From Pollution to Risk:
Ecological Protection and Regulatory Philosophies at the US Environmental Protection Agency

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Abstract

Soon after becoming administrator of the Environmental Protection Agency, Carol Browner announced that ecosystem protection would be one of her top priorities. What factors are likely to help or hinder the achievement of that goal? This study addressed that issue by analyzing the history of ecological protection at EPA from 1970 to 1993. (At EPA, "ecological" is used to refer to values other than the protection of human health and welfare.)

Originally, two questions guided the study: (1) To what extent did EPA carry out regulatory activities for ecological reasons? (2) What factors encouraged or discouraged the use of ecological criteria at EPA? In the course of the study, another question emerged: (3) How did EPA's regulatory framework, or paradigm, change over time? Interviews and published documents provided the sources to address these questions.

EPA placed relatively little emphasis on ecological regulation during the period of interest, stressing instead its role in protecting public health. It would be an oversimplification, however, to say that ecological concerns were unimportant. They played a critical role in the agency's early years. Interest waned in the late 1970s, then increased again in the late 1980s. Institutional, legal, political, social, and scientific factors influenced the fluctuating level of emphasis that EPA placed on ecological protection. Common to debates in all arenas, however, were values. The high value that Americans placed on human life, versus the uncertain value that they placed on other species, was the factor with the most power to influence EPA's trajectory.

Between 1970 and 1980, EPA began a "paradigm shift" from a focus on pollution to a focus on risk. The pollution paradigm grew out of a crisis

mentality that demanded a halt to pollution at any cost. This outlook had its roots in the rapid increase of industrial waste and nuclear fallout during in the decades before EPA's creation, which contributed to the popular idea that the earth was a fragile, endangered system. This paradigm was challenged by a risk paradigm that emphasized tradeoffs rather than absolute values. The risk paradigm became the central focus for EPA in the mid-1980s as it sought to reestablish its scientific credibility and to compare threats across programs.

In the late 1980s, the language (but not the quantitative methodology) of risk assessment became a tool for agency scientists to argue for a redistribution of resources to increase protection of ecological values. This gained greater prominence when the EPA Science Advisory Board seconded that view. The early 1990s have been marked by attempts to develop a formal ecological risk assessment methodology. It remains to be seen how well the methodology works in practice.

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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[1]

Introduction

Soon after becoming administrator of the US Environmental Protection Agency (EPA) in 1993, Carol Browner announced that ecosystem protection would be one of her top four priorities.[2] To many, this might seem to be an unsurprising goal for an agency charged with protecting the environment. But, as former Administrator William Ruckelshaus noted in 1985, achieving a consensus on environmental policy, and especially about protecting "the essential unity of nature," had proved to be an elusive goal. In 1990, the agency's Science Advisory Board concluded that EPA "has considered the protection of public health to be its primary mission, and it has been less concerned about risks posed to ecosystems."[3]

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[1]William D. Ruckelshaus, "Risk, Science, and Democracy," *Issues in Science and Technology* 1 (no. 3, 1985): 19-38, see p. 30.

[2]*EPA Insight* (June 1993): 1. The other three are pollution prevention; partnerships with state/local governments, non-profits, 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 catalyst, create and carry out "a cohesive and comprehensive national policy on ecosystem protection." US Environmental Protection Agency, National Performance Review, "Ecosystem Protection," 6 August 1993, p. 3.

[3]U.S. Environmental Protection Agency, *Reducing Risk: Setting Priorities and Strategies for Environmental Protection*, SAB-EC-90-021 (Washington: Environmental Protection Agency, Science Advisory Board, September 1990), p. 9.

Why has this been the case? And what does that bode for the future of ecosystem protection at EPA? This study addresses those issues by analyzing the history of ecological protection at EPA from 1970 to 1980. (At EPA, "ecological" is used to refer to values other than the protection of human health and welfare.[4]) Originally, two questions guided the study: (1) To what extent has EPA carried out regulatory activities for ecological reasons? (2) What factors have encouraged or discouraged the use of ecological criteria at EPA? In the course of the study, another question emerged: (3) How did EPA's regulatory framework, or paradigm, change over time?

Answers to these questions have theoretical, as well as practical, implications. A central concern of the new field of environmental history is understanding how humans have conceived of and organized their relationship with their surroundings, and historians of science, technology, and government have long been interested in how government institutions set and address priorities. The experience of EPA offers an excellent case of these issues.

The conclusion of this study is that interest in ecological protection at EPA fluctuated over time for social, institutional, legal, and political reasons. Common to all debates over the proper role for ecological concerns, however, were struggles over values. Americans inside and outside EPA placed a consistently high value on protecting human health, while the importance of protecting other species was a matter of dispute. The most successful attempts to promote ecological concerns relied on linking ecological well-being to

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[4]Ecosystem protection is a subset of ecological protection. The EPA National Performance Review team defined ecosystems as "the complex of living and non-living components that function together as a unit in a given area such as wetland communities, estuaries and prairies." US Environmental Protection Agency, National Performance Review, "Ecosystem Protection," 6 August 1993, p. 4.

human well-being. Work is now being done in many parts of EPA to develop the tools to incorporate ecological assessments into the agency's regulatory framework; it remains to be seen how well those efforts tap into values held widely enough to make such efforts successful. The success of that endeavor is linked to the agency's broader efforts to shift from a "pollution paradigm" to a "risk paradigm."[5]

Much of this narrative focuses on pesticides, with important developments in other parts of the agency receiving less emphasis. This results from limits on time and space. Although it would be ideal to provide a full account of activities across the agency, such a narrative would result in a book rather than a paper. Pesticides were chosen as the centerpiece of the narrative because debates over ecological assessments have been particularly public in that program, with important implications for the agency as a whole. More specifically, debates over pesticides helped to catalyze a shift in regulatory emphasis in the 1970s from concern about ecological effects to concern about cancer. More broadly, these debates also catalyzed the shift in regulatory philosophy from a focus on pollution to a focus on risk.

Growth of the Pollution Paradigm (1950-1970)

Although EPA was not founded until 1970, it inherited a set of social tensions created earlier. Many of these tensions came to the fore between 1950 and 1970, when growing national prosperity brought with it benefits and costs, the relative importance of which were matters of debate. EPA also

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[5]Thomas Kuhn popularized the term "paradigm" to refer to widely-accepted world views. Although originally applied to world views of scientists, the term has come to be used for other human endeavors as well. The terms "pollution paradigm" and "risk paradigm" are mine, but they arise out of terms commonly used at EPA. See Thomas Kuhn, *The Structure of Scientific Revolutions* (Chicago: University of Chicago Press, 1970).

inherited a set of ideas that Americans developed about the world around them as a result of the Cold War.

The nation's prosperity in the 1950s and 1960s was a marvel, with the US gross national product doubling from $534 billion to $1075 billion between 1950 and 1970. (Figure 1.) The tremendous increase in production of goods represented by these figures had (at least) two important consequences for the rise of environmental concerns. The first was that per capita personal income grew at a rapid rate, more than doubling from $1501 in 1950 to $3893 in 1970.[6] This increase in prosperity led to the rise of a generation of consumers interested in the quality of life. Unlike the earlier conservationists, who were concerned with efficient use of natural resources for *production*, post-World War II consumers were largely interested in *consumption* of natural resources as way to increase their quality of life. Citizens moved from cities to green and spacious suburbs, sent their children to camp, took up bird watching and fishing, and visited national parks in droves.[7]

Increased production resulted not only in heightened interest in consumption of "nature," but also in concerns about the wastes generated by industry. Smoke poured into air and liquids into water were especially visible, and concerns grew about their threats to human health. In the 1950s, for example, Americans learned that smoke from smelters were blamed for killing some two dozen people in a small Pennsylvania town called Donora.

The term used to describe these (primarily industrial) wastes in air and water was "pollution." The word became so common that its use scarcely

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[6]*Information Please Almanac 1989* (Boston: Houghton Mifflin Company, 1989), p. 51.

[7]Samuel P. Hays, *Beauty, Health, and Permanence: Environmental Politics in the United States, 1955-1985* (Cambridge: Cambridge University Press, 1987), pp 13-39.

caused comment, but its connotations were telling. "Pollution" came from the Latin word *pollutus*, meaning defilement or uncleanness.[8] Unlike the more neutral term "waste," which focused on the source of a substance, "pollution" emphasized the effect of a substance on whomever or whatever received it. Moreover, the effect was moral as well as physical. To be clean and pure was good; to be dirty and contaminated was bad. This suggested that "pollution" invoked deep values about morality and proper relationships between humans and their world.

Concern about pollution focused not only on visible industrial wastes, but also on invisible nuclear radiation. A product of the Cold War between the United States and the Soviet Union, above-ground nuclear arms tests created plumes of fallout that drifted over enormous areas. In 1958, scientists led by Barry Commoner formed The Greater St. Louis Committee for Nuclear Information, which publicized concerns about the effects of fallout on human health. One of their activities--collecting and assessing the radiation burden of baby teeth from children across the nation--emphasized features of fallout that many people found especially disturbing: its invisibility (what you could not see *could* hurt you), and its effect on some of the most vulnerable people, children.[9]

The debate over nuclear fallout in the 1950s led to interest in the possibility that ionizing radiation might cause cancer. One of the issues debated was the relationship between doses of radiation and the likelihood of

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[8]*Webster's Third New International Dictionary of the English Language Unabridged* (Springfield, MA: Merriam-Webster Inc., 1986).

[9]Hays, *Beauty*, p. 174; Ralph H. Lutts, "Chemical Fallout: Rachel Carson's *Silent Spring*, Radioactive Fallout, and the Environmental Movement." *Environmental Review* 9 (1985): 210-225.

contracting cancer. Researchers found that the risk of cancer did rise with dosages, but they found no threshold below which a population was free of risk. Similarly, concerns arose that small amounts of chemical additives in food might cause cancer, and Congress passed the Delaney Clause of the Pure Food and Drug Act, which banned all food additives that showed evidence of carcinogenicity.[10]

In 1963, a treaty restricting above-ground nuclear tests diminished fear of fallout from tests but did not eliminate fears of invisible pollutants. In 1962, Rachel Carson had published *Silent Spring*, a scathing attack on pesticides and the people who promoted them. Called "the most important chronicle of this century for the human race" by Supreme Court Justice William O. Douglas, *Silent Spring* described pesticides as "sinister and little-recognized *partners of radiation in changing the very nature of the world* [emphasis added]." Carson argued that chemicals "work unknown harm" through their "*contamination* of air, earth, rivers, and sea with dangerous and even lethal materials [emphasis added]."[11]

Like "pollution," "contamination" connoted impurity and linguistically linked one's physical and moral states.[12] Carson made this implication of her rhetoric explicit when she said that spray programs raised "a question that is *not only scientific but moral.* The question is whether any civilization can wage relentless war on life without destroying itself, and

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[10]US Environmental Protection Agency, "Health Risk and Economic Impact Assessments of Suspected Carcinogens," *Federal Register* 41 (1976): 21402-21403, see p. 21402.

