Rachel Carson Procedings

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Simple Words of Awakening

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To the average reader forty years ago, the message was startling and eye-opening—that the indiscriminate use of synthetic pesticides was harmful to more than just insect pests. Rachel Carson explained this in her book Silent Spring, and the simplicity of her words rang an alarm heard far and wide. The result was the birth of a popular environmental movement that brought out in the American public a whole new vocabulary.

The chemical industry, seeing its lifeblood threatened, quickly struck back, saying it was not that simple. Chemicals with names like Alrin, benzene hexachloride, chlordane, dieldrin, and dichlorodiphenyltrichloroethane, more simply known as DDT, were all tools that man needed for the progress of a nation. Why listen to an amateur, they said, who knew very little about the sophisticated science of pesticides, a woman who was not even a scientist. At stake was our public health and agricultural productivity. They pleaded with us for our trust; after all, Miss Carson was nothing more than a naive, and misinformed writer.

It was a nasty fight. Carson had stirred up a hornet's nest in her opponents, who claimed to represent the progress of a nation. They used all tools at their disposal to claim she did not have the credentials to comment on their industry. Despite this, Carson stayed on message and described forcefully the impacts of chemicals on the environment in a simple way that the average person could understand—we were poisoning ourselves. Her words struck the blows:

"It was a spring without voices. In the morning that had once throbbed with the dawn chorus of robins, catbirds, doves, jays, wrens, and scores of other bird voices there was now no sound; only silence lay of the fields and woods and marsh... No witchcraft, no enemy action had silenced the rebirth of life in this stricken world. The people had done it themselves."

Carson challenged us to question how easily in the past we had accepted the chemical fogging of neighborhoods and the toxic treatments of wetlands. She taught us that nature was a fragile community, easily weakened or destroyed by the hand of man. She warned us that only through our actions would things change. We listened, and we began to act in what would become a popular movement for environmental protection.

She had a gift of articulating complex ideas in an unadorned but elegant fashion that readers could easily digest. This was the essence of her genius. The words she used opened a new world to her readers. We became familiar with terms like environment, ecology, and endangered species, which brought us all closer to the land, and built in us an awareness of nature's community.

Carson always strived to go beyond the small, tightly knit conservation community and recognize the inherent support of the public to environmental causes. While organizations like the Isaac Walton League and the Audubon Society were the backbone of conservation efforts, she understood that only with the support of the common person could we effect change.

"I am convinced" she said, "that we have been far too ready to assume that these people (the public) are indifferent to the world we know to be full of wonder..." (Lost Worlds)

Although Carson died of cancer in 1964, she lived long enough to see her vision begin to bear fruit. People moved to action. Silent Spring was a runaway best seller that became an icon of our popular culture. Politicians began to stand behind her. They banned the use of DDT in 1972, followed by limiting other pesticides. Despite attacks on her wisdom that are heard even today, her simple truths have held her above the fray as an American who changed the outlook of a nation.

Environmental contaminants still pose serious problems in this 21st century world. We continue to face challenges we have brought upon ourselves. Sometimes we win, but too often we accept partial victory, at the expense of the land. Thankfully, Rachel still speaks to us, feeding our awareness and giving us courage. It is still a simple idea—we should not poison the land if we expect to survive. Forty years after our eyes were opened, we celebrate her words, her wisdom, and are grateful for her courage. The birds still sing, bringing us hope. Listen to the song of the robin at dusk and you may hear the name "Rachel" riding on the wind.

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A Collaboration for the Ages:

Rachel Carson and The United States Fish and Wildlife Service

By Dr. Mark Madison
USFWS Historian

If anything can be said of Rachel Carson, it was that she was a gifted, powerful, and enduring writer, an extraordinary observer of human impacts on natural environments. She linked that writing with her fearful concern for the destruction of fish, wildlife, habitat, and humans by the indiscriminate use of poisons, pesticides, toxic chemicals–most notably DDT. That may be stating the obvious, of course, but it was clearly Rachel Carson's intent to shape public opinion into bolts of lightning and rain them down on the makers and distributors of such poisons.

And if anything can be said of the Fish and Wildlife Service, it's that it gave Carson an opportunity, an opportunity in both research and writing that she used to create one of the most visionary and influential environmental voices of the 20th Century.

But Carson died in 1964 at a time when the public was just beginning to understand and appreciate the disaster she had foretold. In the 42 years since then–reaching into 2006–an enormous movement has grown and prospered–the Environmental Movement with its emphasis on environmental contaminants.

Rachel Carson's sixteen years with the U.S. Fish and Wildlife Service are now largely forgotten, overshadowed by her celebrity as an author. But it is true that many of Carson's ideas and writing skills were developed while working for the nation's only wildlife conservation agency. Their collaboration was a virtually unparalleled partnership in the history of conservation in America.

To celebrate the 60th anniversary of Rachel Carson's first published book, Under the Sea Wind, and in anticipation of the 40th anniversary next year of Silent Spring, the National Conservation Training Center held a symposium on Rachel Carson and the Conservation Movement: Past, Present, and Future. The symposium was designed to blend history, science, and the arts and included readings, a Carson play, artwork from Carson's books, experiential workshops in the Center's labs and surrounding woods, and plenary sessions by distinguished scientists, writers, and conservationists. Among the speakers were Linda Lear, Barry Lopez, Theo Colborn, Sylvia Earle, Pat Hynes, Roland C. Clement, David Pimental, Spence Conley, Mary Henry, Jim Kurth, Ward Feurt and Diana Post. The event was held in Shepherdstown, West Virginia 70 miles west of Washington, D.C. At the National Conservation Training Center, home of the U.S. Fish and Wildlife Service.

Carson had not intended to work for the government, but her hopes of an academic career were derailed by the Great Depression. But faced with supporting a family and armed with a Masters in Zoology from Johns Hopkins University, she sought a position with the Bureau of Fisheries the nation's oldest conservation agency. In 1936 she was hired by the Bureau at the minuscule, but stable, salary of $19.25 a week. She was the first female biologist hired by the Bureau and one of only two women in a non-clerical position. She was assigned to write radio scripts explaining marine biology and the work of the Bureau of Fisheries to the American public. Her aptitude for writing flourished in this position and some of her more ambitious scripts were adapted for popular magazines of the day like Atlantic Monthly.

Carson's ability to make the life of the sea come alive for the American public was evident in her first published book Under the Sea Wind (1941). The book was anthropomorphic albeit engaging in its clear-headed explanations of life in the sea. Unfortunately it was a commercial flop and Carson remained a writer-biologist for the U.S. Fish and Wildlife Service, the new entity created in 1940 by combining the Bureau of Fisheries with the Biological Survey. Within this new agency, responsible for conservation of all creatures on land and sea, Carson rose quickly. Her writing and editing skills allowed her to became Chief Editor of all Publications by 1949 an important position as the Service attempted to explain wildlife conservation for the first time to the broader American public. As part of this effort Carson was put in charge of an ambitious series called

"Conservation In Action"—an attempt to explain the work of the Service through extensive photos, clear text, and an overarching theme of protecting the environment to maintain our wildlife resources for posterity. It was the type of lucid explanation of complex ecological principles (e.g., environmental destruction, food chains, migratory bird flyways and wildlife refuges) that was to become a hallmark of her books.

In addition to being the public relations arm of American conservation, Carson was also suddenly exposed to cutting edge science including troubling new findings on environmental contaminants. The Fish and Wildlife Service's premiere laboratory in Patuxent, MD had begun to study the effects of pesticides like DDT on certain wildlife, primarily birds and their eggs. This research had begun early in 1944 shortly after DDT came into widespread use as a chemical to win the World War II. As Chief Editor Carson oversaw all the scientific publications emanating from this new research and as early as 1945 began considering the topic as a source of an article or book. However, she was already at work on her second more successful book The Sea Around Us (1951). This second book was a bestseller and allowed Carson to leave the "lucrative" field of government service and devote herself full time to writing. Yet the germ of an idea had already been laid and ten years after she left the Service in 1952 Carson would write a pioneering book ushering in the modern environmental movement, Silent Spring (1962) Amidst Silent Spring's voluminous endnotes are references to her scientist colleagues at Patuxent and refuge managers in places Carson had profiled for her "Conservation In Action" series. The skills Carson had developed in her sixteen years as government writer allowed her to take a complex scientific argument and make a compelling case to the general public in the chemical indictment that was Silent Spring.

Although Carson was always a writer and only occasionally a federal conservationist, all of her work benefitted from this important early initiation into public writing, wildlife conservation, and environmental contaminants. Carson gently led her audience through the complexities of food chains, contaminants, interconnectedness of natural systems, and a balance of nature in all her federal and popular writings

Her legacy can be found in the Environmental Protection Agency, the Fish and Wildlife Service's Division of Environmental Contaminants, and in a more knowledgeable American public concerned about the purity of their local environment. Perhaps her final legacy is one of civil servant's mobilized for conservation. There may be no better role model for federal conservationists than Rachel Carson. Not only did she overcome significant obstacles facing women in science, but she became our century's most articulate voice for a harmonious balance between humans and nature.

Carson's life and legacy are an inspiration to public servants who seek to protect our natural resources in perpetuity and a stinging rebuke to those who would diminish and degrade our children's natural inheritance. She outlined a path for all of us to conduct our work with integrity and ethics–even lightning bolts of public opinion—and to devote our lives to conservation in action!

Mark Madison, Fish and Wildlife Service Historian

Environmental Effects of Pesticides On Public Health, Birds, and Other Organisms

By Dr. David Pimentel
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This a tribute to Rachel Carson and her book, Silent Spring (1962). She had the foresight and knowledge to warn us against the ecological hazards of pesticides to public health and other organisms. Carson's book was also instrumental in giving recognition to the growing field of science of ecology. For all of Carson's many contributions, all of us are indebted.

From the time that the U.S. started using synthetic pesticides in 1945 to the time that Carson's book was published, pesticide use increased about 6 fold (Pimentel, 1975). It took 10 years from the time that her book was published before DDT was banned in 1972. By the time that DDT was banned, pesticide use had increased 10 fold to about 1 billion pounds. The total quantity of pesticides in terms of pounds has not increased, however, the actual toxicity of pesticides have increased 10 to 20 times (Pimentel et al., 1993). The prime benefit with the new highly toxic pesticides that replaced DDT and similar chemicals is that the new toxicants do not persist for long periods of time in the environment. DDT persists in the soil for 30 to 50 years, whereas the newer insecticides persist only up to 3 months.

The major problem with the recommended use of pesticides is that so little actually reaches the target pests. The estimate that less than 0.01% of the pesticides that is applied reaches the target pests. (Pimentel and Levitan, 1986). This, of course, means that 99.9% of the pesticide that is applied pollutes the environment. The result is numerous birds, fish, and other species are killed or affected by the applied pesticides.

In this article, I will briefly review the environmental impacts of pesticides on public health, birds, and other organisms.

Human Pesticide Poisonings

In the United states, as mentioned, more than 1 billion pounds of pesticides are applied and worldwide about 5 billion pounds are applied each year (Pimentel and Hart, 2000). Some humans are directly exposed to the pesticide sprays, especially those people who apply pesticides. In addition, pesticides contaminate human food and water resources. For example, about 35% of the food that is purchased has measurable levels of pesticide residues, with 1% to 3% having residues that are above accepted tolerance level

In the U.S., about 110,000 humans are poisoned with pesticides, with about 25 accidental deaths each year (Benbrook, et al., 1996). Worldwide the situation far more serious with 26 million people poisoned, with about 220,000 deaths each year (WHO (1992). In addition, pesticides cause cancer and the estimate is that there are more than 10,000 cases of cancer are the result of pesticide exposure (Pimentel and Hart, 2001). Pesticides also disrupt the endocrine, immune, neurological responses in humans and other animals (Colborn et al., 1996). It is interesting that these Disruptors tend to make male animals become female in structure. In addition, the production of sperm is greatly reduced or is zero.

Bird Poisonings

Like humans, birds are also poisoned by pesticides. Birds, like the canary in coal mines, make excellent "indicator species". In fact, the suggestion in the title of Rachel Carson's book was that if we continued to apply DDT and other pesticides we would have a SILENT SPRING — without birds singing. Birds are poisoned by the direct exposure to pesticides, poisoned by feeding on contaminated prey, and have reduced growth and reproduction because of the exposure to sub-lethal exposure to pesticides. In the United States, approximately 3 pounds of pesticide are applied per acre per year on about 400 million acres (Pimentel et al., 1993). Incidentally, homeowners apply about 8 pounds per acre per year, or nearly 3 times the pesticide dosage that farmers apply per acre. The full extent of bird kills by pesticides is difficult to determine, because birds are secretive, camouflaged, highly mobile, and live in dense grass, shrubs, and trees.

If it is assumed that the that pesticides inflict on birds occur primarily on the 400 million acres of cropland that receives most of the pesticide, and the bird population is estimated to be 1.8 birds per acre of cropland (Boutin et al., 1999) then about 720 million birds are directly exposed to pesticides. If it is conservatively estimated that only 10% of the bird population is killed, then the total number of birds killed is approximately 72 million birds.

Therefore the conservative estimate is that about 72 million birds are killed each year because of the direct exposure to pesticides. This 72 million does not include the nestlings lost because one or more parent is killed and/or that pesticide contaminated insects and earthworms brought to the and fed to the nestlings. The actual number of birds killed might be twice the 72 million figure.

The American Bald Eagle and other predatory birds suffered high mortalities because of DDT and other chlorinated insecticides. The Bald Eagle population declined primarily because of pesticides and was placed on the endangered species list. After DDT and the other chlorinated insecticides were banned in 1972, it took nearly 30 years for the bird populations to recover. The American Bald Eagle was recently removed from the endangered species list (Millar, 1995).

Beneficial Natural Enemies

In both natural and agricultural ecosystems, a large number of species of predators and parasites, control and limit the feeding pressure of plant feeding arthropod populations (Pimentel, 1988). The biological control organisms help ecosystem remain "green" with foliage on trees, shrubs, and other plants. The beneficial parasites and predator help control pest arthropods in agricultural crops (Pimentel et al., 1993).

In the United States, I estimate that while pesticides provide approximately 10% of pest control, natural control provide about twice times this amount of control (Pimentel and Hart, 2001). Many cultural controls such as crop rotation, soil and water management, fertilizer management, planting time, crop-plant density, trap crops, mechanical cultivation, and polyculture provide additional benefits for pest control. Together, these non-chemical controls could be used effectively to reduce U.S. pesticide use by more than 50% , without any reduction in crop yields and/or cosmetic standards (Pimentel et al., 1993). Confirmation that pesticide use in the United States could be reduced by 50% comes from the fact that Sweden reduced pesticide use by 50% from 1992 to 1997 and now on a program to reduce pesticide use another 50% (Pimentel, 1997). In Indonesia, most of the pesticide was applied to rice, Dr. I.N. Oka was able to reduce pesticide use by 65% and increase rice yields by 12%. This illustrates what can be done, if pesticides are used judiciously.

Pesticides frequently have adverse impacts on beneficial natural enemies. For example, the following pests have reached outbreak levels following the destruction of natural enemies by pesticides: bollworm, tobacco budworm, cotton aphid, spider mites, and cotton loopers (Pimentel et al., 1993). Significant pest outbreaks have also occurred in other crops.

When outbreaks of pests occur because their natural enemies have been destroyed by pesticides, additional and usually more expensive and toxic pesticide treatments are required to sustain crop yields. It is estimated that the destruction of natural enemies by pesticides, the subsequent crop losses, and additional pesticide application cost the United States more than $500 million per year (Pimentel et al., 1993).

Pesticide Resistance

The widespread use of pesticides has resulted in the develop of pesticide resistance in insect pests, plant pathogens, and weeds. The estimate is that more than 1,000 species of pests are now resistant to pesticides. As pesticide use increases, the number of pesticide resistant pests explode.

Increased pesticide resistance in pest populations frequently requires several additional applications of pesticides. The additional pesticide applications, tends to compound the problem by increasing selection in the target pests. Despite numerous attempts to deal with this problem, pesticide resistance continues to develop at a rapid rate (Pimentel et al., 1993). Assuming a 10% loss in major crops that also receive heavy pesticide treatments in the United States because of resistance, total losses due to pesticide resistance are estimated to be about $1.4 billion per year (Pimentel et al., 1993).

Honey Bee And Wild Bee Poisonings

Honey bees and wild bees are vital to the pollination of about one-third of the crops in the United States, especially fruits and vegetables. The benefits of bees for pollination are estimated to be about $40 billion per year if forages and pastures are included in the assessment (Pimentel et al., 1997). Because most insecticides and some fungicides and herbicides are toxic to bees, these pesticides have a major impact on both honey bee and wild bee populations (MacKenzie and Winston, 1989; Pimentel et al., 1993).

For most agricultural crops, both yield and quality are enhanced by effective pollination. For example, adequate pollination of fruits and vegetable provide major benefits.. With effective pollination, melon yields were increased 10% and quality was raised 25%, as measure by the dollar value of the crops (Pimentel et al., 1993).

Approximately 20% of all honey bee colonies are adversely affected by insecticides, and the yearly estimated loss from partial bee kills, reduced honey production, and the cost of moving colonies, total about $25 mill per year. Also, as a result of heavy pesticide use on certain crops, beekeepers are excluded from 10 to 15 million acres of otherwise suitable apiary location, and the yearly loss in potential honey production in these regions is about $27 million each year (Pimentel et al., 1993).

