S. Environmental Protection Agency, *Summary Report on Issues in Ecological Risk Assessment*, EPA/625/3-91/018 (Washington, D.C.: Environmental Protection Agency, February 1991); U.S. Environmental Protection Agency, *Framework for Ecological Risk Assessment*, EPA/630/R-92/001 (Washington, D.C.: Environmental Protection Agency, 1992), 2, 4.
54. "Environmental Agency Launches a Study in 'Ecological Risk Assessment,'" *Science* 255 (20 March 1992): 1499; U.S. Environmental Protection Agency, "Agency Approaches to Ecological Assessment," 30 August 1993, unpublished EPA training module. Thanks to Laura Gabanski of EPA for providing a draft prepared by the EPA Science Policy Staff.
55. National Research Council, *Issues in Risk Assessment* (Washington, D.C.: National Academy Press, 1993), 254-55, 265-69.
56. In this paper, these concerns are referred to as *leadership*, *knowledge*, and *institutional culture*. U.S. Environmental Protection Agency, *Managing Ecological Risks at EPA*, 2.
57. EPA was such a large agency (a great deal of regulatory activity took place in ten regional offices) that the survey could not be exhaustive, but the authors did aim for it to be representative. U.S. Environmental Protection Agency, *Managing Ecological Risks at EPA*, 1-2, 25, 44-65.
58. U.S. Environmental Protection Agency, *Managing Ecological Risks at EPA*, 1-2.
59. *EPA Insight*, June 1993, 1. The other three were pollution prevention, partnerships with state and local governments, nonprofits, and business, and environmental equity. Also, a team of agency employees organized as part of the 1993 National Performance Review urged the federal government, with the Environmental Protection Agency as a catalyst, to create and carry out "a cohesive and comprehensive national policy on ecosystem protection." U.S. Environmental Protection Agency, "Ecosystem Protection," *National Performance Review*, 6 August 1993, 3.
60. U.S. Environmental Protection Agency, *Managing Ecological Risks at EPA*, 15.
61. An employee who wished to remain anonymous suggested this idea.
62. Michael Slimak, interview with the author, 8 July 1993.