[11]Rachel Carson, *Silent Spring* (New York: Fawcett Crest, 1962), pp. 16-17. Quotation by Douglas appears on the back cover of this edition. Commoner also explicitly compared pesticides to radiation. Hays, *Beauty*, p. 174.

[12]*The American Heritage Dictionary of the English Language* (Boston: Houghton Mifflin Company, 1976).

without *losing the right to be called civilized* [emphasis added]." In one of the most-noticed chapters of the book, Carson raised the specter that chemical contamination caused cancer. Again comparing pesticides to radiation, she argued that "there is *no 'safe' dose of a carcinogen* [emphasis added]."[13] This argument was consistent with her use of "contamination:" organisms were either pure and healthy or polluted and in danger.

One of the reasons for the power of Carson's rhetoric was that the atomic bomb had led to a reassessment of the relationship between humans and their world. A long tradition in Western history had held that nature was something humans needed to conquer in order to turn it to profitable use. Science and technology were seen as playing important roles in that effort.[14] But the atomic bomb, one of the most sophisticated applications of scientific knowledge to technological development, was seen as having crossed a line. The bomb conferred the capacity for, in Carson's words, "the extinction of mankind."[15] In the bomb's blinding light, the world looked much more fragile than it had before.[16]

Largely but by not solely because of *Silent Spring*, pesticides became symbols for many Americans of the dangers that pollutants posed to human health and to other species. In the 1960s, scientists and lawyers formed a

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[13]Carson, *Silent Spring*, pp. 95, 206.

[14]Carolyn Merchant, *The Death of Nature: Women, Ecology, and the Scientific Revolution* (New York: Harper and Row, 1980); Lynn White, Jr., "The Historic Roots of Our Ecologic Crisis," *Science* 155 (1967): 1202-1207.

[15]Carson, *Silent Spring*, p. 18.

[16]The perceived simularity between radiation and pesticides led to, for example, a thick tome titled *Chemical Fallout: Current Research on Persistent Pesticides*, which brought together papers from a conference that included radiation biologists, entomologists, and other scientists. Morton W. Miller and George G. Berg (eds.), *Chemical Fallout: Current Research on Persistent Pesticides* (Springfield, Illinois: Charles C. Thomas, 1969).

group called the Environmental Defense Fund to push for limits on the use of insecticides. In a landmark case brought by the Environmental Defense Fund in Wisconsin, a hearing examiner concluded that DDT was a pollutant under Wisconsin law. This case illustrated the potential of the legal system as a way for "environmentalists" to achieve their goals.[17]

The Wisconsin DDT hearings also illustrated the extent to which ideas about pollution influenced legal standards. Under Wisconsin law, one could bring suit to halt the discharge of a "pollutant." Significantly, it was necessary only to prove that a pollutant caused danger. The *benefits* of a substance were irrelevant to this designation.[18] This was consistent with the idea that pollutants should be eliminated entirely, the sort of argument Carson made when she said that there was no safe level of a carcinogen.

Other events, some small and some spectacular, in the 1960s and early 1970s also contributed to growing concerns about the effect humans had on their surroundings: an oil spill in Santa Barbara killed wildlife; rivers foamed with detergents and occasionally caught fire; 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 "Earth Day." An estimated 10 million school children at 10,000 grammar and high schools, and students at some 2,000 university campuses, participated. Ten thousand people flooded the mall in Washington, DC, with crowds of up to 25,000 people attending rallies in New

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[17]Thomas R. Dunlap, *DDT: Scientists, Citizens, and Public Policy* (Princeton: Princeton University Press, 1981), p. 4.

[18]In fact, the hearings also involved testimony about benefits, but the hearing examiner said that economic benefits were not considered in deciding the case. Dunlap, *DDT*, p. 233.

York, Philadelphia, and Chicago. *Time* magazine called it the nation's "biggest street festival since the Japanese surrender in 1945."[19]

These events helped precipitate in the late 1960s and early 1970s a mood of crisis or, as President Richard Nixon's deputy assistant later called it, "hysteria." A 1970 poll found that Americans believed pollution was "the most serious problem" facing their communities.[20] Whatever his personal views on the environment (and many observers thought his interest in the issue was low), Nixon responded to public concern in his 1970 State of the Union address. With language consistent with the pollution framework's emphasis on absolute cleanliness and immediate action, Nixon said the 1970s "absolutely must be the years when America pays its debt to the past by *reclaiming the purity* of its air, its waters and our living environment. It is literally now or never [emphasis added]."[21]

Congress, with prompting from the media and environmental and consumer groups, likewise responded to wide public concern about pollution by passing an array of tough new or revised laws.[22] Also consistent with the pollution paradigm, two of the most prominent carried the word "clean" in their titles, called for the elimination of danger from the environment, and

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[19]John Quarles, *Cleaning Up America: An Insider's View of the Environmental Protection Agency* (Boston: Houghton Mifflin Company, 1976), pp. 11-13, with selection from *Time* quoted on p. 13.

[20]John C. Whitaker, *Striking a Balance: Environment and Natural Resources Policy in the Nixon-Ford Years* (Washington: American Enterprise Institute for Public Policy Research, 1976), pp. 9. 27. Whitaker provides abundant data for the rapid rise of environmental concern in the late 1960s on pp. 1-16.

[21]Quoted in Philip Shabecoff, *A Fierce Green Fire: The American Environmental Movement* (New York: Hill and Wang, 1993), p. 112.

[22]The EPA's first administrator later commented on the mood of crisis leading to laws that demanded the elimination of danger. William D. Ruckelshaus, "Risk, Science, and Democracy," *Issues in Science and Technology* 1 (no. 3, 1985): 19-38, see pp. 21, 27.

used words such as "integrity" that (like "pollution" and "contamination") had moral as well as physical connotations. The Clean Water Act called in its preamble, for example, for the nation "to restore and maintain the chemical, physical, and biological *integrity* of the Nation's waters. In order to achieve this objective it is hereby declared that, consistent with the provisions of this chapter--(1) it is the national goal that the discharge of *pollutants* into the navigable waters be *eliminated* [emphasis added]."[23]

The language used to promote the Clean Water Act bespoke a belief that human well-being was linked to the "health" of the environment, implying that the latter functioned in a manner analogous to an organism. Speaking in favor of the act, Senator Edmund Muskie said, "Our planet is beset with a cancer which threatens our very existence and which will not respond to the kind of treatment that has been prescribed in the past. The cancer of water pollution was engendered by our abuse of our lakes, streams, rivers and oceans; it has thrived on our half-hearted attempts to control it; and like any other disease, it can kill us."[24] In fact, the relationship between pollutants and effects on ecosystems were largely unknown. Environmentalists and members of Congress believed that industry would use uncertainties in scientific knowledge to delay enforcement if the act used water quality as the criterion for judging success. As a result, the Clean Water Act focused on technological control of emissions.[25]

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[23]Federal Water Pollution Control Act (33 USCA § 1251).

[24]A Legislative History of the Water Pollution Control Act Amendments of 1972, pp. 161-162, quoted in Clean Water Network, *Briefing Papers on the Clean Water Act Reauthorization* (Washington, DC: Clean Water Network, March 1993), p. 3.

[25]Ruckelshaus, "Risk, Science, and Democracy," p. 23.

The Clean Air Act also reflected the pollution paradigm. After a 1967 bill was criticized for failing to impose national emissions limits, Senator Edmund Muskie proposed in 1970 a stringent act that set national standards, rigid deadlines, and, strikingly, prohibited balancing of costs and benefits.[26] The Endangered Species Act similarly placed an absolute value (regardless of economic cost) on protecting part of the environment, endangered species.

EPA as Embodiment of Tensions (1970)

It was in this complex stew of public concerns and political responses that EPA came into being, although the shape of the agency was not immediately clear. In February 1970, a White House task force drew up a "President's Message on the Environment," which proposed that a new Department of Natural Resources be created to combine environmental protection and natural resource programs. Although previous administrations had also proposed similar departments, the task force's proposal differed from those in using "ecological" concepts to justify the need for a national growth policy. Specifically, the task force argued that the nation needed to preserve ecological balance and decontaminate a polluted environment.[27]

Nixon delegated the reorganization to the Ash Council, a group of business leaders, a management consultant, a business school dean, and a lawyer formed to recommend ways to streamline government. The council staff took over the proposal, at first advocating the merger of development

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[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), pp. 28-30; Alfred A. Marcus, *Promise and Performance: Choosing and Implementing Environmental Policy* (Westport, CT: Greenwood Press, 1980), p. 97.

[27]Marcus, *Promise*, pp. 31-32.

and protection activities. The idea was that a merger would create a balanced national policy by shifting emphasis from growth at any price to protecting ecosystems. This was consistent with the new National Environmental Policy Act, which declared it to be national policy to "prevent or eliminate damage to the environment and stimulate the health and welfare of man."[28]

This proposal quickly fell on hard times. Within the Ash Council, staff members thought that development interests would swamp concern about environmental protection should both functions be combined in one agency. Cabinet secretaries who stood to lose functions to a new agency opposed the proposal. The logical department to incorporate new environmental responsibilities, Interior, was headed by Walter Hickel, who had alienated the President by writing a letter expressing sympathy for anti-war protesters and by seeming to be too enthusiastic a supporter of Earth Day.[29]

So a stalemate ensued, to be broken only after the secretary of Health, Education, and Welfare changed his position and supported the creation of a new agency. The secretary argued that, although environmental protection was a question of public health, a new agency would be better able to compete for funds than if its functions were housed in the enormous HEW. Nixon, however, feared that a new agency might concern itself with health and ecological welfare while ignoring costs. As a counterweight, another environmental agency, the National Oceanic and Atmospheric Administration was created in the pro-business Department of Commerce.[30]

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[28]National Environmental Policy Act of 1969 (42 USCA § 4321).

[29]Marcus, *Promise*, pp. 40-42; Quarles, *Cleaning Up*, pp. 14-19.