Based on the analysis of honey bee and pollination losses caused by insecticides, pollination losses attributed to pesticides are about 10% of the pollinated crops, at a yearly cost of about $200 million per year. The combined annual costs of reduced pollination and direct loss of honey bees due to insecticides can be estimated to be at about $320 million each year (Pimentel et al., 1993).

Ground And Surface Water Contamination

Most pesticides applied to crops eventually end up in ground and/or surface water. Aircraft applications of pesticides is the most effective means of contaminating the environment. For instance, under ideal weather conditions only 50% of the spray from an aircraft or helicopter reaches the target acre, the remaining 50% drifts off to contaminate the environment. The current growing technology is the use of ULV (ultra low volume) spray technology. Because concentrated pesticide spray is applied, little or no water is added to the spray. Of course, this means breaking the pesticide spray into very small particles to obtain good coverage of the crop plants. The very small and light weight droplets are more prone to drift. Thus, under ideal weather conditions, only 25% of the pesticide lands in the target area and 75% drifts off into the environment (Pimentel et al., 1991).

Pesticide contamination of ground and surface waters is a serious concern in the United States. One study showed that pesticide residues were found in 92% of Midwestern reservoirs (Solomon et al., 1996). Also in the Midwest, Iowa, herbicide residues were found 75% of the wells sampled (Koplin, et al., 1998a). Also in the Midwest, 54% of the shallow ground water sites were found to be contaminated with pesticides (Koplin, et al., 1998b). Then in the Northeast, Hudon River Basin region of New York State, pesticides were found in 69% of the well networks (Phillips, et al., 2000).

Approximately 60% of all drinking water comes from ground water. Detectable levels of pesticides are found in about 15% of U.S. wells. If an adequate job were done in monitoring pesticide levels in ground water, the cost would be about $1.3 billion per year (Nielsen and Lee, 1987). Remember this is only monitoring but does nothing to correct the water contamination problem.

Conclusion

We currently spend about $8 billion each year in the recommended use of pesticides and this use of pesticides returns about $32 billion each year. However, these benefits do not include the environmental and public health costs of using pesticides. These costs are estimated to total about $9 billion per year.

If as has been done in Sweden and several other countries, including Norway, Denmark, Netherlands, Ontario, and Indonesia, pesticide use in the United States could be reduced by more than 50% without any reduction in crop yields or cosmetic standards. Reducing the recommended use of pesticides would significantly reduce the environmental and public health impacts of pesticides. It is long overdue that we reduce the use of pesticides use them in a judicious manner that will benefit farmers, the environment, and public.

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Prophets are First Pros

Roland C. Clement, of Hamden, CT, was born in 1912, and after a dozen years in business, returned to school to professionalize his interest in birds. With a diploma from the Stockbridge School of Agriculture (wildlife) and a 1981 citation as Distinguished Alumnus of the School of Forestry at the University of Massachusetts (Amherst) he also spent 3-1\2 World War II years as Air Corps Weatherman, serving in sub-arctic Labrador and studying its birds then got degrees from Brown and Cornell. He spent thirty years as an Audubon Society professional, first in Rhode Island, then in New York City, where he was headquarters' biologist and became a vice president of the National Audubon Society. He was chairman of the Corps of Engineers Environmental Advisory Board and was active in California Condor and Peregrine conservation programs. Historian Linda Lear called him "the best of (Rachel) Carson's public defenders." He wrote two species accounts for A. C. Bent's Life Histories of North American Birds, and contributed to the Service's Birds in our Lives, and Waterfowl Tomorrow.

"Before telling you the little I knew of Rachel Carson, let me say that service in the U. S. Fish & Wildlife Service was long an ambition of mine. My Newport, R. I., friend, John J. Lynch, who became director of waterfowl food habits research on the Gulf Coast, inoculated me by introducing me to the great refuges of the Lousiana coast when I was stationed at Lake Charles. I knew and admired the first chief of your Service, that great naturalist, Ira Gabrielson. Indeed, in 1963, when we both attended the first world congress of the IUCN in Nairobi, it was my great pleasure to bird the flats of Lake Nakuru with Gabrielson and Julian Huxley, author of The Modern Synthesis. I had the same admiration for John Gottschalk, Clarence Cottam, and other members of the Service.

Although I knew of Rachel Carson, having marveled at her book, The Sea Around Us, I had not met her before she authored Silent Spring. I had often heard of her from Shirley Briggs, who had been a colleague at Interior and was active in the local Audubon Naturalist Society.

Sometime in 1961, however, in Audubon's New York City office, I was handed the galleys of a new book by Rachel Carson and was asked to appraise it because her publishers had asked Audubon to endorse the book. I recommended endorsement, but for reasons of their own, my superiors decided not to endorse Silent Spring!

Of course, Carson was "pushing the envelope." The book's illustrator, Louis Darling, was a friend and neighbor, and he felt sure that Carson had overextended herself. Joseph J. Hickey, an ornithologist teaching wildlife ecology at the University of Wisconsin, advised his students not to read the book, just as two decades earlier, Brown University's geologists had advised me to be cautious about Wegener's views on continental drift, since they could not (then) be tested.

But the controversy created by Silent Spring was no academic conundrum. As a participant in the National Academy of Science's "flying symposium on pesticides" in 1964, I learned that industry's top chemists had not even read Silent Spring. Their public relations people had told them it was bad for business, so they joined in attacking it! The controversy raged for a decade and continues more subtly. Linda Lear summed up much of this in her biography, Rachel Carson / Witness for Nature, and I wrote a short version of my own contentions for the law school journal, Environmental Affairs (winter, 1972).

The thing to remember is that Rachel Carson was a good field biologist long before Silent Spring made her a prophet. It was because she knew "the birds and the bees", and the chemical cycling of food webs, that she became concerned about the use of pesticides. The threat of the atom, especially the incredible advice of Vice President Nelson Rockefeller to build your own backyard bomb shelter, had traumatized America. It prepared the way for Silent Spring. The space shots helped also.

It is equally important to notice that Rachel Carson's Silent Spring merely alerted us to a serious environmental

problem. It solved nothing. That is for us to do. And since we are a social species, it is what we do as a society, not as mere individuals, that decides how we exercise our awareness and our responsibility. The problem is institutional. Today's largest and most powerful social institution is the large corporation — no longer the government. Adam Smith warned us that we had better keep the "firm" small, else it would not serve the public interest. We failed to do this, and it is time to wake up to the fact that it is now the actions of corporations that destroy the world, not the attitudes and failures of the citizenry. Let me illustrate this. During a major Senate hearing on pesticides in 1963, the chairman, Senator Ribicoff, came to me during a recess and said, "Clement, if you want us to ban DDT, don't mention exports." The next day Rachel Carson made her plea to this same committee, unaware that the Congress had already made a pact with the chemical industry: "Allow us to ban the use of two or three chemicals, and we won't interfere with your production and export of all these chemicals."

The philosopher, A. N. Whitehead, saw that the world is never the same for our having passed through it. He called this our objective immortality. Rachel Carson died in 1964, but a few months earlier, when she was awarded the Audubon Medal for services to conservation, Margaret W. Owings, champion of the California Sea Otter and the puma, sat next to Rachel at dinner and promised her she would help continue her battle. Margaret then gave Audubon a Rachel Carson Memorial Fund. From this fund we gave a small grant that helped the nascent Environmental Defense Fund to "go national," and in 1972 EDF's petition to EPA to ban the use of DDT was largely granted. But the struggle to bring mankind's use of the Earth into compliance with ecological realities is only begun. The rest is up to us and succeeding generations. May our progeny include enough good naturalists to see the connections."

Cops on the Beat

By Dr. Mary Henry

Mary has both a Masters and a Ph.D. in eco-toxicology, and in that respect she represents sort of the second generation of eco-toxicologists that we have in the country now. These are students who when they began their graduate education, sought out the relatively few professors that would let one or two of their students work on a toxicology study, on the side, in an Aquatic Resources department. In fact, that's where Mary and I first met. We were both grad students together at Iowa State University. That's where Mary was working on her Ph. D. She was pushing the envelope on Aquatic Toxicology. She was getting beyond the routine "kill 'em and count 'em" tests, and studying the various, subtle behavioral effects of pollutants on fish behavior. In fact, one of the behaviors that she would test for was an irritation caused by pollutants on fish gills. Of course, disparagingly, all of us other grad students just called that "fish coughing". But regardless, it was very profound work in that arena. We were beginning to look at the sublethal effects of pollutants on fish and wildlife resources. Mary actually joined the Fish and Wildlife Service while she was yet a grad student. And upon graduation, she began a research career at Columbia-Midwest Science Center, and then later at the Great Lakes Science Center, where she looked at Aquatic Toxicology on big waters. Throughout her career, she has advocated the use of aquatic bio-essays, and has strived to make them portable for users in the field. She has even worked on methodologies for aquatic bio-essays in third world countries and the former Soviet Union. In 1988 she began the Fisheries and Wildlife Co-op Research Unit at the University of Minnesota, where she did groundbreaking work with aquatic invertebrates, discovering the incredible amount of toxicology from agricultural pesticide runoffs into our prairie potholes. When the Research arm of U.S. Fish and Wildlife Service went over to USGS, Mary made a very calculated career change. She decided to stay with the U.S. Fish and Wildlife Service, turned her back for a while, on her research career, and stayed with the part of the Agency where the 'rubber meets the road', as we like to call it. We are very glad that Mary has come over to the operational wing of the Fish and Wildlife Service. Having a scientist of her caliber is very inspirational for all of our young biologists and toxicologists, in the field. It sure gives us credibility when she is doing all of her hard work, arguing for the protection of our natural resources with all of the agencies and industry. Let's give a warm welcome to Mary.

What a lovely introduction. It chokes me up Jewel. Thank you very much. It's a real pleasure to be here today to talk to you. Every year, around this time, I reread Silent Spring. I read it first when I was in college. It made a big impression on me, and that when I changed from pre-med, and began to pursue a career in environmental toxicology. It happens to be my birthday today. [Applause] What are the chances that I would be talking about this subject on my birthday? What a great present, to get Theo's talk. She cross-references a lot of material that I hope to go into in a little more detail. I would like you to stay tuned, and focus on two things as I go through my talk. What you hear here as a main take home message, is that a cornerstone of any debate, any argument, whether it is politically driven, corporate-greed driven, eco-toxicologically driven, environmentally justice driven, the cornerstone is having good science, having good data. The argument is moot without that. Theo has pointed that out beautifully in her talk. The second thing, that I think is subtle, and runs through all of Rachel Carson's work, and in part of my message to you today is, is the value of field work. The endocrine disruption phenomena was observed in the field, in 1988, in colonial nesting water birds along the shores of the Great Lakes. Having these trained people on the ground as scouts, noticing the change, like cops walking their beat, and knowing that something is wrong. This is a critical, critical cornerstone for us to continue this work as a society, or as a Fish and Wildlife Service. And it is woefully, inadequately funded. I'd like you to think about that. We are delegating away to the occasional graduate student, who might be walking that beat for a two to three year period, or to a consultant, a temporary stint in a given area. We are delegating away the eyes and ears that are there on the ground for a decade or two, watching those subtle changes. Sick animals are very difficult to detect. They usually hide. Dead birds don't flush. So you have to be

out there, in the environment, on the landscape, noticing the change. I do have slides, so I am going to use them to make a few points.

Besides those two major take-home messages I'd like to talk a little bit about the roots of our USFWS Environmental Contaminates program. Not just because that's the team I play on, and the jersey I am wearing at the moment, but because I think it's a sterling example of this presence on the ground; this trained, professional pollution biologist watching in the landscape, in the natural resource habitats for changes due to contaminates. I'd be singing that tune, no matter what team I was playing on. Secondly, I have gone through, and picked out a few things that Rachel alerted us to in Silent Spring. I would like offer a 'then vs. now' comparison. I'd like to talk briefly, and only by way of giving you a very quick sampler of things that were not predicted in Silent Spring, that I am sure Rachel would be very interested in. And I'd like to talk about our future as a scientific community since that's what I am here to represent on the program; the science of eco-toxicology, and how we are going about doing it.

The mission of the Fish and Wildlife Service is to preserve, protect and enhance fish and wildlife and their habitats. The mission of the E.C. program, and I will refer to is as such for brevity's sake from this point onward, Environmental Contaminates program, is to look at the quality of the habitat, and the health of those organisms from a pollution threat standpoint. We often get the question; "I though EPA did that? What do we need you for, in the Fish and Wildlife Service?" There is a big difference in the way we approach the work, from the way that the EPA approaches the work. First of all, EPA is principally human-health driven. They are trying to put the "E" back in EPA. But human health concerns are really driving a lot of their efforts. We, on the other hand, are "critter driven", fish and wildlife resource driven. Even if you don't like animals, you can still look at them as sentinels of things that are about to happen to humans, or may be happening to humans as we speak.

EPA is in charge of regulation of chemicals, and abiotic media like water, air, sediments, and discharges. We on the other hand, have the regulatory authority for animals, such as threatened and endangered species, interjurisdictional fish (those are fish that migrate across state lines or country lines) and migratory birds. EPA develops and implements regulation, and legislation. We test drive it for adequacy for trust resources. We use the policy. We evaluate the policies. We use the models. We go out and do the field work to determine if there is a contaminate present, if it's reaching our trust resources, and if it's having an effect.

There are two halves of the EC activities, I think, that are very important. One is prevention. We get very heavily involved in preventing the release of chemicals in the first place. That's half of what we have to pay attention to and Rachel talks about that in Silent Spring. And Patricia Hynes referenced that yesterday. It's one thing to let Pandora out of her box, and then create a recall program. That's very, very difficult. It's a lot easier to prevent the release of chemicals in the first place. And with pesticides, these were chemicals that were developed with release in mind; we do have some control over them. We can prevent release if we determine it's a bad actor for fish and wildlife purposes or human health purposes. We also work with agencies that have this authority, to get them to do their job well. I am going to talk later in this presentation about chlorophenapure, a recent pesticide that we were very, very deeply engaged in debate about with EPA and American Cyanamid.

We also manage our own lands, with an eye on pollution. But there is a lot of chemical out there, from the 1930's, from the 1920's, a historical "gift" from the past that we are still dealing with. And all the way up to recent discharges. Our program gets out there, on the ground, and screens locations and animal populations for the presence of chemicals. Usually it's more than one, we've barely even referenced that. That's a scientific lecture we could have for a whole other weekend, another time; the interaction of these chemicals with one another. If we detect the presence of a chemical, we access the magnitude of the problem. Does it get to the trust resource of concern, or to our lands that we manage? Is it having an effect on trust resources? Take a management action, if one is required. Or, conduct a cleanup, as you'll see in the lower box, "Clean up and natural resource damage assessment". Sometimes working with the principal party that did the contaminating, or did the release in the first place, working on a settlement to restore that habitat, or to develop adjacent properties for use by Fish and Wildlife. The important part of this picture is that we are taking things that are out there. But you never replace what was there. We can't salve our consciences, thinking that cleanup and restoration is indeed the answer, because it's never quite the same. It's better than nothing, but it's never quite the same. Prevention is much more productive.

Let's look for a minute at warnings that Rachel gave us about pesticides, in Silent Spring. She talked about heavy production. David Pimentel referenced the numbers of chemicals being produced as pesticidal products yesterday. We went from about two hundred in 1962, to thousands in the current day. She talked about heavy reliance on organochlorine insecticides, "OPs", chlorinated hydrocarbons, OP's being organophosphate insecticides. I'll show you a list in a moment. The red ones are the ones I'm going to highlight by telling you a little bit more of a story, or a detailed account of what's going on in the

twenty-first century. Residues in food, Theo has already talked about, with the Food Quality Protection Act. Toxic modes of actions of pesticides; Rachel talked about a probable or a prospective toxic mode of action, meaning the way that the chemical renders it's toxicity to the target organism. How it does its bad thing to render the animal either dead or incapacitated. She talked about disruption of energy production in cells. I read this book every year. It's like present. I open it. It's familiar, it has familiar rapping paper, but the contents are always different, because I see something new in the writings. It's as if I had never read the book before. This really stuck out this year, in the reread; disruption of energy production in cells. I don't even know if Rachel had any data on that but the chlorophenapure The example that I am about to talk about is exactly that, cell disruption at the very basic level of oxidative phosphoralation. We'll talk there about impacts on reproduction and persistence as well. But she warned us about 'drift' needing evaluation, about labels being inadequate, about bio-accumulation being possible, all of which are still issues, and all of which I deal with every day. We still have die-offs from correct use of pesticides. Just a few short years ago we lost five percent of the global Swainson's Hawk population due to exposure to monoprotophlase in Argentina. Sub-lethal effects, like Jewel referenced, behavioral changes that make animals more susceptible to perdition. Disruption of courtship, therefore disruption of reproduction; the animal may not be rendered dead from the exposure but it's mucks up it's ecology, it's role in the environment so much so that death often occurs. We call this ecological death. And persistence, as I said, I'll talk about with an example.

Organophosphates, a list that Rachel was talking about in Silent Spring. There are only six, some of which have been banned and that's a good thing. On the other side, we have a list of currently reviewed organophosphates. Life has gotten a little bit complicated, for example, residues, in food; Theo talked about The Food Quality Protection Act. And on paper it sounds great, including my number two: developing and implementing a program for screening and testing pesticides. This Act is an amendment to the Pesticide Act of FIFRA . It requires the setting of maximum levels permitted in human and animal food. I think that yesterday Patricia referenced that there is a philosophical and subtle fundamental decision to be made there as to whether we allow any residue in human and animal food. But given the fact that as a society we are currently allowing that, this Act calls for the setting of maximum levels, called 'tolerances'. And one of the tools that it uses to implement what level is permissible, or acceptable. And we have heard that that program isn't working. So things sound great on paper, but we've got to really lean into, as a society, making sure that these things written down are implemented.