[30]Marcus, *Promise*, pp. 42-47.

While publicly explaining the need for an agency to protect the environment, however, Nixon sounded very much like the environmentalists he feared, even echoing their concerns about ecological systems: "Despite its complexity, for pollution control purposes the environment must be perceived as a single interrelated system. A single source may pollute the air with smoke and chemicals, the land with solid wastes, and a river or lake with chemical and other wastes. Control of air pollution may produce more solid wastes, which then would pollute the land or water. . . . A far more effective approach to pollution control would identify pollutants; trace them through the entire ecological chain, observing and recording changes in form as they occur; determine the total exposure of man and his environment; examine interactions among forms of pollution; [and] identify where on the ecological chain interdiction would be most appropriate." Nixon submitted a reorganization plan to Congress in July 1970 and, without opposition from Congress, EPA started operations in December 1970.[31]

Although described as a new agency, EPA was in fact cobbled together primarily from units of other departments. From Interior came the largest program, the Federal Water Quality Administration. Other units came from Health, Education, and Welfare, Agriculture, and Atomic Energy. The personnel in these pre-existing units brought their previous agencies cultures with them to EPA. In the case of pesticide regulation, the personnel transferred to EPA came from the Department of Agriculture. Viewing themselves as providing a service to agriculture, members of this office had

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[31]Marcus, *Promise*, p. 47; Quarles, *Cleaning Up*, pp. 20-21; Nixon is quoted in Ruckelshaus, "Risk, Science, and Democracy," p. 22.

traditionally tried to protect farmers from false or mislabelled products by overseeing the licensing of pesticides. In the case of air and water pollution control, previous federal efforts had focused on research, planning, grants and technical assistance.[32]

Those approaches could not have contrasted more with the outlook of members of the one EPA office created anew, the Office of General Counsel and Enforcement. Trained to be advocates, lawyers in this office came to EPA to be *environmental* advocates. This orientation toward aggressive law enforcement fit perfectly with the strategy adopted by the first administrator, William Ruckelshaus. Himself a lawyer, Ruckelshaus based EPA's fortunes on public opinion, rather than on established structures of political power, and he believed that the public opinion demanded aggressive action against polluters.[33] Ruckelshaus wasted no time bringing action. The bureaucrats and scientists inherited from other agencies became sources of advice about potential targets for action, but the lawyers staffing the Office of General Counsel and Enforcement, headed by John Quarles, took the lead. In the first week of its existence, EPA sued major municipal and industrial polluters, and undertook "over a thousand enforcement actions" in its first two years. Ruckelshaus's nickname, "Mr. Clean," reflected not only on his personal reputation, but also on the pollution paradigm's language that made cleanliness (i.e., the elimination of pollution) a central goal.[34]

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[32]Quarles, *Cleaning Up*, p. 47.

[33]Quarles, *Cleaning Up*, p. 36. Quarles was EPA's first general counsel and assistant administrator in charge of enforcement. The title of his book about his EPA experiences, *Cleaning Up America*, illustrated the commitment to the pollution paradigm.

[34]Quarles, *Cleaning Up*, pp. 24, 37-53.

Lack of scientific or technical certainty was no hindrance. Quarles later admitted that early enforcement actions were initiated "in areas where effective standards and pollution control requirements had themselves not yet been set."[35] Ruckelshaus himself remembered, "From its earliest days EPA was often compelled to *act under conditions of substantial scientific uncertainty*. . . . Although scientists were often in the forefront of the early struggles against pollutants, most people did not need a scientific panel to tell them that air is not supposed to be brown, that streams are not supposed to ignite and stink, that beaches are not supposed to be covered with raw sewage [emphasis in original]."[36]

The willingness of the agency's lawyers to proceed without what scientists considered to be firm scientific information was one part of a larger conflict of values. This conflict was exemplified in the struggle over pesticide cancellations, one of the earliest battle grounds in the debate over ecological values at EPA.

Pesticide Cases: From Ecology to Cancer and Pollution to Risk (1970-1976)

When EPA was formed, it inherited not only personnel but issues from the Department of Agriculture. One day after EPA began operations, the Environmental Defense Fund petitioned the new agency to cancel and suspend all registrations of aldrin and dieldrin, two insecticides related to DDT. (The Environmental Defense Fund had made aldrin, dieldrin, and DDT targets of legal action prior to the formation of EPA but had not

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[35]Quarles, *Cleaning Up*, p. 53.

[36]Ruckelshaus, "Risk, Science, and Democracy," p. 25. This is a good statement of the "violation of the proper order of life" aspect of the pollution paradigm.

succeeded in having all uses cancelled of any of them.) The petition charged that aldrin and dieldrin caused ecological damage and were carcinogenic, although the latter issue stood in the shadow of the ecological concerns.[37] The agency also inherited the Environmental Defense Fund's petitions to the secretaries of Agriculture and Health, Education, and Welfare asking for suspension of all uses of DDT.[38]

The hearings that ensued were massive undertakings. The DDT hearings began in August 1971, lasted eighty days, involved 125 expert witnesses, and produced 9,000 pages of testimony.[39] The combined aldrin/dieldrin case was before the agency for almost 1700 days, involved 249 witnesses, and produced 60 feet of shelf space of records. In the aldrin/dieldrin case alone, EPA spent an estimated $5.5-6 million, the manufacturer (Shell) said it spent "several million dollars," and the Environmental Defense Fund estimated its expenses as $300,000.[40] Clearly, the agency and others had decided that these were important battles to fight.

These cases revealed a fault line in EPA. On the one side, the Office of Pesticide Programs viewed its role as a licensing organization. It saw its job as helping industry bring effective new products to market and protecting farmers from misbranded or fraudulent products. The species considered relevant to these decisions were humans, vertebrate animals, and vegetation.

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[37]Lawrence E. McCray, "Mouse Livers, Cutworms, and Public Policy: EPA Decision Making for the Pesticides Aldrin and Dieldrin," in National Research Council, *Decision Making in the Environmental Protection Agency: Case Studies* (Washington: National Academy of Sciences, 1977), pp. 58-118, see pp. 60, 73.

[38]Dunlap, *DDT*, p. 206.

[39]Dunlap, *DDT*, 211.

[40]McCray, "Mouse Livers," pp. 61, 101.

Pesticides were useful tools for agriculture, not a threat to human survival.[41] In fact, the Office of Pesticide Program's former home department, Agriculture, sent representatives to testify against banning DDT.[42] On the other side, the Office of General Counsel took the lead in the fight against these pesticides. The lawyers in the Office of General Counsel saw themselves as protecting birds as well as humans from dangerous pollutants, and Rachel Carson had made persistent pesticides such as DDT, dieldrin, and aldrin into powerful symbols of environmental contaminants.[43]

These differences developed into open conflict. EPA lawyers felt that entomology as a field was dominated (as Rachel Carson had argued) by chemical company funding, making it difficult to trust entomologists' assessments of the costs and benefits of chemicals. For their part, scientists in the Office of Pesticide Programs felt that the lawyers were pursuing the aldrin/dieldrin case for political reasons and as a power grab.[44] It has been suggested that EPA leaders could not control the Office of Pesticide Programs directly, so they tried to gain control of pesticide registrations through case-by-case litigation. Members of the Office of Pesticide Programs were troubled that EPA lawyers focused on the harm that insecticides caused without taking

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[41]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*, p. 201.

[42]Dunlap, *DDT*, p. 214.

[43]This split is consistent with that described by Samuel Hays (*Beauty*) and Christopher Sellers (paper presented at 1993 meeting of American Society for Environmental History), in which environmental values are associated with consumers and stand in opposition to values of producers. Here, OGC would represent the former and OPP the latter. Re OGC taking the lead at EPA, and values of its lawyers, see McCray, "Mouse Livers," pp. 64, 105.

[44]McCray, "Mouse Livers," pp. 78, 80.

benefits into account, even though the relevant statute called for balancing costs and benefits.[45]

The early pesticide cases catalyzed two important shifts in agency approach. First, they prompted a shift from a focus on ecological effects to a focus on health effects, and specifically cancer. At the outset, complaints against these chemicals emphasized ecological threats, with concern about health being secondary. When William Ruckelshaus announced his intention to cancel most uses of aldrin and dieldrin in 1972, for example, he devoted but one sentence to health, a reference to tumors developing in mice given high doses of dieldrin. Most of the dangers he emphasized had to do with wildlife and the atmosphere.[46] When he banned DDT on crops, Ruckelshaus said that evidence "compellingly demonstrates the adverse impact . . . on fish and wildlife." Among the effects of greatest concern was what seemed to be the tendency of DDT to cause birds to lay eggs with thin, easily-broken shells. Ruckelshaus also mentioned DDT's "potential" carcinogenicity."[47]

In court, however, cancer became a central concern. A Court of Appeals involved in part of the aldrin/dieldrin case pointed out (perhaps inadvertently) the potential strength of carcinogenicity as a legal argument. Troubled by EPA's laconic treatment of the cancer issue, the court wrote, "[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

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[45]Landy et al, *Asking*, pp. 181-182. The statute governing pesticide registration was the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA).

[46]McCray, "Mouse Livers," p. 74.

[47]Quoted in Dunlap, *DDT*, p. 234.

deference to administrative latitude is beset with concern when the cross-reference is so abbreviated."[48] As advocates, EPA lawyers were interested in arguments that would help them win their case, and here judges were telling them what dangers were especially worrisome. The final brief in the DDT cancellation hearings contained seven "general principles applicable to determination of carcinogenic hazards." The principles held that substances causing tumors in animals "should be deemed potentially carcinogenic in man," and that "the principle of zero tolerance is valid."[49]

Cancer came even more to the fore in the aldrin/dieldrin case. In January 1973, a meeting at the National Cancer Institute reviewed the evidence that EPA's attorneys had collected about the potential for aldrin/dieldrin to cause cancer in humans. The experts said that the case was sound, which the trial staff later recalled as a "major milepost in the case." Meanwhile Shell, the manufacturer, offered to remove some uses of aldrin/dieldrin from the label, a compromise that scientists from the Office of Pesticide Programs thought reasonable.[50]

Attorneys from Office of General Counsel, however, said that "no settlement that allowed for indefinite use of a potential carcinogen would be acceptable."[51] The Office of Pesticide Programs objected to this position in an April 1973 memorandum that said, "[Y]our case is based in part on the claim

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[48]Quoted in McCray, "Mouse Livers," p. 76.