Let's talk a little bit about this chlorophenapure, near and dear to my heart and the idea that it disrupts energy production in cells. Rachel talked about this in general terms in Silent Spring. The other name for this chemical is "Pilot". That's the one that would be on the product if you were to go and by it. American Cyanamid, the company that manufactured it, submitted a registration application in 1994. What's noteworthy about chlorophenapure is that it's the first representative of a class of chemical called 'pirrals' that was up for registration in the U. S. Pirrals are registered in Australia, in South America, but no pirral has ever been registered in the U. S. And chlorophenapure was the first to come to bat. It was being considered as a Beet Army Worm control agent for cotton. The toxic mode of action is not the parent material, chlorophenapure, but a metabolite uncouples oxidative phosphorelation, rendering cell death. It screws up ATP production in cells, a pretty basic, unarguable effect. What's amazing to me, is that EPA in their own registration eligibility document, stated that 'this is one of reproductively toxic pesticides to avian species that EPA has evaluated', period. It persists in soil for over a year. It has great potential for bioaccumulation, and potentially bio-magnification up the food chain. You'd think that this was a "no brainer", right? If we are trying to prevent bad chemicals from ending up out in the environment. The other part of it from an economic standpoint that's important is that there are alternatives available. Some of them are even bio-controls. Companies making bio-control agents for the Beet Army Worm stepped up production, so there are cost effective, safer alternatives available. EPA finally denied registration of chlorophenapure on the March 13, 2000, for 'environmental risk' reasons. This is extremely noteworthy, because this is the first chemical in history of EPA that's ever been denied registration due to environmental risk. Even DDT was banned because of the human health risks associated with it. This "no brainer", from start to finish took six years. Scott Sobiack and I worked on it full time, for the most part, for a full year. So it's quite amazing to see what even a very straightforward example requires of staff, of scientists, of the scientific community. American Cyanamid had $100 million dollars invested in the development of this product. And Theo says, I think rightfully so, that companies would utilize screens earlier in the research and development, and production process, so that they didn't get to this point of having a chemical for which they were seeking registration, unable to recoup any of those research and development costs. Insecticides are not selective poisons. They do not single out the one species of which we desire to be rid.

Another thing that popped off of the page in my reread this year was Rachel's commentary about livestock and poultry rearing. Although she commented on it from a lack of reverence for life standpoint, she would probably be interested to know that these animals are

fed pharmaceuticals, growth stimulants, antibiotics, fertility enhancers, milk production stimulants, fat content reducers. They are treated internally and externally with ectoparasite pesticides. They are given trace elements as supplements to their diets, and all of this ends up in waste lagoons. Accidental and intentional releases often occur. Some of these feeding operations have animals producing waste equivalent to the waste produced by New York City in a day. These are not 'mom and pop' operations. I think that Rachel would have something to say about this, and about the new regulations that are out to try to govern some of the construction and operation of these facilities. We also need to see the problem as a whole. To look beyond the immediate and single event of the introduction of a pollutant into the environment, and to trace the chain of events thus set into motion.

We think of Alaska as pristine, undisturbed, not probably as afflicted by pollution problems as other parts of the country, or other places in the world. We'll talk a little bit about what we've found in Alaska because these persistent organic pollutants are traveling in global air currents and in waters. We've noticed deformed Chickadees in Alaska. We were out on the ground helping to discover the reproduction disruptions due to PCBs, dioxins, etc. in Great Lakes birds, and later in lake trout and amphibians in the Great Lakes. We've looked at head tumors that are induced by polycyclic aromatic hydrocarbons, a material in every gasoline and in every petroleum product on the market. Bird deformities from high levels of selenium in irrigation drain water. Selenium is a naturally occurring element, but because of man's activities in irrigation the selenium is taken from the earth's crust, mobilized, made bio-available to animals where it wouldn't normally be available causing deformities and some reproductive problems.

We're dealing on the ground, as we speak, with unexploded ordinance, left over munitions on military lands, some of which we have taken into the National Wildlife Refuge System. Mercury and loons, bio-engineered products and their impact, potentially, to pollinators. DDT, you thought because it was banned, it was over and done with. Just recently, we settled with a manufacturer of DDT on a Montrose DDT Natural Resource Damage Assessment off the coast of California. On the California Shelf, just off of the coast, pounds and pounds and pounds of resident DDT are still there, circulating in ocean currents. We've got money for it, but is money good enough? The Exxon Valdez is a significant spill but, ironically, just this week, there was another one, this time a 35,000 gallon spill in Prince William Sound. Our folks are out doing bird recovery and rehabilitation. It's the largest spill that has occurred there since the Exxon Valdez. That's another subtle part of this—until we change some of the societal values that we have, whether on the individual level or on the corporate or the political level, we fight these battles over and over again.

Let's talk for a minute about malformed amphibians. A lot of press started in Minnesota. Rachel would be proud that school children were involved with the early discovery of rates of malformations in amphibians in Minnesota. It just goes to show you, that more eyes and ears and people out on the ground, looking for things that are happening is a very positive thing. In the scientific community at large, thirty-eight species of frogs have been detected to have above average rates of abnormalities. Nineteen species of toads, occurring in forty-four states have also been noted. The highest occurrence is sixty percent in some local populations. In 1997 the Fish and Wildlife Service began to survey our own lands, Fish and Wildlife Service Refuges—fifty-five of them in the northeast and in the Midwest—and found high rates of malformations on four in the Midwest and nine in the northeast, as high as eighteen percent. On these set aside lands, that are supposed to provide refuge to fish and wildlife, we found eighteen percent. That is not as high as sixty percent in some highly agricultural areas, but eighteen percent nonetheless. That work continues right now, in conjunction with National Wildlife Refuges. Forty-three more Refuges have been surveyed in 2000, more in 2001 as we speak, in thirty-one states, covering the country. And when we got a little bit of money to do this work, from Congress, we divided it up among our six lower forty-eight geographical regions in the Fish and Wildlife Service. We only gave a pittance to Alaska, thinking, "Well, they're not going to have much occurrence, because they only have three to four species of amphibians in the state, so there probably won't be much happening". Because our field biologists were out there, we determined that Tree Frogs on Kenai National Wildlife Refuge had malformations. Unless we had done that work, and done it without bias, we wouldn't have found this out. Six point nine percent of the Tree Frogs had malformations. We are now examining the role of contaminants, especially pesticides, in amphibian malformation. Looking at them in Alaska; that's a species of Wood Frog. These are the typical, most frequently observed types of abnormalities that we detect in the environment: missing hind legs, missing feet, partial hind legs, deformed hind legs, clubbed feet, missing eyes. And it would be unscientific or unfair of me to suggest that pesticides are the only possible cause. Parasites have been suspected, fungicides have been suspected, and even UV radiation is suspected. But we in the Fish and Wildlife Service are examining the role of pesticides, particularly in these phenomena.

Another problem in Alaska is the Black Capped Chickadee phenomenon. As you can see, these birds have terribly deformed bills. To date, over 692 Black Capped Chickadees have been reported to have bill deformities. It is also occurring to a limited extent in other species; ninety-eight

individuals in nineteen other species to be precise. As you can see, it's on the rise. We don't know why. We don't know what's causing it. Potential explanations include desease, trauma, nutritional deficiencies, contaminates, and in the studies that we are working on with migratory birds and with the USGS, the biological research division, the old Fish and Wildlife Service research group, we are looking at nest-box studies, and examining organochlorines in eggs, chicks and food items. We are also looking at trace metals, and trying to detect any pesticides present in their food. These animals don't do well in nature. They are very dependent on feeders. They go to suet and peanut butter feeders particularly, because they can get the material on their feet. I've seen video footage of them lying on the ground stuffing their feet in their mouths to gain nutrition. So without the feeders in southeast Alaska, these birds would not be doing very well.

Let's look at the oil pit thing as kind of an example, in a different part of the country that seems pretty easy to fix. You would think this would not be a tough thing. Two million migratory birds including Bald Eagle and Peregrine Falcon are estimated to die each year, in these pits. We've have also retrieved Bats, Deer, small mammals, unidentified parts of critters in these pits. The pits, and open tanks are used in the production of oil to separate remaining oil from water. There is a fatal attraction. From the air this looks like water. There are insects caught in the surface film. In the oil layer, they are struggling to get free. It creates motion, and it draws the birds in particularly to that they can feed on these insects. And as soon as they light on the pound surface, they have made contact with the "tar baby" if you'll excuse the analogy. It's tough for them to get out. The Fish and Wildlife Service is working to educate oil companies about the hazard of these things. Two Fish and Wildlife resources are encouraging the use of these closed containment systems so that we don't create the attractive nuisance of these open pits that look like water in an arid west. [Referring to slide being seen by audience] This speaks for itself. This is a bat coming out of an oil pit. As is the next panel, a bat. Yes, bats usually fly during the night, but this guy's left over from his night feeding foray. A [unintelligible] down in the lower left. Pete Ramirez in our Wyoming office started this work, and took this footage. And this Northern Shoveler is not feeling well. We can't model this using a computer program. We have to be on the ground observing this.

Society seldom evaluates the risks of new technologies before they are entrenched in social systems. Man could be working against himself. In spite of the truly marvelous inventiveness of the human brain, we are beginning to wonder whether the power to change the face of nature should not have been tempered with wisdom for our own good, and with a greater sense of responsibility for the welfare of generations to come. We need people on the ground, whether they be academics, or Fish and Wildlife Service EC biologists. This is our budget. This is by no means trying to detract from other programs in the Fish and Wildlife Service, but the Environmental Contaminates funding is as flat-lined as Rachel Carson's EKG [Electrocardiogram]. So, you make the determination about the future of detecting the presence, and impacts of environmental pollutants without scouts, out there on the ground. I dare say that Rachel would think about another book, if she heard this. Thanks very much. [Applause]

Since Silent Spring: New Voices and New Analyses

H. Patricia Hynes
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In 1962, Rachel Carson published Silent Spring, a book credited with initiating environmentalism in the second half of the 20th century, particularly in industrial countries. The unique difficulty in writing Silent Spring, the author confided to a friend, was how to make hydrocarbons compelling.

Not only did the book compel (it was a record bestseller), but it also provoked a storm of protest and parody from the pesticide industry and corporate agriculture. Carson, a highly disciplined scientist, was labeled a "fanatic" by her critics in industry and government. They alleged that her writing was "too emotional" and, thereby, unscientific. She was further trivialized with banal, gender-based stereotypes, as a little old lady in galoshes who worried about birds and a "spinster" who had no business concerning herself with pesticide-induced genetic damage. (Graham 1970).

The major points of Silent Spring can be summarized accordingly:

1. Modern pesticides are in essence, biocides; and the post-World War II agricultural industry is waging a "peacetime" chemical assault on nature.

2. When forests and crops are sprayed, the drift of pesticides contaminates the web of soil, groundwater, streams and the food chain, from insect larvae to worms, birds, fish, and humans.

3. The regulatory system, by permitting toxic chemical residues in commercially sold food, authorizes contamination of public food supplies and promotes a completely unjustified impression that safe limits have been established and are being adhered to. "Tolerances" or the allowable chemical residues on food are a method of slow poisoning sanctioned by the government.

4. People ought to have a civil right to live unendangered in their society. The application of poisons into their environment could justifiably be seen as a violation of that right.

5. There are creative and intelligent alternatives to mass spraying of poisonous chemicals. All are solutions, based in biology, which derive from an understanding of the living organisms they seek to control and of the whole fabric of life to which these organisms belong. (Carson 1962).

Despite fierce and highly-financed opposition by industry critics, Silent Spring swept through United States society with the force of a five-hundred-year flood event, resulting in Executive Branch and Congressional debate and scrutiny of the weaknesses in national environmental protection. By 1970 the federal government created its first comprehensive environmental agency, the Environmental Protection Agency (USEPA). In the same decade, Congress passed a rapid succession of environmental legislation, including the Clean Water Act; the Safe Drinking Water Act; and laws and amendments governing air pollution, pesticides, toxic substances, and hazardous waste. Other industrial countries followed suit, translating Silent Spring (which likewise provoked heated debate among industry, scientists, and government) and laying the groundwork for subsequent environmental legislation.

Silent Spring embodied the message of precaution and prevention in the face of known and suspected pesticide-induced and pesticide-mediated risks to humans and ecosystems. Yet the resultant wave of environmental legislation and enforcement focused on regulating the discharge of pollutants, rather than eliminating toxic substances and seeking alternative cleaner technologies and substances in industrial production. "Tolerances" or permissible limits of pollution were established for industrial discharges to air, water, and soil, thus inaugurating a regulatory parallel to the system Rachel Carson excoriated as a method of slow poisoning sanctioned by government.

In effect, the agro-industrial model challenged by Silent Spring — one which uses factory-like methods in depleting and not replenishing organic soil fertility; in polluting soil and groundwater; in treating animals, plants and soil as mine-able raw materials to be used, manufactured into new products, and exhausted — has remained intact. (Berry 1977, 1987; Tilman 1998). In 1939, 32 active ingredients in pesticides were registered with the federal government. Today 860 active ingredients are registered and are formulated into 20,000 commercial pesticide products. Over 2 billion pounds of pesticides are used in the United States, the majority in agriculture. What many do not realize is that suburban homeowners often use pesticides more intensively than farmers.

Rachel Carson's confrontation with the post-World War II market-based economic paradigm (and its accompanying culture of consumerism) that trades off biodiversity and environmental health for profitable growth, has been defused by the very environmental professions and government bodies that her seminal work generated. (Dowie 1995). Industrial agriculture, if anything, is in the process of completing a post-industrial morphogenesis into agricultural biotechnology. (Hynes 1989; Rachel's Environmental And Health Weekly 1998).

The legacy of Silent Spring lives on, however, with new voices and new analyses. Carson's prescient analysis of the reductionist model of industrial agriculture and industrial chemicals has been revived by a new generation of critics who are taking aim at the new generation of agricultural micro-technologies and their products, genetically- modified organisms or GMOs. And women activists and science researchers in the breast cancer movement, including the Women's Community Cancer Project whose slogan is "Rachel Carson Was Right," and the Silent Spring Institute, a research center dedicated to identifying the links between the environment and women's health, especially breast cancer, hail Rachel Carson as the pioneering fore-sister of their work.

What's New Since Silent Spring?
Genetically Modified Organisms

The suite of critical and cautionary arguments that Carson employed in Silent Spring against the widespread and indiscriminate use of pesticides is being carried forth by public interest organizations in recent challenges to the introduction of genetically modified organisms into the food supply and ecosystem. They charge the industry with cloaking their profiteering in the mantle of altruism, with vertical integration that eliminates small and independent farmers, and diminishes biodiversity; and with trivializing demonstrated and potential risks to humans and ecosystems worldwide from GMOs. U. S. food-related biotechnology industries have consistently refused to label genetically modified products in keeping with the spirit of right-to-know practices; and the conglomerates have pressured the U. S. government to protect and promote the industry by maintaining a light regulatory hand. (Altieri and Rosset 2000; Kloppenburg and Burrows 1996; NGO Position Statement 200). This campaign against genetically modified food and agriculture has arisen in both developed and developing countries, and it has been mobilized by a growing civil sector of non-governmental organizations (NGOs), often called a "third sector" in contradistinction to government and industry. (Runyan 199).

Breast Cancer: Cancer in the Lived Environment

Likewise, activists, public intellectuals, and scientists working in the public interest have solidified a social movement that sustains research and public education on the environmental causes of cancer, particularly breast cancer. One-half of all the world's cancers occur in people who live in industrial countries, while industrial countries constitute one-fifth of the world's population. Breast cancer rates closely approximate patterns of industrialization; that is, the economic activity which results in the manufacture, use, and disposal of vast quantities of toxic chemicals. Breast cancer rates are highest in North America and Western Europe; lower levels occur in lesser industrialized southern Europe and Latin America; and levels are lowest in Africa and Asia. They are thirty times higher in the United States than in parts of Africa. And while Japan has had remarkably low breast cancer rates for an industrial country, it now has the fastest rising rate of all countries (Steingrabber 1997).

Another eye-opening trend that these global studies reveal is that immigrant women, even when they stay culturally separate, take on the breast cancer rates of the country to which they move. In the United States, the breast cancer rates of European, Chinese, and Japanese women immigrants all eventually rise to the U. S. rate, although they do so in differing time frames. For example, Asian-American women who have lived 10 years or more in the United States have an 80% higher risk of developing breast cancer than immigrant women who have arrived more recently. The opposite is also true: women immigrating to a country with lower incidence rates experience a decline in their rates of incidence (Sherman 2000, Steingrabber 1997).

Today breast cancer is the leading cause of death in American women between the ages of thirty-five and fifty, the first post-World World War II generation. They are the first generation of women to be exposed in the uterine environment and in their lived environment as children and adults to an ever-growing number of synthetic pesticides, solvents, and plastics. In the post-World War II culture of modern medicine, American women have been prescribed

and exposed to a comparable supermarket of hormonally active pharmaceuticals, including tranquilizers, DES, the birth control pill, and hormone replacement therapy.