[49]Nathan J. Karch, "Explicit Criteria and Principles for Identifying Carcinogens: A Focus of Controversy at the Environmental Protection Agency," in National Research Council, *Decision Making in the Environmental Protection Agency: Case Studies* (Washington: National Academy of Sciences, 1977), pp. 119-206, see p. 132.

[50]McCray, "Mouse Livers," p. 79.

[51]McCray, "Mouse Livers," p. 79.

that no benefit will justify the risk of cancer. . . . For EPA to officially state such a position, even if it is overturned, is setting a dangerous precedent that we as scientists cannot condone."[52] After two EPA scientists (at least one a pathologist) told the EPA lawyers that the data on aldrin/dieldrin did not support the cancer argument, the lawyers looked for experts from outside EPA, saying that no EPA scientists met the criteria for scientific competence. Eventually, the two EPA scientists offered to testify on Shell's behalf.[53]

Despite these protests, the EPA's final brief in the aldrin/dieldrin case contained nine "established principles of carcinogenicity which can be applied to individual substances to determine their human cancer hazard." The principles drew on the testimony of Umberto Saffiotti, formerly associate director for carcinogenesis of the Division of Cancer Cause and Prevention of the National Cancer Institute. Like the DDT cancer principles, the aldrin/dieldrin principles denied that there was a safe threshold for carcinogens. The same nine cancer principles then appeared at the beginning of the agency's next pesticide hearings, which focused on heptachlor/chlordane. The cancer principles, by virtue of their use in the aldrin/dieldrin case, gained the stature of "facts" in the heptachlor/chlordane case and others. In other words, they became powerful legal precedents.[54]

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[52]Quoted in McCray, "Mouse Livers," p. 80.

[53]McCray, "Mouse Livers," p. 105.

[54]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 US Court of Appeals that EPA had acted appropriately in suspending uses of aldrin/dieldrin, had made these principles into policy. In their decision, the US Court of Appeals cited the "*strong probability* [emphasis in original]" that aldrin/dieldrin was carcinogenic in animals. Karch, "Explicit Criteria," pp. 134-140; "probability" quote is on p. 136 and "facts" appears on p. 138. Saffiotti later said that the principles "were naive and failed to represent the real science to which he alluded in his testimony." Quoted in Karch, "Explicit Criteria," p. 133.

The aldrin/dieldrin case marked a fundamental shift in legal emphasis, if not necessarily in motivations for bringing actions. No longer would ecological issues be the focus; cancer would be. In fact, the scientific evidence for ecological effects and for carcinogenicity were both matters of dispute within the scientific community, so it was unlikely that quality of evidence was the critical factor in the success of each argument. What was at work, then, was a greater willingness of the legal system to grant deference to an administrative agency trying to protect the public from cancer than to non-human species. When judges heard EPA attorneys say that 98-99% of Americans carried residues of dieldrin in their bodies at levels close to what caused tumors in rodents, it was not hard for EPA to argue that there was no margin for safety with these chemicals and that they should be banned.[55] Everyone valued the protection of human health, especially from a disease that the Court of Appeals called "fright-laden;" there was far less universal agreement on the importance of protecting birds.

In addition to shifting regulatory emphasis from ecology to cancer, the pesticide cases also prompted a shift from a focus on pollution to a focus on risk. At least two factors were at work. First, the ongoing struggle between the Office of Pesticide Programs and the Office of General Counsel reached such a pitch that it spilled into the media, forcing Administrator Russell Train to take sides. It was difficult for Train to justify having the Office of General Counsel set pesticide policy; that was, after all, the responsibility of the Office of Pesticide Programs.[56]

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[55]McCray, "Mouse Livers," p. 70.

[56]Landy et al., *Asking*, p. 182.

In a 1975 reorganization, Train put the technical personnel in the Office of Pesticide Programs back in charge of decisions about registrations. This move so alienated the Office of General Counsel that several attorneys, including former associate general counsel Anson Keller, quit in protest.[57] This marked the end of the Office of General Counsel's role as *de facto* policy office for EPA. After that imbroglio, EPA lawyers acted much more like attorneys in firms who represented the interests of their clients (the program offices), rather than as independent agents pushing their own agendas.

The implications of this demotion of the role of Office of General Counsel were profound for EPA, for the agency's lawyers had taken the lead in promoting the pollution paradigm. This paradigm was especially suited to the adversarial American legal system, in which issues were portrayed as stark choices between one course of action or another. Convinced that pesticides were pollutants, the attorneys moved to eliminate them altogether. This all-or-nothing approach was anathema to the Office of Pesticide Programs, which wanted (and in fact was directed by law) to take benefits as well as costs into account when evaluating chemicals. As former members of the Department of Agriculture, scientists in this office believed that pesticides played an important role in boosting agricultural productivity and in helping farmers survive in a difficult business.

Many people shared the belief that EPA should balance costs and benefits--and that the balance sheet should be focused on *human* costs and benefits. When Russell Train testified in 1973 at hearings about his confirmation as EPA administrator, committee chairman Jennings Randolph

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[57]Keller went to the Occupational Health and Safety Administration, where he worked on drafting a generic policy for regulating carcinogens in the workplace. Landy et al., *Asking*, p. 182.

stated that the goal of environmental programs was the protection of public health, and that such programs needed to be balanced against the need to protect the economy. (This contrasted sharply with Ruckelshaus' hearings in 1970, at which the questions had focused on whether he would be tough enough in enforcement.) Train found his confirmation delayed over the summer recess by Senator William Scott of Virginia, who was apparently troubled that Train was identified as a conservationist in *Who's Who*.[58]

The cost-benefit approach found its way into the debate over pesticide regulation. EPA lawyers had explicitly stated that no safe level existed for carcinogens, which implied that the only proper regulatory action was to ban carcinogens altogether. Although well suited to adversarial legal proceedings, this approach sat poorly with many interested parties. Manufacturers resented the all-or-nothing approach of the Office of General, and many scientists and members of Congress shared industry's belief that eliminating all risk, especially for chemicals with high economic value, was impractical.[59]

EPA Administrator Russell Train heard this message when he was called before Congressional hearings. A change in course was in order, and Al Alm, assistant administrator for policy, suggested that a *policy* could be a *process*. Train formed a Carcinogen Assessment group under Roy Albert of the Institute of Environmental Medicine at New York University, and this group set out to develop quantitative methods for assessing risk. Ironically, the method developed relied on the same findings about carcinogenicity of ionizing radiation that had inspired the no-threshold idea characteristic of the

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[58]Quarles, Cleaning Up, pp. 197-200.

[59]National Research Council, *Risk Assessment in the Federal Government: Managing the Process* (Washington: National Academy Press, 1983), p. 58.

pollution paradigm. Rather than focusing on the lack of a safe threshold, however, the Carcinogen Assessment Group borrowed the idea that the rate of cancer in a population was a function of dosage. The group feared that dose-response curves, the use of which implied that some risk was acceptable, would alienate environmentalists. In the interest of political palatability, therefore, the group tried to make sure risk was not underestimated.[60]

The development of these guidelines made EPA the first federal agency to adopt formal methods for assessing risk. The guidelines proposed a two-step process. First, the agency would determine whether a substance posed a cancer risk. Second, the agency would decide what regulatory action, if any, to take. This second step called for quantitative risk assessment, the results of which would be weighed against a chemical's benefits. When published in the *Federal Register*, no mention was made of diseases other than cancer, or of protecting species other than humans.[61] The transformation from ecology to health, and from pollution to risk, formally had been made. (Figure 2.) How it would influence the agency's regulatory activities remained to be seen.

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[60]Landy et al., *Asking*, p. 182; Betty Anderson, address to Society for Risk Analysis, 4 December 1992.

[61]National Research Council, *Risk Assessment in the Federal Government*, p. 58; US Environmental Protection Agency, "Health Risk and Economic Impact Assessments of Suspected Carcinogens," *Federal Register* 41 (1976): 21402-21403.

Institutionalizing Cancer and Risk (1977-1990)

The fate of the agency's emphasis on cancer was linked to national politics. Jimmy Carter was elected President in 1976 after promising to streamline the federal government by eliminating duplication among agencies. EPA was one of the chips in the poker game of governmental reorganization. Here, the cancer card played as well, and the ecology card as poorly, as in the courts.

"Environmentalists Come in from the Cold In Carter Administration," trumpeted *National Journal* in March 1977. Although Jimmy Carter had nominated "officers, lobbyists, lawyers and researchers" from a slew of environmental organizations to fill key administration posts, the *Journal* noted that this herd of activists was hardly free to stampede across the regulatory landscape. "[Y]oung, relatively unknown and particularly beholden to the President for their new national prominence," the new regulators would have to follow the lead of their President. Industry representatives were "cautiously optimistic" that their companies would fare well under the new President.[62]

Industry optimism looked even more well-founded because Carter's reorganization team proposed to consolidate environmental protection and natural resource management into a large Department of the Environment. One of the choicest plums for Cecil Andrus, the Secretary of Interior expected to preside over the consolidated department, was EPA. According to one of

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[62]J. Dicken Kirschten, "Environmentalists Come in from the Cold in Carter Administration," *National Journal* (12 March 1977): 382-384, see p. 382. Organizations represented included Natural Resources Defense Council Inc., National Audobon Society, League of Conservation Voters, Environmental Defense Fund Inc., National Wildlife Federation, Izaak Walton League of America, Environmental Policy Center, Sierra Club, Save America's Vital Environment.

his aides, Andrus desire to take over EPA was second only to his desire to have the Forest Service. If this plan went through, the EPA administrator would no longer report directly to the President. Although Andrus had labored to create a reputation for himself as an environmentalist, the Department of Interior's close historical association with producers suggested that their interests could dominate environmental protection in the proposed department. Given Carter's campaign promise to simplify government structure, and his declaration that Andrus was his "best friend," prospects surely looked bright to Carter's transition team for a reorganization."[63]

The uncertainty of EPA's independence played a part in the selection of EPA's new administrator. The Carter team wanted to find someone who could work either independently or under a cabinet official, and even gave Andrus the chance to review and approve the nominee. They looked for a good manager, but not someone backed by strong environmental and public interest constituencies. Out of this process emerged Douglas M. Costle, a thirty-seven-year old lawyer who fit the "young and beholden to the President" description. Costle had most recently served as commissioner for Environmental Affairs in Connecticut. A veteran of the Ash Council that had recommended the creation of an independent EPA to President Nixon, Costle was assured by Carter assistant Hamilton Jordan only that the independence of EPA had not been "pre-judged." Andrus himself told Costle,