In the same period in which this generation was born and grew up, 1945 to the present, almost 80,000 chemicals have become commonplace in commercial use and consumer goods. Of these, less than 3 percent have been tested for carcinogenicity. The Environmental Defense Fund estimates that less than a third of the 3,000 highest volume chemicals produced in the United States have basic toxicological data available. Fewer of these have been screened for their effect on breast cancer and their potential to disrupt the endocrine system (Brody et al, 1998). Moreover, recent research casts doubt on the ability of standard cancer bioassays to detect chemical agents that cause mammary tumors in animals (Ibid.). All of these products, which we are encouraged by consumer marketing to purchase, to put on and in our bodies, to throw into landfills, or incinerate or dispose of in septic systems and wastewater treatment plants, are marketed as positive, progressive, and life-enhancing.

And yet, in the face of what appears to be an alarming association between increased cancer incidence and mortality and increased production, use, disposal, and human exposure to toxic chemicals in industrial countries, the cause of the breast cancer epidemic in women is being trivialized and due to so-called lifestyle factors. Correspondingly, federal investment in research on the links between environmental factors and breast cancer is miserly.

Of a total of 722 awards made to breast cancer research in fiscal year 1997 by the National Institutes of Health, only 33 (or 5 percent) involved a potential environmental connection, such as living near a hazardous waste site, drinking contaminated municipal water, living downwind of manufacturing facilities, eating food contaminated with pesticides and other toxic chemicals (Women's Community Cancer Project Newsletter 1997).

In 1996 Harvard University's Center for Cancer Prevention published a report entitled "Harvard Report on Cancer Prevention." It was intended to serve as a resource on cancer prevention for the scientific and medical communities, policy makers, and general public. In this report the researchers concluded that "public concern about environmental carcinogens is out of proportion with the true risk of cancer" (Harvard Report on Cancer Prevention 1996) and that public attention should focus on the most important causal factors — tobacco use, diet, obesity, and lack of exercise. These are the notorious "lifestyle" factors which they attribute with causing 65 percent of total cancer deaths in the United States.

"Shifting responsibility for cancer onto individuals must be seen, in part at least, as an attempt to privatize cancer causation, to take it off the backs of American industry and public research institutes and hand it back to victims of disease themselves" argues Ellen Leopold, a breast cancer activist. "It cannot be coincidental that this report comes along just as so many other long-established social obligations are being off-loaded onto individuals" (Women's Community Cancer Project Newsletter 1997). I would add that to call diet, obesity, lack of exercise, and even tobacco use "lifestyle" is to turn a blind eye towards the deliberate creation of a consumer culture—whose origins are traced back to the 1920s by cultural historians (Durning 1996)—which has popularized and glamorized meat-eating and junk foods, the car, television watching, passive recreation, and smoking. How much undesirable weight gains (and breast cancer) result from hormonal agents in our food supply? Animals raised for market have been fed growth hormones since the 1940s, including DES for a period nearly 20 years even though National Cancer Institute studies show DES to cause breast cancer in mice (Sherman 2000). There is deep cultural and corporate responsibility for the tobacco-addicted, hormonally-dosed, overweight and physically passive society we have become. (Nonetheless, it's clear that we cannot wait for corporate and cultural change in order to live a healthier life and that, as individuals, we must take responsibility to change our lifestyle).

The Rise of the NGO Sector

The latter part of the twentieth century — the period in which Silent Spring so profoundly affected US environmentalism — was marked by global social movements of liberation. These social movements have fed, in many cases, an expanding non-governmental sector of local, national, and international organizations which function as agents of social change for human rights, peace, women's rights, environment and development. Analysts characterize the 20-fold surge of non-governmental organizations between 1956-1996 as a civilian response to the political monocultures and monopolies of government and business (Runyan 1999).

From this strikingly heterogeneous "third sector," many unprecedented expressions of environmentalism have emerged to form a new historical edge — and I would say vanguard — of the environmental movement. These include an environmentalism distinctly and popularly expressed in developing countries, as well as the environmental justice movement among urban and rural poor and people of color in the United States. Both of these socially-conscious expressions of environmentalism have arisen within the structural contexts of worldwide urbanization, industrial and economic globalization, and the proliferation of inexpensive telecommunications.

In these national and international community-based movements, women are often a plurality of members, leaders, and strategists, an undoubted consequence of the global women's movement over the past 30 years (Hynes 1998). An international survey of public attitudes about the environment, commissioned by the United Nations Environment Programme, found that women across the world, in industrial and developing countries alike, express more concern over the state of the environment than do men. They also favor more stringent environmental laws and more public spending for environmental protection than do men (Seager 1993).

Environmental Justice

Environmental justice arose in the United States during the 1980s and 1990s as a new paradigm of environmental protection, one which is informed by the lived experience of low-income and working class communities in both rural and urban areas and which honors the expertise of experiential knowledge. An early spur for this new framework was the successful protest of blue-collar housewives and mothers at Love Canal, New York to have families relocated from a neighborhood that had been built adjacent to a mile-long trench filled with industrial waste. Their action, begun in the late 1970s, launched modern grassroots environmentalism based on "popular science," citizen protest, making links between human health and environmental pollution, and calling for cleaner products, product substitution, and waste reduction (Gibbs 1982).

In the early 1980s, an African-American community in Warren County, North Carolina protested the US Environmental Protection Agency's plans to site a national landfill for the disposal of polychlorinated biphenyls (PCBs) in their community, using the tactics and tradition of the Civil Rights movement. This event sparked a sequence of studies of and protests against the disproportionate siting of waste facilities and "dirty" industry in poor communities of color, calling the practice environmental racism. People of color gathered in Washington in 1991 for their first national conference on environmental justice to organize, strategize, and promulgate a set of principles. Government and major environmental organizations were publicly challenged to include people of color in their organizations and to integrate issues of race and economic justice into their environmental analysis and decision-making (Bullard 1994).

While using conventional techniques of environmental monitoring; tools of surveillance and analysis, including exposure assessment and cumulative risk assessment; and the force of environmental law, environmental justice introduces new dimensions to older environmental frameworks. These dimensions include injecting a consciousness of class, race, and gender into environmental analysis, research, remedial action, and resource allocation. Additionally, environmental justice brings a place-based and community-based focus to environmental protection. The central paradigms of nature as a wilderness remote from people, and of the environment as the physical media of air, water, and soil threatened by pollution, have lacked the historic connection of community environmental health to the lived environment. The environment as city people experience it encompasses the nexus of buildings, traffic, neighborhood streets, social well-being, security, and human services together with ambient air, water, soil, waste, and urban open space.

Vacant Land: An Inadvertent Asset

In the United States, the poor, people of color, and immigrants are most highly concentrated in depressed center cities and extensive ghettos of pollution and poverty (O'Hare 1996). The primary environmental health crises of urban children living in poverty — asthma, lead poisoning, and accidents — are correlated most closely with these children's physical and built environments, that is local air, soil, and housing (Doc4Kids Project 1998). Their daily and dominant experiences of nature are weedy, littered lots where housing once stood, industrial brownfields in and at the edge of their neighborhoods, and polluted waterbodies.

One of the more unusual outcomes of the environmental justice movement is the re-claiming of natural assets at the neighborhood level, now occurring in numerous inner and center cities. Urban disinvestment has left vast amounts of vacant land. Chicago, for example, has 56,000 vacant lots; 18 percent of once-productive industrial land is vacant. One out of every eight lots in Central Harlem — the equivalent of 112 acres — was vacant in the early 1990s. Philadelphia, the oldest industrial U.S. city, has 15,000 vacant housing lots and 21,000 abandoned houses.

Like Harlem, Philadelphia, and Chicago, older cities are plagued with abandoned land and buildings, so much so that the U.S. Conference of Mayors recently declared that vacant land and buildings are our key urban environmental health threat. Urban historians have elaborated the structural causes of this trend in abandonment: the growth of the suburbs and the exodus of the white middle class, industry, commerce, and capital from center cities; redlining on the part of banks and insurance companies; neighborhood clearance in the name of urban renewal; real estate speculation when the market rose and bankruptcy when it plummeted; and insufficient community reinvestment on the part of banks. Tax cuts and reductions in welfare during the Reagan years further deepened poverty for the poorest fifth of the country, mainly poor women and children, and widened income inequality.

As neighborhood buildings were vacated, torched, and razed, nearby residents often mobilized to plant community gardens on the building footprint. And the beauty, utility,

and community-building capacity of their unremunerated labor fortified many a neighborhood against the ugliness, waste dumping, isolation, and crime which plague deserted urban areas. During the past two decades, community gardening has been the most tangible improvement in many of our poorest urban communities, offering city planners and community development corporations the respite they needed to address the more capital-and time-intensive challenges of building affordable housing and attracting economic development. Further, these pockets of green space have challenged and changed, here and there, the prevailing industrial notion of cities as de-natured "hardscapes," inevitably dominated by buildings and traffic (Hynes 1996).

The American Community Gardening Association (ACGA) estimates that municipal governments and nonprofit organizations operate community gardening programs in about 250 cities and towns. (ACGA staff has told me privately that the number could be twice as large).

Global Environmentalism

The governing sociological stereotype of environmentalism in the latter part of the 20th century has been that of a "postmaterialist" value, which emerges once a society has undergone a transition from survival concerns about food, housing, and economic security to a widespread and sustained affluence (Dunlap, Gallup, and Gallup, 1993). Environmentalism — as has been alleged in other social causes such as human rights, women's rights, and democracy — is characterized as a quality of life concern of the well-off in industrial societies, a luxury that can only be afforded and enjoyed once survival is assured. If this version of environmentalism as a cultural sequel to an economic transition was ever accurate, such is no longer the case, as evidenced by the environmental justice and community garden movement in the United States and the results of a recent survey entitled "Health of the Planet."

In the early 1990s, the George H. Gallup International Institute and affiliates conducted a survey of public opinion about environmental issues, values, and concerns in 24 countries, covering a diverse range of world regions and economies. According to the principals, the "Health of the Planet" survey was the "largest environmental opinion survey ever conducted" as well as the first of its kind to assess public opinion on environmental issues in nonindustrial countries, and to be capable of revealing differences and commonalities in public opinion on environmental issues between rich and poor nations (Ibid,. p.8).

The goal of the survey was to test the governing stereotype of environmentalism as a higher priority issue of wealthier countries in comparison to poorer ones. Questions were designed to reveal differences in perception of gravity in the local and global environment; the degree of concern about environmental degradation; awareness of links between pollution and welfare; attitude toward tradeoffs between economic development and environmental protection; and the sense of social responsibility for environmental protection.

The most interesting and surprising finding, according to the Gallup Institute, is that national environmental quality (together with other social and economic crises) is perceived as a very serious problem by a majority interviewed in poorer countries as well as richer countries. Contrary to conventional expectation, larger percentages in developing countries reported higher levels of concern about environmental problems than those in industrialized countries. Respondents from the poorer industrializing and highly polluted countries tended to rate the quality of their local and country environments more negatively than the wealthy industrialized countries, providing a measure of validity to the survey's findings, given that their responses corresponded with the more deteriorated state of their local environments.

Likewise, residents of poorer countries reported that environmental pollution has impaired their health in the past and increasingly in the present in much higher percentages than residents in wealthier countries. The authors point out that daily experience of degraded water and air, and poor waste disposal, especially in developing world urban settlements — that is, the immediate, surrounding environment — accounts for the high awareness and concern among developing country respondents about the connections between environmental quality and human health.

Even with heightened awareness of pollution and effects on health, would poorer people be willing to choose for environmental protection over economic growth? The results of questions about environment and economy, including respondents' willingness to pay higher prices for environmental protection, revealed no major difference between poorer and wealthier country residents in prioritizing environmental protection over economic growth. Further, while a higher percentage of residents in industrial countries were willing to pay more for cleaner products, the difference in "willingness-to-pay" between the rich and poor countries was small compared to the difference in income and standard of living.

The survey results squarely refute the hypothesis that environmentalism is a luxury of development and wealth-building. Rather they support the conclusion that people in developing countries are as conscious and concerned about environmental degradation as those of the developed world and are as willing to choose environmental protection over economic growth. For most of the developing world, a safe and clean environment

is a survival issue, encompassing housing, food, clean water and air, waste disposal, and human health, thus revealing a kinship with the "new environmentalism" of the environmental justice movement in the United States.

Conclusion

Since the publication of Silent Spring in 1962, major structural changes have altered the human presence in the world, among them rapid urbanization due to the mechanization and globalization of agriculture. In 1960, approximately 1 in 3 of the world's 3 billion people lived in cities; today, 50 percent — or 3 billion people — do. The United Nations forecasts that almost 2 of 3 people will be urban residents by 2030, an estimated 5 billion people (WorldWatch 1998). Major environmental health crises —insecure shelter, water contaminated with waste, inadequate fuel, food, and health care —are increasingly felt by those rural poor pushed and pulled by the structural forces of rural unemployment, disinvestment, and poverty to urban fringes and settlements. These few billion people, the poorest of whom are women and children, need and seek models of environmental protection that offer survival and security through sustainable shelter and environmental health, as the "Health of the Planet" survey empirically confirmed. One such model, the Guarari Project in Costa Rica, exemplifies the "new voices and new analyses" of environmentalism in the 21st century.

Guarari Community Development

The Guarari Project is a self-help, low-cost housing project in Guarari, Costa Rica, which grew out of the crisis of rural poor migrating to the edge of San Jose, the capital of Costa Rica, and constructing squatter settlements on open land with no safe water source and waste disposal. The project was developed by feminist and housing development NGOs with low-income families and the Costa Rican government; and it embodies gender-consciousness and environmental restoration in all aspects of the community development project and the ongoing management.

In the late 1980s, the feminist organization CEFIMA partnered with a housing organization, COPAN, to work with squatters — most of whom were single-parent women and heads of households — to design and build up to 4,000 units of low-cost, self-help housing within a community setting. They negotiated land, utilities, and road construction from the government and organized collaborative design sessions that sought resident input and provided environmental and social considerations. Principles of participation were established, among them that every future homeowner would give 900 hours of work. Most of these hours were committed to construction, including training in construction; but hours spent in communal child care, communal food preparation, and participation on governance committees, such as education, recreation, environment, violence against women, and health, also counted. COPAN offered mortgages of 15 years or more, with monthly payments equivalent to 25 percent of income.

In its early stages, the project was evaluated by the World Conservation Union (IUCN) for design, cost, and sustainable impacts. According to the evaluators, the community design resulted in better interior ventilation, smaller yards and larger common areas with generous play space, communal recreation facilities, cost consciousness and cost reductions per unit compared to comparable housing. One of the most sustainable components of the project, the evaluators noted, is the "educational achievements...The construction techniques learned by men, women, and children alike, are a permanent part of local knowledge and thus transmissible to future generation" (Dennis and Castleton, 25-26).

Environmental awareness in Guarari is high and discernible even in a casual survey of the project. Large canopied trees remaining from a former shade tree coffee plantation are encircled by benches, and they are signed, "Respect our trees, they are our life." Each yard has a well-kept garden, an amenity which is highly encouraged and rewarded. "No dumping" signs are posted, and, judging by the lack of litter, generally abided by. When streets do need a clean-up, the environment committee organizes work parties, maintaining Guarari as an exceptionally clean low-income neighborhood. Even the primary treatment wastewater facility provides ecological literacy: "With this treatment plant, we protect our local river" reads a sign posted by it.

The community center, called La Casa de la Mujer, is the hub of community and social life offering educational classes, women's health groups, self-defense, dancing, and so on. Principles of respect for women, hand-printed on paper and wood and displayed on the walls, consistently recall and reinforce the higher standards of dignity upon which Guarari is built—"Women's rights are human rights"; "A person who loves does not abuse."(7) (8)

Since Silent Spring, the gap between rich and poor worldwide has widened, resulting in deeper and more entrenched poverty within a financially richer world. Like the human poor, the earth's natural assets are more depleted since Rachel Carson sounded her clarion call in 1962, resulting in greater natural poverty within a more environmentally concerned world. By contrast, social movements for women's rights, human rights, and environmental justice have added social wealth to a socially impoverished world throughout this same period. Like the community garden movement in U. S. center cities, the Guarari project may well be a metaphor for the more vital and relevant environmentalism of the urbanizing 21st

century world, one which speaks to people's lives because it is tightly linked with their survival, social security, and human dignity; and because it is within their reach and because it restores and builds wealth in all of the ways we need — human, social, natural, and financial.

Endnotes

1. A genetically modified organism is an organism — plant, animal, bacteria, etc. — in which genetic material or DNA from another organism has been inserted by means of genetic engineering technology in order to produce characteristics such as resistance to pests and herbicides.

2. The Women's Community Cancer Project, founded by breast cancer survivors in 1989, is dedicated to public health and regulatory policy based on the precautionary principle as expressed in their manual, "Indication of Harm, Not Proof of Harm, Is Our Call to Action." They consistently expose the role of the pharmaceutical companies in determining the course of cancer research and in diverting public attention from the role of environmental pollution in carcinogenesis. (They may be contacted c/o The Women's Center, 46 Pleasant St., Cambridge, MA 02139 Phone (617) 354-9888.)