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[63]Dick Kirschten, "Reorganizing Natural Resources May Be Tougher Than Carter Thought," *National Journal* (15 October 1977): 1613-1618. For "best friend" quote, see J. Dicken Kirschten, "Environmentalists Come in from the Cold in Carter Administration," *National Journal* (12 March 1977): 382-384, see p. 382. Later, National Journal reported that Andrus said he sent a memo to Carter in January 1977 opposing transfer of EPA to Interior. Dick Kirschten, "DARR, DEPH, DORE and Other Departments," *National Journal* (17 December 1977): 1976.

with whom he had developed a friendship, that he would oppose making EPA part of Interior.[64]

Others also took a dim view of reorganization plans, among them outgoing EPA Administrator Russell Train. At a dinner party, Train overhead Senator Abraham Ribicoff (D-Conn.), chair of the Senate committee overseeing reorganization, reveal to a guest that EPA was going to become part of Interior. So two days before Carter's inauguration, Train told the Senate Environment and Public Works Committee that the move would be "a very backward step." He argued that disputes between EPA and the Army Corps of Engineers and Bureau of Reclamation (both of which would be in the new department) should be aired in public, not buried inside a department. Senator Edward Muskie and other members of the panel strongly agreed.[65]

But Andrus's assurance and Muskie's support did not necessarily make EPA safe, and as late as December 1977 Carter's reorganization team was talking of folding EPA into a Department of the Environment and Public Health or a Department of Ocean Resources and the Environment.[66] Delays in implementing reorganization plans, however, gave EPA leaders time to prove themselves in their current location.[67] Costle took advantage of this

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[64]Dick Kirschten, "Reorganizing Natural Resources May Be Tougher Than Carter Thought," *National Journal* (15 October 1977): 1613-1618, see p. 1616; Landy et al., *Environmental Protection Agency*, p. 39.

[65]Dick Kirschten, "Reorganizing Natural Resources May Be Tougher Than Carter Thought," *National Journal* (15 October 1977): 1613-1618, see p. 1615.

[66]Dick Kirschten, "DARR, DEPH, DORE and Other Departments," *National Journal* (17 December 1977): 1976.

[67]Dick Kirschten, "Reorganizing Natural Resources May Be Tougher Than Carter Thought," *National Journal* (15 October 1977): 1613-1618, see p. 1618.

opportunity by emphasizing human health, and especially cancer, over ecological concerns.

In 1976, protecting species other than humans was largely seen as the bailiwick of the Department of the Interior. Environmental health, on the other hand, had not yet been claimed by an existing agency, and it was on this territory that Costle planted the EPA flag. Aside from giving EPA a unique mission, this emphasis had the advantage of political palatability. Polls showed that the public continued to support pollution control, but Washington insiders feared that the public's support was waning in the face of growing awareness of costs of control. The view inside the Washington beltway was that something more compelling than "ecological purity" was necessary to justify EPA's existence.[68]

Costle set out to convince the public that EPA was not primarily a "bird and bunny" agency, but a public health agency.[69] Costle pushed this new image hard, touring the country giving a speech on the dangers posed by toxic chemicals. EPA could not wait for dead bodies to regulate carcinogens, Costle told the American Chemical Society, especially since cancer was the second leading cause of death in the country.[70] Assistant Administrator William Drayton announced that programs to measure effects of pollutants on non-human species--such as the effect of air pollutants on trees, crops, and

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[68]Landy et al., *Asking*, p. 41.

[69] To this day, EPA employees remember Costle as declaring that EPA was not a "bird and bunny" agency. Many interpret the remark as a slight of ecological concerns; others believe 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 non-human species. In general, regulation of non-human species has been a matter of concern to states rather than the federal government, with migratory and endangered species being the major exceptions. Interview with Michael Slimak, 8 July 1993.

[70]*Environmental Reporter* (15 September 1978): 914.

natural systems--would be cut in favor of research on human health effects, and that much of the research on ecological effects would be contracted out. One reason given for this shift in emphasis was that news about toxic substances generated cancer scares which led to increased Congressional funding for EPA.[71]

Judging from EPA's fate in budget battles, the new strategy was a winner. The Office of Management bought both the programs and rhetoric Costle proposed, saying that the reason for environmental protection was to protect human health. EPA's budget grew 60%, and staffing 20%, between January 1977 and January 1979.[72] It would be inaccurate, however, to attribute all this increase to Costle's campaign. Concern about toxic chemicals was on the rise in the country in the mid-late 1970s, leading to passage of a major act given to EPA to regulate, the 1976 Toxic Substances Control Act in 1976. To a great extent, then, Costle could be seen as riding a wave already set in motion by others.

But there was no denying that Costle made carcinogens a major concern. In addition to promoting EPA as a public health agency, he also pushed ahead with the risk assessment framework already under development. Much of this work was done in collaboration with the Food and Drug Administration, Occupational Safety and Health Administration, and Consumer Product Safety Commission. The mechanism for this collaboration was the Interagency Regulatory Liaison Group, which consisted

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[71]Dick Kirschten, "EPA: A Winner in the Annual Budget Battle," *National Journal* (28 January 1978): 140-141. However, Thomas Jorling, who headed the EPA water program, said that this rhetoric was targeted toward the White House and that changes would not be so drastic as they sounded.

[72]*Environmental Reporter* (26 January 1979): 1763.

of the heads of those agencies. According to some, one of the motivations for this collaboration was to show that these agencies could function effectively without reorganization.[73]

If preservation of agency independence was one of the motivations, serious interest in solving regulatory problems was another. Growing out of informal breakfasts among the agency heads, the Interagency Regulatory Group became a tool for solving a difficult and common problem: regulating toxic substances. At first, the group tried to address broad policy issues dealing with risk assessment, but consensus was impossible with such a diverse sampling of institutional missions and professional backgrounds. So the group decided to do something manageable. Risk assessment methods had been developed more fully for cancer than for anything else, and cancer risk assessment became the focus.[74]

In collaboration with scientists from other agencies, the Interagency Regulatory Liaison Group produced a draft in 1978. The document elicited controversy over a key point: were quantitative estimates of risk valid? The draft, which relied heavily on *scientific and technical* arguments for evidence, said yes. The Occupational Safety and Health Administration, which had been developing separate guidelines that relied on *legal and legislative* judgments, said no. Here, then was a clash of the risk paradigm, which accepted some level of danger, with the pollution paradigm, which sought to eliminate danger. (Although scientists generally preferred the risk paradigm and lawyers the pollution paradigm, this division was not absolute. Scientist

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[73]Kirschten, "Reorganizing Natural Resources May Be Tougher Than Carter Thought," p. 1618.

[74]This account draws on Landy et al., *Asking*, pp. 172-203, who discuss the Interagency Regulatory Liaison Group and its cancer guidelines in more detail.

Umberto Saffiotti of the National Cancer Institute was one the most outspoken opponents of quantitative risk assessment, believing that the scientific evidence was inadequate to characterize the magnitude of risk.)[75]

Despite these conflicts, the Interagency Regulatory Liaison Group managed to compromise enough to produce a document. One observer noted that compromise was achieved not through shifts in position, but through the incorporation of ambiguous language. However, all was not word smithing. As with EPA's earlier risk assessment guidelines, the methods were designed to err on the side of safety whenever the science was in doubt. The document was published in the *Federal Register*, the President's Regulatory Council adopted the report as the basis for government regulation in 1979, and EPA said that it relied on the document. The Occupational Safety and Health Administration, on the other hand, argued against quantitative risk assessment in a brief to the United States Supreme Court.[76] Consensus among agencies on regulatory philosophy was not at hand.

Although the pollution paradigm was under strong attack by industry and many scientists by the late 1970s, the arrival of the Reagan Administration meant that the highest levels of government would share that opposition. On the campaign trail, Reagan had been quoted as saying that if EPA had its way, "[Y]ou and I would live like rabbits," and that trees

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[75]The cooperating agencies included Toxic Substances Strategy Committee (under the White House Council on Environmental Quality), Office of Science and Technology Policy, National Institute of Environmental Health Sciences, National Cancer Institute, and National Institute of Occupational Safety and Health. The OSHA guidelines were developed under Anson Keller, the EPA lawyer who had had resigned in protest over the EPA's handling of pesticides. Landy et al., *Asking*, pp. 191-193. Here, "lawyers" refers to those working for regulatory agencies.

[76]Landy et al., Asking, pp. 194-196; National Research Council, *Risk Assessment in the Federal Government*, p. 61.

and plants were the chief cause of air pollution. Large as Reagan's victory was, it seems unlikely that these positions on the environment were the reason. Polls showed consistently high public support for environmental protection despite rising costs.[77]

Once in office, Reagan appointed Anne Gorsuch to be EPA administrator. Widely perceived as hostile to environmental protection, Gorsuch oversaw a period in which the number of cases referred to the Department of Justice for enforcement declined fifty percent. Agency morale plummeted, and forty percent of agency personnel left within a year.[78] The Gorsuch team concluded that the agency's cancer risk assessment procedures were "bad science" and called for their revision, which led to the perception that EPA was manipulating science for predetermined political ends. This view was bolstered by an Office of Technology Assessment finding that there was no scientific basis for EPA's change in cancer risk assessment procedures.[79]

Gorsuch's controversial tenure at EPA came to an end in March 1983, when she resigned after learning that the White House would not defend her against a charge of contempt of Congress. The contempt charge arose from her refusal (at the behest of the Department of Justice) to provide Congress

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[77]Landy et al., *Asking*, p. 245.

[78]Landy et al, *Asking*, pp. 245-250. Gorsuch denied hostility to environmental protection and accused the media of misrepresenting her positions. She pointed out that she had cosponsored an air pollution bill in the Colorado legislature and the national media reported her as opposing air pollution control. Anne Burford with John Greenyea, *Are You Tough Enough?* (New York: McGraw-Hill Book Company, 1986).

[79]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), pp. 162-164.

with documents about alleged problems with Superfund, the program designed to clean up toxic waste dumps. Gorsuch's resignation crowned a spate of publicity that charged charged EPA with a host of problems, including corruption at Superfund, mishandling of the clean-up of dioxin "contamination" of Times Beach, Missouri, and "capture" of EPA by business interests.[80] With EPA's reputation in tatters, the White House turned to William Ruckelshaus to replace Gorsuch as EPA administrator.