   Silent Spring Institute is currently researching the 20% higher incidence of breast cancer among women on Cape Cod compared to the state of Massachusetts. Two hypotheses are being examined: that endocrine-disrupting chemicals increase the risk of breast cancer and that consumer products used and disposed have contaminated environmental pathways, including air and water, and exposed residents. Website: www.silentspring.org

3. For an opposing view of agritechnology, which argues that it can solve the food insecurity of the poorest one-fifth of the world, particularly in Sub-Saharan Africa; which is "technology optimist;" which places its trust in the rigor of FDA and EPA regulatory oversight; which charges critics with being "postmaterialist" and sports a condescending attitude toward NGO-mobilized protest, see Conway 2000 and Paarlberg 2000.

4. A healthy realism about NGOs is needed, however. NGOs are not necessarily exempt from narrow self-interest and lack of accountability and transparency. Some sell out to special interests and funders; others professionalize and bureaucratize, like government. Some are fronts for business and government interests under the guise of neutrality.

5. Demographer Douglas Massey (1996) argues that, with the worldwide phenomenon of urbanization, most of the world's poor will be clustered and segregated in poor neighborhoods of cities. This trend in the growing urban spatial segregation of the poor from the affluent is paralleled by a rising income inequality between affluent and poor in the United States and internationally, a trend that has been growing since the 1970s. Factors include stagnant incomes in the global economy and "racial and ethnic exclusion" which exacerbate growing class segregation. In other words, the poor are growing poorer and more isolated in urban slums while the affluent are growing more concentrated and segregated from the poor. Inequality in the US, as measured by the GINI index for family income, rose 14% between 1973 and 1991, thus reversing the post World War II reduction in poverty, growth of the middle class, and decline in inequality.

   Robert Plotnik (1993) examined changes in income inequality during the Reagan years 1980-1988, measuring income inequality as the ratio of the total income received by the top quintile (20%) of families by the total income received by the bottom quintile. Inequality by this measure increased 18% during the Reagan years, reaching the highest value since 1947 when this data series began and reversing a modest trend of declining inequality since the post-war years. He concludes that reductions in welfare and tax cuts of the Reagan Administration coupled with population increases and trends cited by Massey resulted in greater poverty and inequality.

6. Surveys were conducted in face-to-face interviews at home to minimize lack of response due to illiteracy. Gallup used a network of affiliates and partners in the 24 countries; the location of affiliates and funding determined the participating countries. As a consequence, the poorest and least economically developed countries, especially on the continent of Africa, are underrepresented in the survey. Thus, the authors do not consider it representative of the entire world but adequate to assess difference or commonality of opinion between 12 richer, "industrialized" countries and 12 poorer, that is, low-medium, low-income "developing" countries, and thus able to test the prevailing social stereotype of environmentalism. In all countries, representative samples of populations were surveyed, with the exception of India, due to terrorism in certain regions. The sample margin of error is +3%

7. In November 1994 I visited Guarari with a member of CEFEMINA, where I observed public consciousness-raising on environment and violence against women, especially through hand-hewn signs placed throughout the project. I was immediately struck with the contrast to U. S. public housing: the individuality and charm of yards and small attached homes; the intactness and

integrity of common recreational and children's play areas, and the presence of small co-op businesses that supplied daily sustenance needs including food, clothing, and building materials, furniture and machine repair shops, and a tavern (but no bar).

8. Costa Rica, the Central American country admired for its stable, non-militarized democracy, is rapidly becoming a center of child prostitution to which adult males who sexually prey on children are flocking, according to the Miami Herald (Garvin 2000). Four factors have been identified as causal: Strict laws and enforcement crackdowns elsewhere on adults sexually exploiting children; growing poverty in Costa Rica; no legal or enforcement teeth and few support services in Costa Rica to protect children; and a long, unspoken tradition of incest in Costa Rican families. Community support projects, like the Guarari Project, are vital in providing the communal infrastructure of respect and security that protects children from sexual abuse and resorting to prostitution.

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Protecting the Artifacts of A Life

By John D. Juriga

Thank you very much. I believe I heard stomachs growling in the background, other ones and including mine. I am going keep my remarks short rather than compete with low blood sugar levels here. I want to want to thank Steve Chase and Mark Madison for inviting me to participate in this symposium. I come to you as a volunteer from the Ward Museum of Wildfowl Art in Salisbury, Maryland. In 1999 the Ward Museum featured an innovative exhibit entitled, "Witness for Nature: The World of Rachel Carson". The drawings and carvings on display here this weekend were part of the Carson Exhibit at the Ward. I have more to say about this event but first, I want to tell you a little bit about the Ward Museum.

Here you see the Ward Museum perched on the banks of the Shoemaker Pond in Salisbury, MD. [Showing slides] The Ward Foundation was established in 1968 to acknowledge and perpetuate decoy carving as an original American art form. Now, for you trivia buffs out there, the other three totally American art forms are Jazz, Scrimshaw, and patchwork quilts. The foundation is named after Steve and Lem Ward; two brothers from nearby Crisfield, Maryland who are credited with making the transition to creating decorative bird carvings. Like their father, both brothers started out as Barbers by trade who carved decoys during their leisure. In time, their decoys became well known throughout the Chesapeake Bay region. In fact, occasionally hunters would come in bringing their decoys for repair, sheepishly admitting that they had shot the wrong bird because the decoys looked more real than the real birds. Toward the end of World War II decoys made from synthetic fiberglass and plastic appeared to relegate the old time carver toward obsolescence. The Ward brothers however, directed their talent to create finer pieces that were better suited for the mantle than for the Bay. Here, we see Lem Ward and his brother Steve. They worked hand in hand. When I think of the word "brothers", I think of Wilbur and Orville Wright who worked together as a duo, like hand in glove. Steve was the carver, and Lem was the painter. Here we have Lem. Both of the brothers are deceased and I don't have a slide for Steve. So Steve, wherever you are, please forgive me for this slight. Here we have a drake, Blue Winged Teal, which was done circa 1967. You can see that this is a finer piece with the raised wings, the posture of the bird. It is certainly not one that would be suited for hunting uses. And here we have the Canada goose, circa 1965, that has now become the Ward logo Goose. Any stationary or anything associated with the Ward Museum has the facsimile of this Canada Goose.

In 1970, the first Ward Championship Carving Competition was held in Salisbury. The competition consists of various levels of skill, from novice to world. At the world level there are several divisions including life sized decorative, life sized floating pairs, miniature, interpretive, and the shooting stool or working decoy. The bird carvings that you see here on display this weekend have all competed in the life sized decorative division at the world level. A Gary Otis Robin pair was the world-class winner in that division for 1989. Several years ago, the competition moved to Ocean City. Held the last week of April, the event attracts carvers from across the country, as well as from England and Japan.

Aside from promoting Wildfowl carving, another mission of the Ward Museum is to foster environmental awareness. Following the release of Linda Lear's superb biography of Rachel Carson we at the Ward conceived the idea of a major exhibit that would chronicle Carson's life and writings. I had the privilege of serving as Curator for that project. Previous exhibits at the Ward had featured artists who worked with a visual medium. This exhibit presented a challenge as it captured the beauty of the written word through complimentary artwork. "Witness for Nature" was a collaborative effort between the Ward Museum and the Rachel Carson Homestead in Springdale, Pennsylvania. We also displayed photographs from the Rachel Carson Historical Project. The father and son team of William and David Turner, from Olney, Virginia loaned us several bronze wildlife sculptures that helped to illustrate Rachel Carson's prose.

Our visitors were fascinated with the number of artifacts that we were able to assemble for this exhibit. The Rachel Carson Homestead loaned us the bronze bust of Irving Boteler, which you see here. A copy of the 1925 Parnassas, Pennsylvania High School Yearbook with Carson's senior entry, copies of her handwritten applications to Graduate School at Johns Hopkins University, and a framed fan coral that Rachel herself collected, probably during her research for The Edge of the Sea. Shirley Briggs, one of Carson's contemporaries loaned us the original Howard Freck drawings that illustrate the 1941 Simon and Schuster edition of Under the Sea Wind, Carson's first book. These drawings, heretofore, had never been displayed publicly. These drawing were juxtaposed with a collection of Bob Hines that illustrates the fiftieth anniversary of Under the Sea Wind from 1991. Regrettably, the "Witness for Nature" exhibit was dismantled in May of 1999. We at the Ward are hopeful that there might be sufficient interest to reassemble material and create a traveling Rachel Carson exhibit. Following the closing of our Carson exhibit Shirley Briggs donated to the Ward Foundation her collection of the Howard Freck drawings.

I would like to recap the history behind these drawings. Howard Freck was born in Cincinnati, Ohio in 1873. But he spent most of his adult life in Baltimore. An artist, from an early age, Freck studied at the Art Students League in New York City as well as at the Maryland Institute of Art in Baltimore. During World War I he did anatomical drawings for the Army Medical Museum. After the War, Freck became a staff artist for the Baltimore News and the Baltimore Sun. At the Sun, he had an innovative assignment for the weekly Sunday supplement. [He was] to create portraits of those celebrities who appeared in the pages of the supplement. Howard joined the Faculty of the Maryland Institute of Art where he remained for nearly forty years, until his retirement in 1966. During his tenure there, Freck was promoted to the position of head of the Graphics Department. Although his forte was etchings and monoprints Freck proved his versatility as an artist with oils, mural paintings, oriental screens, and bass relief. Later in life, he even dabbled in abstract art. Howard accepted commissions to augment his teaching salary. And it was through one of these commissions that Howard Freck collaborated with Rachel Carson. During the 1930s the U. S. Bureau of Fisheries, a predecessor to the Fish and Wildlife Service, launched a series of radio programs to educate the public about marine life.

The Division Chief offered the challenge of writing the scripts to Rachel Carson. Rachel's boss then asked her to compose an introduction to the series for a proposed government brochure. To her dismay, he vetoed her composition. He said it was too good for it's intended use and suggested that she submit the essay to The Atlantic Monthly. Meanwhile, Carson began to freelance, writing articles on Chesapeake Bay topics for the Baltimore Sun. Rachel developed an ally in Mark Watson, the Sun editor who appreciated her writing and encouraged her to write articles for publication in his newspaper. In time, Rachel did submit her essay to The Atlantic, which accepted and published it with the title Undersea in 1937. The essay caught the attention of those in the literary trade, some of whom encouraged Rachel to expand the piece into a book. Rachel signed a contract with Simon and Schuster. By day she worked for the government. After work and on weekends, she would compose her book. Through the encouragement of Sun editor, Watson, Rachel commissioned Howard Freck to illustrate her book.

Howard's son, Bryant who is now 75 years of age recalls as a teenager, accompanying his father on a visit to Carson's apartment in Silver Spring. He describes that in a room "filled with cats", he remembers Carson as being slight in stature, rather soft spoken, and her demeanor serious and direct. Despite Carson's reserve, she and Howard Freck had a cordial business relationship. In the Rachel Carson Collection, at Yale's Binecki Rare Book and Manuscript Library there is an exchange of letters between Rachel Carson and Howard Freck. On September 24, 1940 Carson writes, "Eventually, I am sure we are going to want that scene described in the first pages of chapter one; the Black Skimmer coming down to the island after sunset. If you should be interested in doing that as your sample, here is the way that I see it. There is only a little of the island in the foreground. Most of the picture is water and sky. The water is calm with a bright path across it, the sky with some clouds that reflect the glow of the sun. Several Skimmers are silhouetted against the sky and one is coming down to that water, near that shore of the island. It is a twilight scene with just the sunset afterglow on the clouds and water". Nearly two months later, on November 24th the inevitable occurred, Carson writes, "When your drawings came last week, I was a little startled by what seemed to be inaccuracies of the anatomy of birds. I am going to enumerate the mistakes for each bird on separate sheets and send them to you when

I return the drawings. After reading this letter, and looking over the list of corrections, you will see just what the artist who does my book is going to let himself in for. And if you wish to wash your hands of the whole thing, I couldn't blame you; although I should be very sorry". And Carson did include a laundry list of errors for both the Great Blue Heron and the Osprey.

Simon and Schuster released Under the Sea Wind in November of 1941. Interspersed throughout the text are six aquatinted Fred illustrations. Upon its publication Under the Sea Wind did generate initial critical acclaim. Oceanographer William Bebee wrote a positive review in The Saturday Review of Literature. Bebee ended his review with, "The illustrations by Howard Freck are beyond criticism, and satisfactory in every way. I wish there were twice as many". Bryant Freck recalls that that comment brought a wave of applause in the Freck household. Unfortunately, the month following the books release brought the attack on Pearl Harbor. The newly released book for forgotten during the ensuing war. Total sales of the book were less than fifteen hundred copies. Bryant Freck recalls Rachel Carson's invitation to Howard Freck to attend a local book signing. Howard declined, refusing to participate in any event that resembled commercialization.

Discouraged by the poor reception of her first book, Rachel Carson again turned to magazine writing. It was nearly a decade later when she decided to about the world's oceans. Drawing from the recent military research in Oceanography. Carson obtained a contract with Oxford University Press, which was then a fledgling publishing company. There is a story that is probably apocryphal that is told in the Freck family. Reportedly, Carson approached Howard Freck about drawing illustrations for her new book. With out a strong business sense, Howard declined. That book turned out to be The Sea Around Us, which was a huge commercial success. As interest in The Sea Around Us crested, Oxford University Press reissued Under the Sea Wind in 1952. Carson then had two books on the Best Seller list. "A phenomenon," said the New York Times, "as rare as a total solar eclipse". Unfortunately, Oxford opted for a Spartan volume of Under the Sea Wind, without the Freck illustrations. When Shirley Briggs donated the Freck drawings to the Ward Foundation, the agreement states that we will make them available for public viewing. We at the Ward are grateful to Ms. Briggs for her generous donation. And I am pleased to share both the Freck drawings and the history behind them with you this weekend. Thank you very much for your attention. [applause]

By Barry Lopez

Essayist, short-story writer, and international traveler, Barry is considered one of the nation's premiere nature writers. He is also the author of Arctic Dreams, for which he won the National Book Award. He is also a writer of many works of fiction. He is the recipient of the Literature Award from the American Academy of Arts and Letters, the John Burroughs Medal, Guggenheim and Lannan Fellowships. He lives on a river in Oregon.

Somebody at lunch said, "What we really need are a few jokes", after the information that we got this morning. I am not prepared to tell any jokes, but I want to offer a couple of things in a minute as maybe a change in perspective. The first thing that I would like to do is to salute the courage and the professionalism of the three women who preceded me here this morning. I think that in different ways, you see the light that is Rachel Carson, faceted in these women; in their determination to ignore the price and bring home the information, in their willingness to devote their lives outside of their families to the betterment of their communities. Part of the reason that I would accept an invitation to come into a group like this, and try to speak with you, or join forces with you is out of a profound, and that is the right word, regard for what all of you do. Everyone in this room has been at professional risk to say what they believe must be said in a country that is pure blind about its biological fate. And it's important to me to convey to people outside the world of government and science and academe that a lot of men and women have sacrificed some measure of their spiritual lives in order to offer their children figuratively and literally a more conducive place to live; an environment in which they could thrive. So my real reason for being here is to say thank you and specifically to pay my respects to the women who preceded me because I sat there and watched the spirit of this woman, whose name we have gathered in today, reflected in the careers of all three of these people. So maybe you would join me in another applause for my predecessors.

I hope that Rachel is smoothing the pleats of her skirt over that. Here's a quick, slightly different take on what it is that we face. A couple of years ago I was having lunch with a writer who many of you know, David Quaman, in San Francisco. The subject of the Exxon Valdez came up. And David said something I thought was well worth remembering. He said, "You know, petroleum has been seeping out of the earth for eons, and at some point, and in some place, the devastation locally to wildlife must have been like that which we experienced at Prince William Sound. My question is, do people really understand the environmental damage of a movie like A River Runs Through It?" I asked him what he meant. He told me, "Well, once in Montana a more or less contiguous forest in a certain area, of a certain river. And now people with 'toxic' levels of wealth have moved in, cut all of these pieces apart and taken up the life of the author of A River Runs Through It. And in living our their Norman McLain lives, they have disturbed wildlife more permanently and probably more deeply than did the wreck of the Exxon Valdez." Whether or not this is a databased opinion that can be validated by somebody outside that experiment, I don't know. But it's a good way to look at things because some of the most innocuous entities that we celebrate turn out to be, on second sight, more damaging to our way of life that we thought originally. We are so distracted and so dazzled by things that entertain, like movies, that we fail to see they promulgate a set of values that are no good for us. And one of the things that is no good for us is that we should aspire to having five homes and 12,000 acre ranches and having all of the animals come and pay their respects to the "king". That's not the way we should live. A second point, to clarify what I mean about reorientation: Two years ago, my phone, which had a deeply unlisted number, rang. The man at the other end of it, or actually his assistant, verified that I was there and then put his boss on. His boss was a man named Bill Wade. He was at that time the President of ARCO, an oil company that some of you may have heard of, with some interests north

of the Brooks Range. He said, "I have been reading your work for ten years and I would like to know if I can come and pick you up and fly up to the north slope, and the two of us can just walk around for a couple of days and talk about oil and civilization and where in the hell are we going?" In that moment I thought, " I'm in over my head". And in the next moment I thought, "At this age, and at this point in my life if people don't know what I stand for I'm not going to explain it. And I am going to go with this guy." So I did. What it opened up was a possibility for me to sit down with people like him. And I asked him at one point, "Bill can you say what you've said to me in the confines of this private corporate aircraft on our way up to Prudhoe, at a stock holders meeting?" He answered "No". Can you say this at a Board of Directors meeting? "No". And I said, "What I really want to know is do you guys talk to each other like this at these Aspen retreats for high powered executives?" "No". They are so afraid to say what's on their minds and what disturbs them deeply, and the embarrassment that they feel and how they are publicly represented as businessmen in extractive industries like oil that they don't say anything. But I have been able to introduce some of these people to each other. They talk a language I can't talk, and I am hopeful that a consortium of them at some point will stand up and say, 'We're gonna stop it. We're just gonna stop it'. And take their minions, those in Congress and those in the White House for example, and tell them that it's time to grow up; we can't live like this anymore and insure the biological integrity of Homo sapiens or any other organism. We can't do it. So that's my little piece of hope at the moment. That somebody would pick up the phone and say, 'I am in pain, and I have no one to talk to, and I would like to talk to someone who I believe can hear what I am trying say; and not make a judgment about me because of my corporate position, or because of the career that I have chosen'.