In his second stint as administrator, Ruckelshaus advocated a sharply different approach to regulation than in his first. Whereas the pollution paradigm reigned supreme in the early 1970s, the mid-1980s marked the formal adoption of the risk paradigm at EPA. Ruckelshaus signalled the new approach and contrasted it with the old in his first policy address as administrator, a speech to the National Academy of Sciences: "Ten years ago . . . . I believed it would become apparent to all that we could virtually *eliminate the risks we call pollution* if we wanted to spend enough money. When it also became apparent that enough money for all the pollutants was a lot of money, I further believed we would begin to examine the risks very carefully and structure a system which forced us to *balance our desire to eliminate pollution against the costs of its control*. . . . I was wrong [emphasis added]." He laid much of the blame on an attitude in the public "approaching panic" about pollution.[81]

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[80]Landy et al., *Asking*, p. 251.

[81]William D. Ruckelshaus, "Science, Risk, and Public Policy," in Julie Sullivan (ed.), *The American Environment* (New York: The H.W. Wilson Company, 1984), pp. 163-169, see pp. 163-165. In presenting his plan, Ruckelshaus contrasted the "emotionalism that surrounds the current discourse" about pollution control with the "idea of science:" that "disciplined minds can grapple with ignorance, and sometimes win [p. 163]."

Ruckelshaus made it his mission to institute a system for balancing costs and benefits. The method for this endeavor had two steps. The first was *risk assessment*, or quantitative scientific estimates of the danger a toxic substance posed to public health. The second was *risk management*, or deciding what to do about the danger. Implicitly acknowledging that this framework and its language were unfamiliar to most people, Ruckelshaus said that the agency would make it a priority to find "ways of describing risk in ways the average citizen can comprehend."[82] Fortuitously, the National Academy of Sciences brought out a book (dubbed The Red Book for the color of its cover) in 1983 that codified risk assessment procedures. It divided risk assessment into four steps: hazard identification (deciding whether a substance could cause harm), dose-response assessment, exposure assessment, and risk characterization (the probability of harm, which was a function of the previous three calculations).[83] One of the crucial differences between this approach and the pollution approach was that the latter sought to protect everyone, whereas risk, which dealt with probabilities, implied that some level of danger was acceptable.

This regulatory approach was a striking turnabout for Ruckelshaus. In his first term, Ruckelshaus had *followed* public opinion, took strong enforcement actions to *eliminate* pollution, and supported agency lawyers who wanted to take tough enforcement actions *over agency scientists who wanted to weigh costs and benefits*. The pesticide cases of the 1970s exemplified these tendencies. Now, Ruckelshaus was arguing that EPA should lead public opinion rather than follow it, weigh benefits against costs rather than focus

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[82]Ruckelshaus, "Science, Risk, and Public Policy," pp. 163, 167.

[83]National Research Council, *Risk Assessment in the Federal Government.*

only on benefits, and elevate scientific over public, statutory, and legal judgments. Moreover, his statement of EPA's priorities focused entirely on risks from toxic chemicals to public health, with no mention of their effect on non-human species.

Why the change? Ruckelshaus later said that many of the assumptions that had driven environmentalism, Congress, and EPA at its founding were erroneous, especially the notion that the agency knew how to measure and reduce pollutants.[84] He also identified a growing public awareness that "exposure to a very large number of unfamiliar and largely untested chemicals is universal," sparked in particular by awareness of two "ubiquitous" and carcinogenic substances, asbestos and PCBs. The discovery by epidemiologists that cancer rates varied with environment, and publicity of toxic waste dumps, also contributed. Concern about these largely invisible substances--"unlike the touchable, visible, and malodorous pollution that stimulated the initial environmental revolution"--moved "the problem of [scientific] uncertainty from the periphery to the center" and made risk assessment more important.[85]

In addition, Ruckelshaus may have developed a greater appreciation for industry's dislike of hard-line regulation while serving as a senior corporate executive for Weyerhauser Co. from 1976 to 1983. After contrasting the extreme environmental point of view, which pushed for elimination of danger, with the extreme industry point of view, which argued for no control

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[84]Ruckelshaus, "Risk, Science, and Democracy," pp. 21-22.

[85]Ruckelshaus, "Risk, Science, and Democracy," pp. 25-26. Ruckelshaus noted that EPA had always been faced with scientific uncertainty, but this uncertainty was "partially masked" at the beginning of EPA by the "blatant" nature of the pollutants the agency was trying to control [p. 25].

until the science was absolutely certain, Ruckelshaus presented risk assessment as the middle ground: "We will emerge from the blind alley and reforge a practical consensus on the environment only when we are able to redefine the problem of environmental protection as being 'the management of risk.'"[86]

Observers have pointed out other advantages of risk assessment for the agency. One of Ruckelshaus's responsibilities was to restore EPA's credibility after the Gorsuch era.[87] In presenting his plan, Ruckelshaus alluded to this goal: "Despite conflicting pressures, risk assessment at EPA must be based on scientific evidence and scientific consensus *only*. Nothing will erode public confidence faster than the suspicion that policy considerations have been allowed to influence the assessment of risk [emphasis in original]."[88] Separating *scientific* assessment of risk from *political* decisions about risk management contributed to this goal.[89]

Risk assessment provided an important management tool. Assistant Administrator Milton Russell argued that risk assessment offered a way to compare programs across statutes and constituencies, thereby avoiding

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[86]Ruckelshaus, "Risk, Science, and Democracy," p. 31.

[87]Landy et al., *Asking*, p. 251.

[88]Ruckelshaus, "Science, Risk, and Public Policy," p. 167. He also wrote, "Both industry and environmentalists fear this manipulation [of risk assessment findings]--from different brands of administrator, needless to say. Although we cannot remove values from risk assessment, we can and should keep those values from shifting arbitrarily with the political winds." Ruckelshaus, "Risk, Science, and Democracy," p. 28.

[89]Goldstein argues that one of the major reasons for adoption of risk assessment was public perception that EPA science had been manipulated for political purposes. Bernard D. Goldstein, "If Risk Management is Broke, Why Fix Risk Assessment?" *EPA Journal* 19 (no. 1, 1993): 37-38, see p. 37.

having priorities set by administrative accident or political influence.[90] It was also useful as a counterweight to the cost-benefit analyses conducted by the Office of Management and Budget, for risk assessment emphasized EPA's commitment to health (an area on which the federal government had traditionally spent large amounts of money) rather than focusing only on economics.[91]

In proposing risk as a framework for evaluating EPA priorities, Ruckelshaus was making a paradigm developed for human health the center of the agency's thoughts. In 1985, he commented that the agency's top leaders had an almost single-minded focus on health: "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. We need a return to the vision of environmentalism embodied in the documents that created EPA."[92]

Although developed to measure danger to human health, the risk paradigm eventually provided a framework for assessing ecological threats as well. Outside of EPA, scientists had been developing "environmental risk analysis," a method for identifying and quantifying the probability of adverse

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[90]Cited in Norman J. Vig and Michael E. Kraft (eds.), *Environmental Policy in the 1990s: Toward a New Agenda* (Washington: CQ Press, 1990), p. 176. Ruckelshaus called risk assessment "an irreplaceable tool for setting priorities." Ruckelshaus, "Risk, Science, and Democracy," p. 27.

[91]Richard N.L. Andrews, "Risk Assessment: Regulation and Beyond," in Vig and Kraft, *Environmental Policy in the 1990s*, pp. 167-186, see p. 177.

[92] Ruckelshaus, "Risk, Science, and Democracy," pp. 37-38.

changes in the environment from human activities. G.W. Suter and L.W. Barnthouse at Oak Ridge National Laboratory were leaders in this effort. They and other Oak Ridge scientists worked on contracts for EPA's Office of Research and Development. In 1982 and 1986, they estimated risks associated with indirect coal liquefaction, including risks to fish, algae, timber, agriculture, and wildlife of deriving oil from shale.[93]

Inside EPA, scientists began using risk assessment terminology to characterize threats to non-human species. In 1986, for example, the Office of Pesticide Programs published ecological risk assessment guidelines that drew on the methods developed by Barnthouse 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 technique was the "quotient method," in which one calculated the estimated environmental concentrations of a chemical and divided it by the LC_{50} level. If the ratio exceeded certain levels (which varied depending on which organisms were being studied), then one proceeded to simulated or actual field tests. Up to that time, the effects of concern had been single species of non-human, non-target organisms, including endangered or threatened species. Most of the species studied were chosen because they were important for food or recreation (including hunting), and because well-defined protocols existed.

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[93]L.W. Barnthouse et al., *Preliminary Environmental Risk Analysis for Indirect Coal Liquefaction*. Report to the Office of Research and Development, U.S. Environmental Protection Agency, Washington, DC, 1982. Cited in G.W. Suter et al., *Environmental Risk Analysis for Oil from Shale*. ORNL/TM-9808. Environmental Sciences Division Publication No. 2605 (Oak Ridge, Tenn.: Oak Ridge National Laboratory, 1986); G.W. Suter et al., *Environmental Risk Analysis for Oil from Shale*. ORNL/TM-9808. Environmental Sciences Division Publication No. 2605 (Oak Ridge, Tenn.: Oak Ridge National Laboratory, 1986).

Among the types of organisms studied were fish, aquatic invertebrates, mammals, and birds.[94]

While developing these guidelines, EPA scientists were aware of difficulties. Health risk assessments dealt with only one species, humans, while ecological risk assessments theoretically could be concerned with all other species on earth. The wide range of species potentially affected by a chemical made testing a tremendous logistical challenge. The only realistic way to proceed was to select a handful of species for testing with the hope that they would be "surrogates" for other species. The species selected tended to be those society had already identified as valuable through legislation. There was doubt, however, that single-species testing would reveal effects on other levels of organization, such as ecosystems. Ecological risk assessments also had the problem of answering the question, "So what?" Was a fifteen percent reduction in a fish population significant? Perhaps so, perhaps not, depending on the species of fish and other factors. Also, health risk assessments dealt with dangers already familiar and of concern to the public, such as cancer or birth defects. Ecological risks were less familiar, and the value placed on them by the public was less well-defined.[95]

Difficult as developing ecological risk assessment was, the framework equipped EPA scientists with a powerful tool for questioning the agency's

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[94]U.S. Environmental Protection Agency, *Hazard Evaluation Division Standard Evaluation Procedure: Ecological Risk Assessment*. EPA-540/9-85-001 (Washington: Environmental Protection Agency, Office of Pesticide Programs, 1986), p. 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, Dexter Hinckley, James Plafkin, and Michael Slimak, "Ecotoxicity and Ecological Risk Assessment: Regulatory Applications at EPA," *Environmental Science and Technology* 24 (1990): 10-15.

[95]Office of Pesticides and Toxic Substances, "State of the Practice: Ecological Risk Assessment Document," 14 March 1990, pp. 5-6. (Unpublished document obtained from Donald Rodier, EPA.)

distribution of resources. Within EPA, a number of ecologically-oriented scientists felt that the agency had devoted too much money to health issues and not enough to ecological protection. No one event led to a revival of interest in ecological protection, but a number of factors likely contributed. Ruckelshaus's replacement as administrator, Lee Thomas, encouraged interest in ecological issues. Skepticism about "chemical time bombs" grew as people began to wonder whether toxic waste sites, which seemed to pose little risk outside of a limited area, deserved such enormous attention and resources. Publicity about greenhouse gases and destruction of the ozone layer stimulated interest in issues beyond cancer. With the blessing of Thomas, 75 EPA professionals tried to compare agency priorities with their judgment of areas of greatest importance.[96]

The result was a multi-volume 1987 publication called *Unfinished Business*. The report divided EPA's concerns into four categories: cancer, non-cancer, ecology, and welfare. Although the 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 26 "stress agents" to 16 ecosystems: geographical extent of effect, intensity of effect, length and frequency of exposure, and reversibility. In the end, the group ranked ecological problems as 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

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[96]Landy et al., *Asking*, pp. 256-257; U.S. Environmental Protection Agency, *Unfinished Business: A Comparative Assessment of Environmental Problems*, vol 1: *Overview* (Washington: Environmental Protection Agency, February 1987), pp. i-ii.

working group was enthusiastic about risk as the organizing concept for ecological protection, and the inclusion of ecological issues as a major category went a long way toward legitimizing this interest within the agency.[97]

The ecological risk framework was taking hold, but a great deal of work remained in developing and disseminating methods. In 1988, EPA published *Review of Ecological Risk Assessment Methods*. After studying 20 ecological assessment methods, the authors concluded that most methods addressed threats to populations rather than to communities or ecosystems, and that the "endpoint" of concern was usually death of the organism. The factor limiting community or ecosystem analyses was insufficiency of data.[98] Soon after, the agency published a *Summary of Ecological Risks, Assessment Methods, and Risk Management Decisions in Superfund and RCRA*. The report concluded that Superfund sites posed ecological threats, but that effort devoted to reducing them had varied across sites. The report attributed this variability to "lack of policy and guidance rather than a lack of ecological expertise among Superfund professionals." Similarly, it concluded that ecological issues had not played a significant role in implementation of the Resource Conservation

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[97]U.S. EPA, *Unfinished Business*, p. 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 indicates, I believe, the extent to which the risk paradigm had spread throughout the agency: its language was used even when the formal methodology was not.

[98]U.S. Environmental Protection Agency, *Review of Ecological Risk Assessment Methods* (Washington: Environmental Protection Agency, November 1988), pp. 1-3. A 1987 review paper by a contractor found that there was little agreement about the definition of "endpoint" 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, pp. 1-3.

and Recovery Act and cited the need for more policy guidance, data, training, and methods.[99]

These sorts of structural issues were important, but there was also room within EPA for individual leaders to take action to protect ecological values. Despite the formation of an ecological effects branch in the Office of Pesticide Programs and the collection of data showing ecological effects, pesticides were not banned for these reasons. (Continuation of the Department of Agriculture culture, which stressed costs and benefits to humans, was likely important. In the pesticides office, the ecological effects people were called "bird and bunny people," a term of "contempt.") In the mid-1980s, Assistant Administrator for Pesticides and Toxic Substances Jack Moore and Steve Schatzow, head of the Office of Pesticide Programs, decided to look at ecological effects of two chemicals in particular, carbofuran and diazinon.[100] Carbofuran was highly toxic to humans in liquid form, but it was much safer to humans when applied in granular form. It was blamed, however, for killing bald eagles. Moore did not take action against carbofuran before leaving EPA, but his successor pushed for its ban and negotiated a phase-out of most uses.[101]

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[99]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: Environmetnal Protection Agency, June 1989), pp. I-37, II-18-22.

[100]The motivations for this are not clear, although the people I talked with agreed that Moore and/or Schatzow said, paraphrasing, "Let's do something about ecological effects." Interviews with Anne Barton, 25 June 1993, and with Edward Gray and Edwin Tinsworth, 28 June 1993. Barton is now Director, Environmental Fate and Effects Division, Office of Prevention, Pesticides and Toxic Substances at EPA. Gray and Tinsworth worked on pesticides in OGC and OPP (respectively) at EPA and then went to work for a consulting firm, Jellinek, Schwartz, and Connolly.

[101]Interview with Gray and Tinsworth, 28 June 1993. Tinsworth commented: "We think he [Moore] was bothered by several things about the case [which led him not to ban carbofuran before leaving EPA]. First, carbofuran was a good insecticides. It worked well, and EPA had a good data base on human effects, which were well known and readily available. Second, he

Diazinon was also a granular insecticide blamed for harming birds, specifically ducks and geese found to ingest the chemical while grazing on grass. EPA cancelled use of diazinon on sod farms and golf courses, two uses for which the benefits side of the risk-benefit analysis was weak because alternative chemicals were available. The manufacturer, Ciba-Geigy, appealed the decision to the Fifth Circuit of the US Court of Appeals, a circuit with a conservative reputation. Ciba-Geigy did not dispute that diazinon killed birds, focusing instead on the significance of those kills by arguing that EPA would have to show that diazinon killed birds "more often than not." The court rejected that argument, finding that EPA needed to find only "significant probability of unreasonable risk." Sounding surprisingly like environmentalists, the court concluded that EPA did not have to show harm to *populations* of birds, but only to individuals.[102]

It seemed, then, that judicial standards may have changed between the 1970s and the late 1980s. Whereas the early pesticide cases shifted their emphasis from ecology to cancer because the latter argument was much stronger in court, by the late 1980s a reputedly conservative court was willing to let EPA ban uses of a pesticide solely because it killed some birds. It was not necessary to show effects on humans or even effects on bird populations. (The court's finding was therefore more consistent with the pollution

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did not trust the objectivity of the ecological effects branch. He believed they were overly zealous and likely to dwell on data that supported their point of view while downplaying other studies. Third, it was unclear that cancelling carbofuran would really improve the environment. Would the insecticide used in carbofuran's place be any better? Fourth, this was a slippery slope. It was almost impossible to distinguish one chemical from the next on these criteria--almost all had ecological effects--and did EPA really want to eliminate a whole category of chemicals?"

[102]Ciba-Geigy v. U.S. Environmental Protection Agency, No. 88-4361, U.S. Court of Appeals, Fifth Circuit, 2 June 1989.

paradigm than the risk paradigm.) Despite that precedent, EPA has not tried since to ban other pesticides for ecological reasons.

This apparently was not because of a lack of openness to the idea at the top. Thomas's successor as administrator, William Reilly, was viewed by agency employees as supportive of ecological concerns. So was EPA's Science Advisory Board. Reilly asked the board to evaluate *Unfinished Business*, a process that resulted in the 1990 publication of *Reducing Risk*. This report placed an imprimatur on the use of risk to evaluate the agency's priorities. While criticizing some of the methods used to create the risk rankings in *Unfinished Business*, the board nevertheless gave ecological concerns a tremendous boost in recommending that "EPA should attach as much importance to reducing ecological risk as it does to human health risk." The board argued that productive natural ecosystems were essential for human health and economic growth, and that they were "intrinsically valuable in their own right."[103]

Using the health risk assessment as their model, EPA employees continued to develop ecological risk assessment methods. In 1991, the agency issued a *Summary Report on Issues in Ecological Risk Assessment*, which suggested changes in terminology from the health framework while retaining the same fundamental approach and sequence of steps. For example, the report substituted the term "stress-response" for "dose-response."[104] This laid the groundwork for a 1992 publication, *Framework for Ecological Risk*

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[103]U.S. Environmental Protection Agency, *Reducing Risk: Setting Priorities and Strategies for Environmental Protection*. SAB-EC-90-021 (Washington: Environmental Protection Agency, Science Advisory Board, September 1990), p. 6.

[104]U.S. Environmental Protection Agency, *Summary Report on Issues in Ecological Risk Assessment*. EPA/625/3-91/018 (Washington: Environmental Protection Agency, February 1991).

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. (Figure 3.) Each of those phases was then divided into smaller steps, most of which were analogues of steps in health risk assessment.[105] The idea that risk assessment was the best way to evaluate and rank environmental problems gained ever greater currency outside EPA during this same period, with reports by the National Academy of Sciences, the Carnegie Commission, and Resources for the Future arguing for this approach.[106]

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.[107] A group called the Habitat Cluster had developed a draft strategy to protect and restore natural ecosystems, the Ecosystem Valuation Forum was trying to quantify "services that ecosystems provide to society in economic terms," an Ecological Risk Management Communication

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[105]U.S. Environmental Protection Agency, *Framework for Ecological Risk Assessment.* EPA/630/R-92/001 (Washington: Environmental Protection Agency, Risk Assessment Forum, 1992), p. 2.

[106]National Research Council, *Issues in Risk Assessment* (Washington: National Academy Press, 1993); Paul R. Portney, (ed.) *Public Policies for Environmental Protection* (Washington: Resources for the Future, 1990); Carnegie Commission on Science, Technology, and Government, (*Risk and the Environment: Improving Regulatory Decision Making* (New York: Carnegie Commission on Science, Technology, and Government, 1993).

[107]Science Policy Staff, "Agency Approaches to Ecological Assessment," EPA Training Under Development, 30 August 1993. (Draft obtained from Laura Gabanski, EPA.)

Group discussed issues about ecological risk management, and Geographic Initiatives tried to create partnerships with government and non-government agencies to protect particular ecosystems, such as the Chesapeake Bay.[108]

Despite these activities, a review of programs across the agency found that "EPA still lacks a clear ecological mission statement or set of specific ecological values to protect and apply in Agency analyses and decisions." The review concluded that there remained a division within EPA between health and ecological risk assessment, "even though humans are inextricably linked and dependent upon the long-term health of ecosystems."[109]

Conclusion

What does the future hold for ecological protection at EPA? The past offers some hints, but no definitive answers. One consistent pattern is that EPA's leaders have had an important influence on EPA's priorities and actions. When Ruckelshaus wanted to emphasize enforcement, the agency emphasized enforcement. When Costle wanted to emphasize cancer, the agency emphasized cancer. When Ruckelshaus wanted to emphasize risk, the agency emphasized risk. When Steve Schatzow wanted to take action against pesticides for ecological reasons, the agency took action. When Reilly wanted to see more attention to ecological protection, methods and ideas for doing so were developed. Administrator Carol Browner's decision to make

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[108]Office of Science, Planning and Regulatory Evaluation and Office of Policy, Planning and Evaluation, "Ecological Risk Management at EPA," 1 July 1993, p. 1. (Draft obtained from Michael Brody, EPA.)