The third thing that I would like to offer, and I hope this sounds even more hopeful; I am not being naive; I have seen the dark cloud and faced more of it maybe on purpose than some people have. Because I believe that if writers don't do that, they are of no value to their society. We do not need people to tell how brilliant the light is who refuse to look at the darkness. What we need is people who have stared right into the heart of darkness and turned around and said, " I believe there is enough light'. That's what we need. And any time I see that flicker, I want to aide and abet. And that's what I saw with Bill Wade. And I don't care if he is the President of an oil company, which he has resigned from at this point. I want to help him do what his heart makes him feel that he must do, knowing what he has learned. He was the President of ARCO Alaska when the Exxon Valdez ran onto a rock and had a slight accident, so he knows a little bit about being in the crosshairs. The third thing that I want to say, which I will be very brief about; is a program at Texas Tech University in Lubbock. Eighteen months ago they came to Ed Wilson, Neal Wilson and myself and said, "Would you design for us a brand new undergraduate major that would combine the Sciences and the Humanities and produce a student who was conversant with molecular and field biology, and the arts; and competent to move in either arena, would you do that?' Well, we did. The degree program takes four and a half years because it requires a full-scale field experiment in Biology, and also requires a full-scale terminal project in the arts. It takes a little longer than the standard four-year program. But that program will open at Texas Tech this September. The speed with which they moved it, not only through their own corporate academic machinery, but also through the State Board of Higher Education in Texas was breathtaking. I turned the curriculum in to the University in December of 1999, and the program was approved and most of the paperwork was completed my December 2000. I remember, I told Sylvia this earlier that Ed said to me on the phone one night, "You know, I would love to have something like this happen at Harvard." But it's not going to happen at Harvard or Stanford or at Madison or Ann Arbor or Berkeley because those faculties are too entrenched in their differences. It's got to happen at some off of the map place. I hope nobody went to Texas Tech here. Ed also said, "I'll guarantee you that once this program is up and running, every major university in the United States is going to come to this school and say, we have so many students who would like to in essence double major in Biology and the Humanities; the arts or English Literature or History or Language. We have so many students who desire to not split themselves up. But in the wake of two thousand years of enlightenment division, to reunite the Sciences and the Humanities: we know this is what our students want. And we'd like to ask you 'can you help us?'" We had a talk about this about six months ago and I'll end with this point; We were flying back from New York to Lubbock, and the major is organized under the umbrella of the Honors College at Texas Tech. I heard the Provost talking with the Dean of the Honors College. And he said, "Gary, I'd like to have in place in two years a degree requirement for everybody in the Honors College, and that would be a course sequence in Biology, and a course sequence in Ethics. I do not want a student to graduate from our Honors College who does not have a full awareness of the biological impact whatever it is that they choose to do as a career. And religion aside, I want them to have a clear understanding of their responsibilities to the human community." There was a pause, and then John Burns, the Provost, said, "And I am hoping that you'll work with me so that in four years our graduates from the Engineering School and the Business School, every undergraduate at this School, there are about twenty-seven or twenty-eight thousand students there. I would like to see that no one graduates from Texas Tech University without a course sequence in Biology, a focus in Conservation Biology, and a course sequence in Ethics."

I wanted to offer those thoughts before I began because some of what I have to say is not light. I don't know how all of this works actually, but I'm going to be with both sessions this afternoon and glad to entertain any questions during those sessions or after dinner. I probably can't talk while I am trying to read tonight, but that aside, I am glad to join with any of you in conversation about these ideas.

Rachel Carson is a great hero of mine. When I was a young man and read her books, I was thrilled to know that another human being was as enthralled with the world as I wanted and hoped it to be; with what I had to work with in an agricultural valley in southern California. It was a while before I understood who she really was, and how brave she really was. And as a young man I admired her not only as a scientist, but because she was a first-class citizen. And later I understood she was like people whom I admire as writers, like Stegner, who managed to be both an extraordinary writer and a first-class American citizen. She has made me rethink a number of things, and one of them is the whole idea of what it means to be a Naturalist. That's what I would like to make my formal presentation about this afternoon.

My home stands on a wooded bench, set back about two hundred feet from the north bank of the Mackenzie River in western Oregon. Almost every day I go down to the river with no intention but to sit and watch. I have been watching the river for thirty years, just the three or four hundred yards of it that I can see from the forested bank. [There is] a run of clear, quick water about three hundred and fifty feet wide. If I have learned anything here, it's that each time I come down something I don't know yet will reveal itself. If it's a man's intent to spend thirty years starring at a river's environs in order arrive at an explanation of the river, he should find some other way to spend his time. To assert this, that a river can't be known, does not to my way of thinking denigrate science any more than saying a brown bear can't be completely known. The reason that this is true is because the river is not a 'thing' in the way a Saturn Five engine is a thing. It is an expression of biological life in dynamic relation to everything around it—the salmon within, the violet-green swallows swooping its surface, alder twigs floating its current, a mountain lion sipping its bank water, the configurations of basalt that break it's flow and give it timbre and tone. In my experience with field biologists, those fresh to a task, say Caracara research, are the ones most likely to give themselves a deadline; ten years for example, against which they will challenge themselves to know all that there is to know about that falcon. It never works. Most seasoned field biologists, not as driven by a need to prove themselves, are content to concentrate on smaller arenas of knowledge. Instead of speaking definitively of coyotes, armadillo, or widgeon, they tend to say, 'this one animal, that one time, did this in that place'. It's the approach to nature many hunting and gathering peoples take to this day. The view suggests a horizon, rather than a boundary for knowing towards which we are always walking. A great shift in the western naturalists frame of mind over the past fifty years it's seems to me, has been the growth of this awareness. To get anywhere deep with a species, you must immerse yourself in its milieu. You must study its ecology. If you wish to understand the Caracara you need to know a great deal about where the Caracara lives, when. And what the Caracaras relationships are with each of the many components of that place, including its weathers, it's elevations it's seasonal light. The modern naturalist then, is no longer someone who goes no further than a stamp collector, mastering nomenclature and field marks. She or he knows a local flora and fauna as pieces of an inscrutable mystery increasingly deep, a unity of organisms, western culture has been trying to elevate itself above since at least Mesopotamian times. The modern naturalist in fact has now become a kind of emissary in this, working to reestablish good relations with all of the biological components humanity has excluded from its moral universe.

Sitting by the river, following mergansers hurtling past a few inches off of it's surface or eyeing an otter hauled out on a boat or with, in my binoculars the scales of a trout glistening on it's face; I ask myself not, 'What do I know that Canada geese have begun to occupy the nests of osprey here in recent springs, that Harlequin ducks are now expanding their range to include this stretch of water', but 'Can I put this together? Can I imagine the river as a definable entity evolving in time?' How is a naturalist today supposed to imagine the place between nature and culture? How is he or she to act, believing as many do, that western civilization is compromising it's own biology by investing so heavily in material progress? And knowing that many in positions of corporate and political power regard nature as inconvenient and inefficiency in their plans for a smoothly running future. The question of 'how to behave?' it seems to me, is nerve- racking to contemplate because it is related to two areas of particular discomfort for naturalists. One is how to keep the issue of spirituality free of religious commentary. The other is how to manage emotional grief and moral indignation in pursuits so closely tied to science with its historical claim to objectivity. One response to the first concern is that the naturalist's spirituality is one with no icons, unlike religions. And it is also one that enforces no particular morality. In fact, for many, it is not much more than the residue of awe which modern life has not yet erased, a sensitivity to the realms of life which are not yet corralled by dogma.

The second concern, how a person with high regard for objectivity deals with emotions like grief and outrage,

like so many questions about the trajectory of modern culture, is only a request to express love without being punished. It is more deeply an expression of the desire that love may be on an equal footing with power when it comes to social change. It is of some help here to, I think, to consider where the modern naturalist has come from, to trace his or her ancestry. Since the era of Gilbert White in eighteenth century England, by some reckonings, we've had a recognizable cohort of people who study the natural world and write about it from personal experience. Gilbert and his allies wrote respectfully about nature. And their treatments were meant to be edifying for the upper classes. Often the writer's intent was to remind the reader not to overlook natural wonders, which were the evidence of divine creation. Darwin, in his turn, brought unprecedented depth to this kind of work. He accentuated the need for scientific rigor in the naturalist's inquiries, but he also suggested that certain far-reaching implications obtained entanglements. "People too", he said, "were biological", subject to the same forces of mutation as the finch. One hundred years further on, a man like Aldo Leopold could be characterized as a keen observer, a field biologist who understood a deeper connection, or reconnection with nature. But also as someone aware of the role that wildlife science had begun to play in politics. With Rachel Carson, the artificial, but sometimes-dramatic divide that can separate the scientist with her allegiance to objective, peer reviewed data from the naturalist for whom biology always raises questions of propriety, becomes apparent. Following Leopold's and Carson's generations came a generation of naturalists that combined White's enthusiasm and sense of the non-material world; Leopold's political consciousness and feelings of shared fate, and Carson's sense of rectitude and citizenship. For the first time, however, the humanists among this cadre of naturalists were broadly educated in the sciences. They had grown up with Watson and Crick, not to mention sodium-floroacetate, Ebola virus ecology, melting ice shelves and the California condor. The modern naturalist, acutely, even depressingly aware of the planet's shrinking and eviscerated habitats, often feels compelled to do more than merely register the damage. The impulse to protest however, is often stifled by feelings of defensiveness, a fear of being misread. Years of first hand field observation can be successfully challenged in court today by a computer modeler with not an hour's experience in the field. A carefully prepared analysis of stream flow, migration corridors, and long-term soil stability in a threatened watershed can be written off by the press, with some assistance from the opposition, as a hatred of mankind.

At the opening of the twenty-first century, the naturalist then knows an urgency that White did not foresee, and the political scariness that Leopold might actually have imagined in his worst moments. Further, in the light of the still unfolding lessons of Charles Darwin's work, he or she knows that a cultural exemption from biological imperatives remains in the realm of science fiction. In contemporary native villages one might posit today that all people actively engaged in the land; hunting, fishing, gathering, traveling, camping, are naturalists. And say that some are better than others according to their gifts of observation. Native peoples differ here, from the Gilbert Whites the Darwins the Leopolds and the Rachel Carsons in that accumulating and maintaining this sort of information is neither avocation nor profession. It is more comparable to religious activity, behavior steeped in tradition and considered essential for the maintenance of good living. It is a moral and an inculcated stance, a way of being. While White and others by contrast, were searching for a way back in to nature, native peoples down to the present in some instances for whatever reason have been at pains not to leave. The distinction is important because, looking for a way back in is a striking characteristic of the modern naturalists frame of mind.

Gilbert White stood out among his social peers because what he pursued, a concrete knowledge of the natural world around Shelburne and Hampshire was unrelated to politics or progress. As such, it could be dismissed politically. [It was] Fascinating stuff, but inconsequential. Since then, almost every naturalist has born the supercilious judgments of various sophisticates who thought the naturalist a 'romantic' a 'sentimentalist', a 'bucolic', or worse. And more laterally the condescension of some scientists who thought the naturalist not rigorous, not analytic, not detached enough. The naturalist of the modern era, an experientially based well versed devote of natural ecosystems is ideally among the best informed of the American electorate when it comes to the potentially catastrophic environmental affects of political decisions. The contemporary naturalist, it has turned out again, scientifically grounded politically attuned, field experienced, library enriched is no custodian on irrelevant knowledge. No mere adapt, differentiating among Empidonax Flycatchers on the wing, but a kind of citizen whose involvement in the political process and the debates of public life, in the evolution of literature and the arts has become crucial. The "bug bear" in all this, and there is one, is the role of field experience; the degree to which the naturalist's assessments are empirically grounded in first hand knowledge. How much of what the contemporary naturalist claims to know about animals and the ecosystems they share with humans derives from what he has read, what he has heard, what he has seen televised? What of what the naturalist has sworn his or her life to, comes first hand experience, from what the body knows? One of the reasons native peoples still living in some sort of close daily associations with their ancestral lands are so fascinating to those of us who arrive from the rural, urban

and suburban districts of civilization, is because they are so possessed of authority. They radiate the authority of first hand encounters. They are storehouses of it. They have not read about it. They have not compiled notebooks, and assembled documentary photographs. It is so important, that they remember it. When you ask them for specifics, the depth of what they can offer is scary. It's scary because it's not tidy. It doesn't lend itself to summation. By the very way that they say they know, they suggest that they are still learning something that cannot, in the end, be known. It is instructive to consider how terrifying certain interlopers; rural developers, government planners, and other apostles of change, can seem to such people when on the basis of a couple of books the interloper has read or a few usually summer weeks in the field with a pair of binoculars and some radio collars, he suggests a new direction for the local ecosystem. And says he can't envision any difficulties.

In all of the years that I have spent standing or sitting on the banks of this river I have learned this; the more knowledge I have, the greater becomes the mystery of what holds that knowledge together. This reticulated miracle called an ecosystem. The longer I watch the river, the more amazed I become, afraid actually sometimes, at the confidence of those people who after a few summer seasons here are ready to tell the County Commissioners here emphatically what the river is, describe it's meaning for the outlander. First hand knowledge is enormously time consuming to acquire. With it's dallying, and lack of end points it is also out of phase with the short-term demands of modern life. It teaches humility and fallibility and so represents an antithesis to progress. It makes a stance of awe in the witness of natural progress seem appropriate, and attempts to summarize knowledge, naive. Historically, tyrants have sought selectively to eliminate first hand knowledge when its sources lay outside their control. By silencing those with problematic first hand experiences, they reduce the number of potential contradictions in their political or social designs, and so they felt safer. It is because natural process; how a mountain range disintegrates or how nitrogen cycles through a forest, is beyond the influence of the visionaries of globalization that first hand knowledge of a county's ecosystems, a rapidly diminishing pool of expertise and awareness, lies at the radical edge of political thought. Over the years I have become a kind of naturalist. Although I previously rejected the term because I felt I did not know enough, that my knowledge was far too incomplete. I never saw myself in the guise of Gilbert White, but I respected his work enough to have sought out his grave in Shelburne and expressed there, my gratitude for his life. I never took a course in biology, not even in high school. And so it seemed to me that I couldn't really be any sort of authentic naturalists. What biology I was able to learn, I took from books, from veterinary clinics, from an apprenticeship to my homeland in the Cascade Mountains, from fieldwork with western biologists, and from traveling with hunters and gatherers. As a naturalist, I have taken the lead of native tutors who urged me to participate in the natural world, not hold it before me as an object of scrutiny. When I am by the river therefore, I am simply there. I watch it closely, repeatedly, and feel myself not apart from it. I do not feel compelled to explain it. I wonder sometimes though, whether I am responding to the wrong question when it comes to speaking for nature. Perhaps the issue is not whether one has the authority to claim to be a naturalist, but whether those who see themselves as naturalists believe they have the authority to help shape the world. What the naturalist as emissary intuits I think, is that if he or she doesn't speak out the political debate will be left instead to those seeking to benefit their various constituencies. Strictly speaking, a naturalist has no constituency. To read the newspaper today, to merely answer the phone is to know that the world is in flames. People do not have time for the sort of empirical immersion I believe crucial to any sort of wisdom. This terrifies me, but I too see the developers' bulldozers arrayed at the mouth of every canyon, poised at the edge of every plain. And the elimination of these lands, I know, will further reduce the extent of the blueprints for unmanaged life. After the last undomesticated stretch of land or ocean is brought to heal, there will be only records. Strips of film, and recording tape, computer printouts, magazine articles, books, and laser beam surveys of these immensities. And then, any tyrant can tell us what it meant and in which direction we should now go. In this scenario the authority of the grizzly bear will be replaced, by the authority of a charismatic who says that he represents the bear. And the naturalist, the ancient emissary to a world civilization wished to be rid of, a world it had hoped to transform into a chemical warehouse the same uneasy emissary who intuited that to separate nature from culture wouldn't finally work will be an orphan. He will become a dealer in myths.

What being a naturalist has come to mean to me, sitting my mornings and evenings by the river hearing the clack Herons through the creak of Swallows over the screams of osprey under the pearl of fox sparrows, so far removed from White and Darwin, and even Leopold and Carson is this; pay attention to the mystery. Apprentice to the best apprentices. Rediscover in nature your own biology. Write and speak with appreciation for all who have been gifted. Recognize that a politics with no biology, or a politics without field biology, or a political platform in which human biological requirements form but one plank, is a vision of the gates of hell. Thank you.

Crossing the Line for National Geographic

By Sylvia Earle

Dr. Sylvia Earle. Sylvia has a distinguished career as a Marine Biologist, and is currently Explorer-in-Residence at the National Geographic Society. At the risk of sounding informal, I just have to say that she is a really cool person. Just listen to some of these things that she has done: she has lead dozens of oceanic expeditions, and she spends about as much time underwater as is possible for a land mammal, with over six thousand hours of dive time. She has written passionately, and extensively in both the scientific and popular literature about water, and as she describes it, "water, the single non-negotiable requirement for life." She is the former chief scientist for the National Oceanographic and Atmospheric Administration. There, her research focused on marine plants and the exploration of the deep sea. She is currently the Project Director for 'Sustainable Seas', a joint project between the National Geographic Society and NOAA. There she is spearheading an initiative to explore our twelve marine sanctuaries in great detail. Please help me welcome Dr. Sylvia Earle.

What a pleasure to be here, and to be here with you. This is time for celebration. To look back on not just the problems that have taken place since the time that Rachel Carson was around to inform and inspire. But, springing forward from that time, to consider where, from here, we might be going. I found the books that Rachel Carson wrote, and the articles and essays about the ocean to be particularly meaningful to me as an aspiring 'ocean person' some years ago. And I found especially appealing the fact that she'd actually say things in ways that weren't totally acceptable, scientifically, but had a broad appeal. She had a genius in communicating sound science in a wonderfully agreeable form without compromising an iota of the scientific merit. Now, it's tough for scientists, it is, to cross the line, and speak in ways that are acceptable to the general public; that will be listened to by the general public. In fact, there is such resistance I know that many of you in the audience have experienced this. I certainly know that Theo has. You get branded by your stuffier-than-thou scientific colleagues as a 'quotes popularizor' if you get out of the learned journals, and you speak or write in ways that are intended to communicate to an intelligent ten year old, or even a Congressman or two, without compromising the truth. [Laughter]

I was inspired personally, when I finally crossed the line, when the National Geographic actually asked me to write an article back in 1970, and my first reaction was "no". Actually, my reaction was "Hell no". I couldn't do it because my reputation would be destroyed. Even though it was for a reputable publication such as the National Geographic. And finally, I guess common sense prevailed, and finally, I said, "Ok, I'll do it." And I wrote my first article for the general public. It came out in 1971, and it was about what it's like to live under water. But I crossed the line, and I haven't looked back since then. Because for one thing the rigors that I was subjected to by the National Geographic to make certain that every last decimal point was precise, they checked my grammar even, to make sure that that was ok. Even my toughest peer review journal that I had faced up to that time didn't match with the reviews that I got from the staff at the Geographic.

But all of that said I nonetheless derived inspiration from Rachel Carson. Because she not only crossed the line, she waltzed through whatever lines there were. And when she accepted the National Book Award for The Sea Around Us, she said, "The winds, the sea, and the moving tides are what they are. If there is wonder, and beauty and majesty in them, science will discover these qualities. If they are not there, science cannot create them. If there is poetry in my book about the sea, it is not because I deliberately put it there, but because no one could write truthfully about the sea and leave out the poetry."

And fortunately, she has lots of poetry to explain the nature of the ocean, the 'sea around us.' And the previous book, Under the Sea Wind, copyrighted first in 1941, that was an incredible era, the decade of the 1940's. It was an extraordinary time. For humans it was a decade of war. And as we focused on annihilating one another, there was a curious pause in the war that we seemed to be waging,

up to that time, on the creatures of the sea. We picked up and made up for lost time after World War II and then some. But by the mid 1940's many sea mammals were at historically low populations already because of human perdition–whales, seals, otters—and it seems so unlikely that perdition from a terrestrial primate should have such an impact on systems that have been developing for hundreds of millions of years in the absence a terrestrial primate. We have just come along in the last few thousand, and have made such tremendous impact on the land, and now increasingly, on the sea as well.

By the time Under the Sea Wind was published, we aggressive terrestrial primates had already made substantial inroads in the wild sea creatures. For five centuries, cod had provided the mainstay for the underpinnings of wealth for several nations, including our own. But by the 1940's, cod was already in serious decline from what had seemed to be, and what still seems to be an astonishing abundance prior to that time. Wars among people had already been fought over cod and herring, another cornerstone species in the North Atlantic ocean ecosystems. And we had seen even by then, a sharp decline in many fresh water species.

Yet with all of that said, despite the sharp declines already apparent, some 60 years ago in 1947, when Thor Heyerdahl and his colleagues made their remarkable Kon Tiki voyage across the Pacific from Peru to Polynesia on a balsa-wood raft, the sea was essentially pristine, largely intact, and mostly free from contamination from humans. There was no plastic 'stuff', no plastic debris drifting around in 1947. It was before we heard from the film, The Graduate, "the future is in plastics". It is well to think about the history that has rolled by in the time since Under the Sea Wind was published. The massive intrusion of toxic materials, while it was still largely a matter of the future, we had already gotten a little start, certainly on the land, and inevitably the sea, because all waters flow to the sea. Our population numbers in the 1940's were just over two billion on a global scale, up from one billion in 1800. Looking back, Thor Heyerdahl said that what impressed him the most, crossing the Pacific was how wild the ocean was; he does that from the perspective of the present time. He looked back, particularly from the perspective, some years later, in 1969 and 1970, during the Ra Expeditions when he traveled across the Atlantic, and every day saw great evidence that human beings had arrived on this planet— big time! With little balls of tar, with little bits of plastic, even then.

The Sea Around Us, published in 1950, was a monumental tribute to ninety-seven percent of earth's water, essentially ninety-seven percent of the biosphere. Home, literally for most of life on earth. It's where the greatest diversity of life actually is. With all due respect and homage to rain forests and other terrestrial habitats and systems, the action is mostly out there in that huge three dimensional realm–where the average depth is two and a half miles and the maximum depth is seven miles. And where the big wedges of life that make up the genetic diversity, the thirty or so divisions, the phyla of animals, the many classes of animals; the many variations on the theme of plants, the variations on the theme of bacteria. All of the major divisions, essentially all, there are very few exceptions but most of the major divisions of plants and animals are out there in the ocean. Only about half have representation on the land or in fresh water systems. So when you think about diversity of life; and we are caused, I hope at this point in time to think very hard about the diversity of life, think 'ocean'.

I think a lot about the diversity of life with respect to the theme of Theo's presentation this morning, the way that on one hand, every critter, including all the critters in this room, every one is unique. And that is something of a miracle about life. Every cat, every dog, every horse, every fish, every bird, and certainly you know, every human is different from every other one. Not just today, but through all time. Imagine all of the trees that have come and gone. Every one it's own self, it's own distinct creature. Despite all of the cloning stuff, the natural fact is that we've got all of this immense individuality out there. But the other miracle is the way it all ties together. The chemistry of life that ought to give us pause, when we think about what we are doing to the chemistry of the planet, is common ground that we share, whether we are talking about bacteria from the depths of the ocean or spiders, or our fellow mammals. We have the chemistry that binds us together. If we monkey around with the way the chemistry of the planet is geared, we are monkeying around, for sure, with our own future. And certainly when we do things to alter the nature of water; fresh water, salt water whatever it is, we are risking the life support system that provides the underpinning of all life. Fresh water of course, largely originates from the sea, evaporated from that two thirds of the earth's surface that is aquatic, and is returned via rain to the land and the sea.

In an introduction to a new edition of The Sea Around Us in 1989, Ann Swinger reminded us that it is hard to put ourselves in the context of that time in 1950, when The Sea Around Us was being drafted and presented. It is hard to realize how much nobody knew, and certainly what Rachel Carson did not know at that point in time. And yet, the way that she did at that point in history, to bring people up to date, at least on the state of knowledge and communicate to the world at large was and still is a remarkably successful book to communicate the nature of the ocean. In her own preface to the 1961 edition to The Sea Around Us, just three years before Rachel Carson left us, she reflected on the astonishing discoveries in the decade after writing The Sea Around

Us–the first crossing of the Arctic Basin under the ice by submarine and the discovery of some forty thousand miles of undersea mountains, the single largest feature, geologically, that the planet has. A continuous stretch of mountains down the Atlantic, Pacific and Indian Oceans that we just didn't realize were there. They were suspected in part, but not the magnitude, not the scope, not the significance of them. That has gradually unfolded in the years that have followed.

The existence of immense subsurface currents, rivers in the sea, was largely unknown prior to the 1950's. It wasn't until 1960 that for the first, and remarkably the only time in history still, that two people actually got to the bottom of the ocean. I mean, the deepest part of the ocean, seven miles down. And seven miles down is a long way. When you think you've got to hold your breath, or develop a piece of equipment to get down there. We have lots of equipment that can take us high in the sky, aircraft of many variations on the theme, largely developed in the last fifty years as well, but what has happened in the ocean? Well, many new technologies that have come along but it is just amazing that only two people have successfully made a round trip to the deepest part of the sea. One way trips? Really easy! We just don't know how many of them there have been.

But to get the report back in 1960, yes, it's possible we have the technology we can do this, but also, there is life down there. In fact, there is life all the way, from the top to the bottom. That is confirmation what had been suspected. But here it was with human eyes, down where the pressure is sixteen thousand pounds per square inch, where it's really dark. It gets really dark when you get below one thousand feet or in Boston Harbor, below about ten feet. It depends upon where you are. But in the open sea light actually penetrates below one thousand feet. I have been at one thousand feet, and looked up, and could see just a glow above. At two thousand feet, though, it's dark, except for the flash and sparkle and glow of bioluminescence, a profoundly important kind of chemistry. There are some seventeen variations on the theme of ways to create bioluminescence, but with a similar kind of pattern; fireflies do it. But in the ocean, some ninety percent of the creatures in the deep sea have some form of bioluminescence, much of it bacterial in origin. With many creatures creating special favorable conditions for the growth of bacteria, in little patches on their hides, such as many kinds of fish with lights down their sides, populated by luminous bacteria.

What are we doing to the ocean, I wonder Theo, with respect to the chemical processes that are so fundamental to things such as bioluminescence? Nobody seems to really be focusing on that question. Although I know that there is some interest, on the part of military forces around the world; they'd like to turn the lights out because sometimes it has been kind of disconcerting to be able to spot from the sky ships that are cruising along with their lights out, but making this big glowing wake as they pass through. Submarines are detectable under the surface as they create a swath of luminescence many feet from the surface, also detectable from up in the sky. But it's really scary, thinking about the thought that we could really turn the lights out in the ocean through some chemistry; intentionally or unintentionally.

Technologies developed during World War II, and later during the so-called Cold War were used certainly, to gain access to the ocean, among them the acoustic techniques to develop what we now know about the configuration of the sea floor. Presently you can go to the National Geographic and find these wonderful maps. There are other sources as well. NASA has beautiful maps derived from high in the sky, using new techniques that are being deployed from satellites. They are looking at minute differences in the sea surface, the actual sea surface difference that reflects the terrain below. These are minute differences that when magnified show the configuration of where the mountains are, where the valley are, and where the broad plains are in the ocean. That doesn't mean, however, that we know what's down there. We know something about the geography of the ocean, more now than ever before, and a lot more than we knew in 1950, or 1960, or 1970 for that matter And it gets better all of the time. There are still blanks on the map, however. I have just had the fun of producing, in cooperation with the National Geographic, the first Ocean Atlas that they have ever turned out. It will come out in about a month. I was on one hand just thrilled to see that yes there are places on the planet that we haven't yet mapped, underwater, near Antarctica. So they appear on these fancy new maps with all of the latest information from NASA, the Navy, and from NOAA.

We still have places that we don't know enough about to say more than, wait, there's a blank space, still on the map of the earth. So that's the good news in a way. It's also the bad news. What do you mean we don't have a complete map of our own planet? We've got detailed maps of the Moon, Mars, and even the moons of Jupiter, so what's the big deal about mapping our own aquatic planet? But the fact is, that we don't know even in broad strokes the nature of what's out there in some fashion. In writing about the ocean, from her perspective in the 1950's and again, with the update in the 1960's Rachel Carson expressed grave concerns about the excessive capture of wildlife from the sea.

People ask me, "What are the big problems that face the ocean today?" And you can boil it down to some broad categories. What we are taking out of the ocean, I'll get

into this a bit more in a moment; also though from what you've heard from Theo and others; and what we are putting into the ocean. Those are not new concerns they are just growing as time passes. Carson particularly noted, some forty years ago, about the consequences of waste disposal at sea. She noted radioactive waste; problems that have not gone away in forty years. Nor will they in four thousand years. She said that the truth is that disposal has proceeded far more rapidly than our knowledge justifies. To dispose first and investigate later is an invitation to disaster. For once, radioactive elements–you could say that about a host of other things as well— are deposited in the sea, they are irretrievable. The mistakes that are made now, are made for all time. And somehow this wears well, even considering four decades later. It is sound advice. What we are doing now is the inheritance for all time. But it cuts both ways. Some of the bad news that could cause all of us to go out and sit under a tree and contemplate 'what's the use?' We could also flip it around and simply say as never before, "We have an opportunity." Maybe as never again, but certainly, we know more now. We have, as ever before, a sense of urgency to set in motion policies, decisions, attitudes, a knowledge base that will be a legacy for all time. So side by side with the unfortunate aspects of what humankind is doing, there ought to be, and I think there is; and I think this conference is one shining example of the flip side—the positive side of communicating among ourselves. And then being inspired to be able to go out and communicate in every way possible to the rest of the world about the urgency of somehow getting it right.

Back in the 1960's, for the ocean, there was established in this country, for the first time, by this country, a commission to set in motion what was thought to be favorable, desirable policies. It was called the Stratten Commission. The people who were on the Commission really can't be blamed I suppose for the attitude of the time. It was about thinking that the only ways that you could use the sea; and that was their charge, "How do we use the ocean productively?" Was it to extract things from it—oil and gas, minerals, and certainly wildlife? In fact, at the time it wasn't just in the United States doing this , it was around the world. It was believed, and it was considered a desirable thing to feed the growing numbers of people that were clearly coming onto the planet from ocean resources; to take the wildlife. One hundred million tons was the goal to be extracted annually from the ocean back in that 1960's perspective. At that time, something like forty million tons a year was being extracted. But even that is a staggering amount when you consider that we are talking about perdition from a terrestrial primate, new on the scene in the last few hundred years effectively. Yes, we have taken from the sea as long as people have been around, no doubt. But not on the scale, not in the magnitude that has happened since the time that The Sea Around Us was published.

It is absolutely unprecedented, the technology now used to find undersea mountains, or submarines for that matter, is being used to find fish. Every last fish in a school is now detectable, and catchable, using the technologies and materials that have been developed since the two major wars, the Second World War and certainly the Cold War. We have the capability now, if we wanted to, of getting every last whale. Our capacity to do that is clear. We came close to doing it without even trying by the 1940's the 1950's and 1960's before we hauled ourselves up short as a species and said, "Hey, wait a minute, maybe there is some use to whales beyond just pounds of meat and barrels of oil". But even then, if we want to have whales to kill, we have to take measures to protect them in some fashion. Well, we haven't done a great job of doing that. But at least there is some good news. Some of the populations of whales that were definitely on the way out are recovering, and would have been exterminated, had we continued as we has been proceeding through the years prior to taking action. There is good news with respect to some species of fish. But by and large fish are in trouble. I am going to give you one small example, as portrayed in one of the other means of communicating that has come about largely since the time of The Sea Around Us and that is with films. There is no substitute for the written word, but I've grown up, and so have you, with an age of communicating beyond the words and using images to help and complement the poetry and the science that is communicated. We really need this if we are to understand the latest news about what is happening. Around the world right now, some one hundred species of marine creatures are- for the first time, in 1998, listed as endangered or threatened; basically in trouble on a world scale. It is clear, that just as with populations of wildlife on the land, wildlife in the sea is vulnerable to unrestricted taking. And it's hard for most people to empathize, to sympathize, to comprehend what's been happening in the ocean. Why? It is largely because we are terrestrial primates. We don't get out there, or down there to see what's going on. So when I had a chance, a few years ago to work with the National Geographic to try to get people to think like a tuna fish I jumped at the chance to do so. Now, this is not great prose, it is mostly a film. But it's another avenue for communicating the ethic of trying to take care of the natural world, that when you get right down to it, it takes care of us. I am going to show you just this first little piece of bluefin tuna film that will give you an idea of what I am suggesting as another means to get out and about, and stir things up. I am using the magic of technologies developed since the 1950's here.
[Film segment plays]

I just wanted to give you a taste of what it might be like to be a bluefin tuna out there in the wild ocean. I was instrumental, I think, in convincing the National Geographic to make this film, and to make this film about this fish.

Because for me it was a symbolic creature that could convey a message, carry the freight if you will, for a lot of other things. Now, there have been dozens, maybe hundreds of films about sharks and whales, but how many films do you know, that have been made about a fish? I guess there have been films about salmon, wonderful creatures, but largely on the basis of 'how to we catch them and how to we cook them?' Not really from the standpoint of the creatures themselves.

What inspired me the most about this particular creature took place when I was serving as the Chief Scientist at NOAA. A little piece of paper came across my desk that really rocked me right down to the tips of my flippers. It was just a very straightforward summing up of the status, as best the fishermen and the scientists together, could provide for population evaluation of these creatures in the last twenty years—it said that the population of the Blue Fins in the North Atlantic was down to essentially ten percent of what it had been when the assessment began, twenty years before. I just fell off my chair! I was in a sort of stuffy meeting that followed. We were discussing what the policies would be about how many fish would be allowed to be taken in the future. Because I wondered did anybody think that maybe the point had come when we ought to stop killing them altogether to give them a chance to recover. Well, no because tuna by then had proven to be extremely valuable. And it continues: a single bluefin can bring, in a market in Tokyo, thousands of dollars. One, a few years ago that Carl Sophina reports on in his great book Song for a Blue Ocean sold for $83,000! This was one fish. It was a big fish of eight hundred pounds. I was at the Tokyo fish market two years ago and there wasn't a single one that came close to being that large. In fact, they were mostly babies. I could go around and pick most of them up in my arms. They were that small. But they are still extremely valuable, and pound for pound, one of the most valuable pieces of protein on the planet. So of course they are going to continue to extract what they can. And there are still quotas.