[109]Office of Science, Planning and Regulatory Evaluation and Office of Policy, Planning and Evaluation, "Ecological Risk Management at EPA," pp. 1, 16.

ecosystem protection one of her four priorities thus has the potential for the same powerful effect on agency activities.

Important as leadership is, leaders operate within political and cultural systems that set limits on what they can hope to accomplish. Some government agencies (such as the Veterans Administration, Department of Agriculture, and Department of Defense) have bases of political power in interest groups ready to lobby on their behalf. From the start, however, EPA tied its political fortunes to the broad public interest and relied for its political clout on public opinion. Although occasionally strong, public support for protecting non-human species has fluctuated (or believed in Washington to have fluctuated), which has made this strategy less than reliable. As Doug Costle demonstrated, public health, and especially protection from cancer, was something that had greater political clout than did ecological protection, especially in times of budget austerity. Protection of the public from cancer also had greater clout in legal settings, as the pesticide cases of the early 1970s made clear. Judges were willing to grant EPA broad administrative discretion to ban substances that might cause cancer in humans, even in the absence of direct evidence. Evidence of harm to non-human species was subjected to a higher level of scrutiny. If the past is a faithful guide, today's concern about the national debt might make protecting "birds and bunnies" a politically difficult strategy.

On the other hand, history need not necessarily repeat itself. The 1989 appeals court decision in the diazinon case was intriguing: a supposedly conservative court decided that the agency had the power (even under a cost-benefit statute) to ban uses of a chemical because it killed some birds, not because it threatened bird populations or human health. If this reflects a change in public views as a whole, it may be that support for ecological

protection is more widespread than in the past. Even as the public might be more accepting of these sorts of arguments, however, the agency is moving away from them. The risk paradigm differs from the pollution paradigm in emphasizing tradeoffs and scientific knowledge, which makes it less accessible to the general public. EPA has always relied on public opinion for its political clout. Now, it has set its task to lead, rather than to follow, public opinion. This is a more difficult task politically.

Above all, EPA's history has been the story of clashes of values. At the outset, this clash was exemplified in the different approaches taken to pesticides by the Office of Pesticide Programs and the Office of General Counsel. One favored a cost-benefit approach and the other a more absolute approach. One favored an emphasis on humans and the other an emphasis on other species. The success of ecological protection at EPA will likely rest on the extent to which the agency can tap values widely held in the public.

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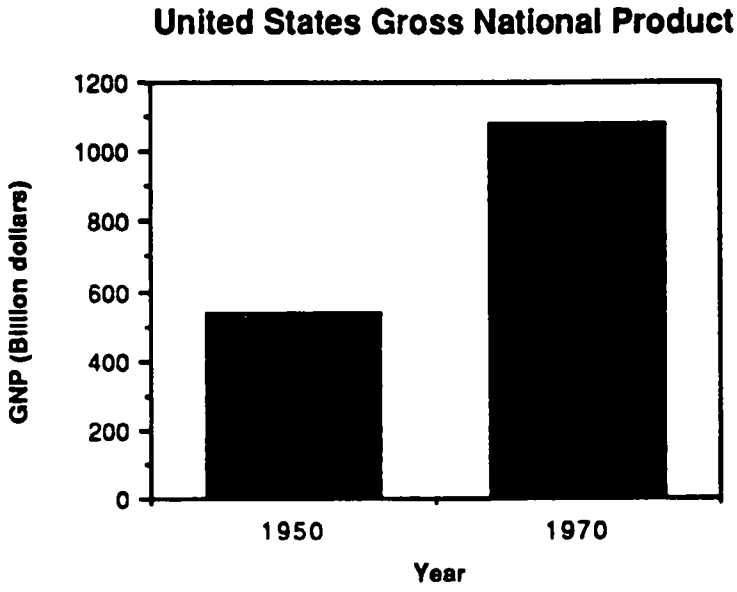

Figure 1: United States Gross National Product, 1950 and 1970, In Constant 1972 Dollars. (Graph Created from Data in *Information Please Almanac 1989* (Boston: Houghton Mifflin Company, 1989), p. 53.

Paradigm	Pollution	Risk
Problems	Often visible and concrete	Often invisible and abstract
Time frame	Immediate (crisis calls for action)	Longer (time for study and planning)
Goal	Stop	Reduce
Standards	Absolute	Relative
Featured rationale	Values	Tradeoffs
Methods	Command Control Quick to sue	Markets Persuasion Slower to sue
Shorthand for methods	Clean up	Manage
Relationship with regulatees	Adversarial	Cooperative (with enforcement as backup)
Calculation	Ignore costs of control	Balance costs of control
Focus of blame	Polluters, especially industry	Diffuse
Focus of measurement	Source	Receptor
Statutes	EPA: • Clean Air Act • Clean Water Act Others: • NEPA • Endangered Species Act • Migratory Bird Act • Bald and Golden Eagle Act	FIFRA TSCA
Willingness to regulate if science is uncertain	Higher	Lower
Exemplars: Individuals outside EPA	Carson Commoner	Portney (RFF)
Exemplar: Individual at EPA	Ruckelshaus I	Ruckelshaus II
Exemplars: EPA offices at founding	General Counsel and Enforcement	Pesticides
Exemplars: Environmental groups	Early EDF Greenpeace	Center for Resource Economics
View of nature	Fragile	Resilient
View of human effect on nature	Disruptive (Absolute harm)	Variable (Probability of harm)

Reliance on public opinion to drive agenda	Higher (especially as expressed through Congress)	Lower (reliance on expert opinion, with public education as goal)
Visibility of regulation to public	Higher (court cases in headlines)	Lower (negotiation not in headlines)
Featured professionals	Lawyers	Scientists Managers
Familiarity of language to public	Higher (dirty air, dead animals)	Lower (probability, dose-response curves)
Tilt in Power	Legislative	Executive
Units of analysis	Often unquantified; references to values, lives, and economics	Often quantified in lives (risk) and dollars (costs and benefits)
Antecedents	Romanticism (Thoreau) Preservationism (Muir)	Utilitarianism (Mill) Conservationism (Pinchot)

Figure 2: Pollution and Risk: A Comparison of Regulatory Paradigms

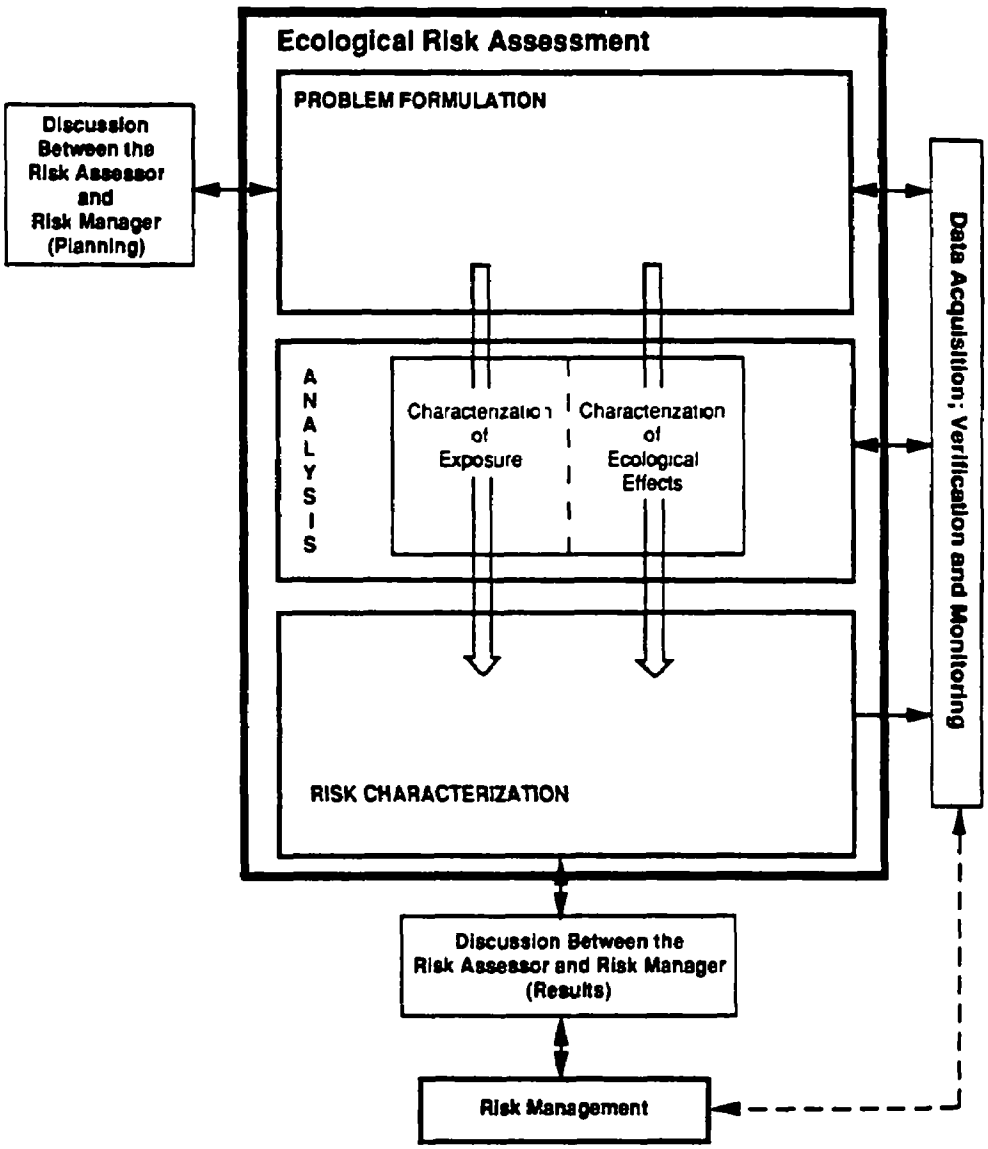

Figure 3: Framework for Ecological Risk Assessment. (Reproduced from U.S. Environmental Protection Agency, *Framework for Ecological Risk Assessment*, p. 4.)