Yes, there are quotas, but unrealistic quotas about how many can be taken. And the population of bluefin is still very much in doubt for the future. And it's just one of sixty-five or so variations on the theme of tuna, all with the same basic predatory life style. So that taking a pound of tuna, let alone eight hundred pounds of tuna out of the ocean; or tons of tuna, or millions of tons of tuna currently being extracted really represents a huge cost to the ocean ecosystems.

We are talking about a fish that eats fish, that eats fish, that eats fish, and oh, by the way, we're talking about a fish that is eight or ten years old by the time it's extracted from the ecosystem. So we are accounting for on the order of something like one hundred thousand plants back here at one end of the food chain, for every pound of tuna that we haul out at the other. It's true too, of course, with Cod. And any of these top of the line predators. Think about how many pounds of sunlight are invested in an orange. Roughly, that may be one hundred years old before it comes to your plate. Or rockfish in California, some of those populations were down to not just ten percent, but two percent, and not yet fully protected despite this absolute collapse since the publication of The Sea Around Us. It's happened largely, not just in fifty years. It's happened in the last twenty-five, the last twenty, the last ten. And in some respects the pace just keeps picking up because we haven't taken the pressure off.

And the chance of recovery for some of these species looks considerably remote. I wonder sometimes what Rachel Carson would think if she could come back and go out aboard an oceanographic research vessel today. She did in her time. It helped certainly, to form the basis for that remarkable volume in 1950 that brought a summing up of where we were then. I would take all of us, right now, out into the ocean. Again, I'll have to do it vicariously through a film. In this case, I was an advisory for this little piece. This was down in a submarine called the Johnson Sea-Link, to go prowling around the ocean, looking over the shoulder of a specialist in bioluminescence, Dr. Edith Whittier who is at Harbor Branch Oceanographic Institution. [Shows a short film] So, just to give you a glimpse of what it's really like on most of the planet.

How do we take care of this vast realm that we barely understand? We are only beginning to understand how much we don't understand! It's perhaps one of the most important discoveries of our time; not all of the stuff that we have learned, although that is important. But understanding how much we don't know it perhaps the most important breakthrough of our time to face up to the magnitude of our ignorance. How do you take care of a place that is so little know, and is so vast? Well, on the land, back in 1872; coincidentally that would be the same year that the first global oceanographic expedition took place when the Challenger set out on a four year mission to look at the oceans of the world. That was the same year that the first National Park was established, Yellowstone. It took a few years before something like a system got up and running. But it took one hundred years before something similar was put into place with respect to legislation that made possible something in the ocean. The system that is now known as the National Marine Sanctuary program, with now some thirteen sites; a place in the Great Lakes, and Thunder Bay was recently added. There are eighteen thousand square miles. And if the area designated off of the northwestern Hawaiian Islands becomes integrated into the system, it will really be a nice jumpstart for the ocean. This is in terms of some eighty-eight thousand square miles of aquatic protected area.

Now in truth, there isn't much protection inherent, not much sanctity in the sanctuaries. Just as there wasn't in the early days of the National Parks. It was all right on kill the bears, or knock off the wolves. In fact there was a bounty on wolves, as you know, in the early days of the National Parks. We are finally getting around to trying to restore some of that loss in the system of Refuges and other areas on the land that now serves as the bulwark against change. We are saving the legacy, the cornerstone of biodiversity on the land. It is monumental in its importance. And if we had to start today to do for the land what we are now facing that we have to do for the ocean, think of the difficulties if somebody hadn't put land in trust for the future in the twentieth century. If nothing had been done, prior to the present time to protect the inheritance that we now face, it would be a terrible challenge. And it is a terrible challenge. And it is an awesome one.

To think that as we now embark on the twenty-first century of the magnitude of the job ahead if we are to do something comparable for the ocean. The good news is that perhaps in some instances at least, there is more 'wild' out there. There is more a chance, but more of a challenge, because it isn't just the United States that has to act. We have to perhaps take a leadership role, but we have to also partner with other countries if we are to protect the ocean. It is hard enough to form partnerships within our own country, within agencies to protect land and fresh water and ocean as nobody knows better than the people in this room. But miraculously, a couple of weeks ago the Department of the Interior joined forces with the Department of Commerce and set aside what is today the largest 'no take' area in this country in the ocean. It is off of the Dry Tortugas. There are two hundred miles where the fish are safe. Well, in theory at least. They are safe from direct perdition. There is no commercial fishing, not even any sport fishing. They are not safe from the kinds of forces that flow in from the sky above and surrounding water. This is in terms of contamination, or changes in the nature of the ocean itself. But certainly, we are taking the pressure off of that little patch. And we are using it, one would hope, as a model for what might be done successfully elsewhere.

On balance, it is safe to say that we have learned more about the ocean, not only in the last fifty years, but in the last twenty-five, than during all preceding human history. We have learned more about the nature of the ocean. But probably the most important thing is the magnitude of what remains. At the same time though, that we have learned more, we have lost more than during all preceding human history. We have the capacity now, as never before that we are six billion human beings each with an appetite, and each in one way or another, drawing on the resources-the life support system of the planet. We are at a point as never before where we have to size up where we might be going. It is easy to be discouraged, but I take heart from one of my fellow Explorers in Residence, Jane Goodall, actually who in her book Reasons for Hope comes up with a nice solid list of four good reasons for hope. One of them is the human mind. We have the capacity to solve problems once we recognize that the problems exist. That's a first step. The second is the human spirit. It isn't just the technology that will bail us out. It can't, not without the human spirit and the motivation, the desire and the will to actually use our minds in a positive sort of way. Another good reason for hope; is fundamentally the resilience of nature. But for the resilience of nature, we would have been sunk a long time ago, given our capacity to destroy. Whether it's forests, or fresh water, or fish in the sea. Nature is resilient. Give nature a break, and often enough systems will recover. Not if we go too far, and that's what we now face. There is the rather awesome prospect that we may push things over the edge irretrievably, as far as our own future is concerned. The final reason is one that is really meaningful for me personally. I have not only three children, but also I have four grandsons in the offing. Jane Goodall suggests that the youth of today represent her most important reason for hope. Because every little kid who comes along has what Rachel Carson called "that sense of wonder". That open mind, that willingness to learn, that eagerness to learn, that eagerness to embrace nature. Somehow, often it gets lost. I don't know why. I don't know how. But we have to do what we can to do what Ed Wilson suggests that we do with kids. That is to let them go and play around in the mud. Let them go and get dirty and go explore. Let them pick up bugs. He did, and I did. I know that Barry Lopez did. You can see it in his face. I think it's in the face on everyone here. You've got it. You became acquainted with critters when you were very small. And you've never lost your sense of wonder. No scientist does. No scientist stops being an explorer, a little kid. Every kid is an explorer. You start out that way. And those who stay, as explorers have just never quite grown up thank goodness. It's the key to success, not just as an explorer or as a scientist, but I think as a human being. If we could instill in children, and to find in us; to rediscover that sense of wonder that has been buried for too long, and inspire that knowledge that we are connected to all of the rest. And that what we do to the rest of the living world, we do to ourselves.

If we take care of them, our future is more secure.
Thank you

Rachel Carson and the USFWS

By Spence Conley

Spence Conley is a longstanding leader of the Fish and Wildlife Service. He is the Assistant Regional Director for External Affairs in our Regional 5 office, which makes up the 14 states of the northeast, with headquarters in Hadley, Mass. He is also an instructor extra ordinaire for us here at NCTC. He is also a member of the Heritage Committee for the Fish and Wildlife Service, which is an endeavor the Service started a couple of years ago to try and rekindle enthusiasm in the history of the Fish and Wildlife Service; collecting from both our employees and our retirees. It has been a very successful effort thus far. We had a retiree weekend here, several months ago back in May and we saw about eighty people here for that, which is a really big deal for us. It was great! Spence is also my friend, and he is a great guy, and I guess he doesn't need any introduction other than that. Please welcome Spence Conley.

First off, I must bow in the direction of Linda Lear–a wonderful mentor as it were— because what I am going to do is to talk about the extension of Rachel Carson's legacy in information services that in fifty years, has become the Office of External Affairs in the Fish and Wildlife Service, headquartered in Washington, D.C., but with regional operations all over the country. Rachel Carson was the first serious practitioner of "public relations" for the Service.. Her's was a far more narrow calling that that of today. We deal with the press, Congressional contacts, special events, and crises management. Rachel would know this, but would undoubtedly be transfixed by the boom in information technology that allows us to transmit text, pictures, and video in a split-second to literally hundreds of recipients merely at the touch of a key.

It was a very hot day in Washington, several years ago, and I, and one of my colleagues from Hadley in western Massachusetts had flown down to meet Linda at the Smithsonian. I was working on a speech about Carson. Linda was absolutely fabulous, and gave me a bunch of stuff, and she told me, "Oh, by the way, I'm writing this book!" It turns out, that it is just a wonderful biography, and I am full of admiration for her. If she recognizes any of the language that I am using tonight; plagiarism is not my style, but you could forgive me.

The reality of course, is that when Rachel Carson came into the Service, she was entering what was largely a man's field. That made it very, very difficult for her at the outset. People weren't exactly falling down to welcome her. But when she finely got to do the things that she did well, particularly to write, that's pretty much when she launched her career. She actually set a standard that people have been striving for, ever since.

I don't think we've had many people with quite the writing skills that she brought to the table during that time period and in that place. In that time, if you think about it there were only two sources of mass media—newspapers and magazines, and commercial radio. That's how Rachel got started. She was essentially taking material that was fairly complex and creating radio scripts. I don't know whether we know, (do we Linda?), exactly how those scripts were treated. Whether we actually did what we call recordings (transcriptions) during that period, and provided them, or whether we simply provided the scripts to the various networks that existed during that time period. I'm not sure that any of us really know how that distribution was accomplished But today, we still have radio, but thousands of diverse stations. We still have the print media, but we have about thirty-three percent fewer daily publications today than we had then. Here in the northeast for example, we have the largest local media constituency in the country. We have about forty-two hundred media outlets. Of those, there are about two hundred and fifty television stations that operate on a regular basis; including the critical locations in Washington, New York, Philadelphia, and Boston. What you have there is the headquarters for the networks in New York, and Washington, the power base of the world media .

At the same time, we have all kinds of Service activities is going on in each region. I can press a computer key

and transmit news material to virtually every outlet in the northeast region–print or broadcast. In Rachel's time; yes, she had a distribution network, but we're not sure that we completely understand how that took place. It was considerably more labor intensive–typing, editing, mimeographing, printing, stuffing envelopes, etc., etc. We suspect that she provided information to the radio networks. And then the networks themselves would relay that information on a whole bunch of different outlets.

They used to take this stuff up right and left, because they had a very small staff. So by providing information to them, you were virtually guaranteed to get the stuff on the air. Then there was the print media, including wire services–Associated Press, United Press, International News Service, Agence France Press, Reuters and a few others that could claim a national constituency. But not many are left. Information provided to all these services and so many other media enjoyed considerable popularity.

I will come back to that in just a minute. Today, we operate by using computers, using digital photography and streaming video. I hope everybody knows what that is right now. We can take video and digitize it and send that stuff instantly, anywhere. It is truly amazing, the instantaneous nature of our communications. Now, I believe that we can put a small camera in a cell phone, and it can take a picture of you, while on the other end, a picture is being taken of somebody else. It's a little choppy right now, but I suspect that in a few years you are going to be seeing; it's going to be like the movies where you can talk to each other, and actually see each other. I don't know how good a thing that is, but… it is possible. [From the audience; "you could do it while you're driving!"] That's right, you could do it while you're driving, like a cell phone! [Laughter] That's another thing; cell phones. Can you see Rachel Carson on her cell phone? I don't think so. But the reality is that we have a totally different kind of communication technology today.

I did mention that Rachel had a very difficult time of catching on with the Federal Service, especially with an agency traditionally focused on consumptive use of fish and wildlife resources; the 'hook and bullet' crowd. Not surprisingly though, it was her writing talent rather than her technical biological talent that opened the door for her. And in the end, it was her writing of course that opened the eyes of the world to the devastating effects of pesticides on wildlife, particularly on migratory birds. I want to say, by the way, that that battle is not over. It was mentioned today by one of the gentlemen that we are still fighting that battle. I can tell you that in northern Maine, we have a low nest reproduction of bald eagles. It is the only place in the country where we have this problem. It is because the eagles are feeding out of one of the rivers up there that has high heavy metal contamination problem . It is something that we are working on, but we haven't licked it yet. Even though we are fifty years into this process, things are still happening.

The broad question that we can ask at this time is; what impacts did Rachel Carson, and the Service have on each other? The answer is of course, is that yes, they were tremendously beneficial each to the other.. The Service gave her the opportunity to succeed as a writer. She opened the door, she wrote, and she became a success. But by and large, if the opportunity had not been given to her, she might not have succeeded, at least in the way she did, inside the Fish and Wildlife Service. She might have gone elsewhere. Her Conservation in Action series started in 1946, for example. It is a marvelously written collection of narratives about refuges, and the Refuge System. And I might say, that Steve and I were talking one time, about what we could do by way of the Heritage Committee, to figure out whether or not there are any other publications that we should take another look at for reissuing. I suspect that if we ever had the opportunity to sit down and look at the Conservation in Action series; that's something that we really ought to take a look at. Because even though some aspects of it have changed, the writing quality has not. And the messages that she sent about places like Metamesquite and Bear River and others were just absolutely fabulous.

Albert Gray, who Linda mentioned earlier today, had taken over as Director of the Fish and Wildlife Service in 1946. Rachel convinced him that this series, the Conservation in Action series, was very important. Her idea was not to give a dry history of a Refuge, but to inspire what we now call an ecological view of the mission of a Refuge, and how it fits into the bigger picture. In approving the project, Albert Gray possibly contributed more to Rachel Carson's career than either could have ever imagined at the time. The series was beautifully written, meticulously researched and hugely popular. It provided Rachel with the kind of travel and writing opportunity that she craved.

Her effort on the booklet, Guarding Our Wildlife Resources, which came out in 1948, was a precursor to her dramatic writings about the threats of contamination, especially DDT, on the environment and her urgent call to action. We've heard a great deal about that today. The Fish and Wildlife Service gave her that chance by first recognizing, and utilizing her talent, and by not getting in her way. This is an important element of this, because a lot of us who work in public affairs, we have to be more sensitive about all manner of things: The influences of nongovernmental organizations, of Congressionalists, of political factors that we must take into account before we move forward on many of the publications that we prepare. This is not an ideal situation.

Her journey to celebrity, and I'll just backtrack here, a little bit; began in 1935. Rachel was living in Baltimore, and wanted to go back to Graduate school. She had hoped to return to school to earn her Doctorate degree. But with the Depression, and her family situation, she simply could not afford it, so she wrote. It was the one thing that she could do, and she did it. She published all kinds of articles, particularly with the Baltimore Sun. And she wrote magazine articles as well. It wasn't a particularly prosperous living, but she did it, nonetheless. It was an important source of income to a family that was struggling.

At the time, Rachel had a mentor who was working for the Federal government. Although she was looking for a teaching job, her mentor suggested that she take the exam for a position in the Federal Bureau of Fisheries, just to see what comes of it, and to at least have a record of the exam and her interest in the files. In those days, and this is a curiosity, we look at it as something of a curiosity, Civil Service exams were segregated into groups. There was more than one list, there were several in fact. One list was for men, one list for women, one for minorities. At that time, such a practice was normal and accepted. Rachel Carson took three examinations. She scored the highest on the "female list" in Marine Biology, and was very high on the Parasitology exam. The Wildlife exam was the lowest of the three, but still very good. That is interesting because when she first started out in College, she was an English major, and she switched it to Zoology, and then never really got a chance to work in wildlife management. She wound up doing Fisheries first. It's funny how things happen.

In the mean time, Rachel was introduced to Elmer Higgins, who was mentioned earlier today by Linda. He was a Biologist in the Bureau of Fisheries, with an office in Baltimore, and one in the Commerce Department in Washington. Elmer had heard that Rachel was in Graduate School and needed a job. He also recognized her skill as a writer. When Rachel came in for the second time, looking for work, Rachel was invited to prepare a script for a radio program on fish. The Bureau had mounted a campaign to promote fish consumption to a consumer base that as not used to considering fish as a significant part of the family diet. At that time, if you think about it, beef was being put to other uses. There wasn't a lot of beef during the war period!

Even though Rachel Carson was always more interested in birds than in fish, she did make her best efforts to make fish seem interesting to the public. I want to add another aside here. I don't know if you know it, but one of the horrible things that we have in the rivers of this country today are Carp. But Carp were perceived as a protein source in the 1880's and the Fish Commission decided that we would import Carp from Europe. So we did, and not many people wound up eating Carp. But the Bureau of Fisheries at the time actually created a cookbook for Carp! How many of you have one of those? [Laughter] In any event, in the push to make fish seem more interesting, the responsibility fell to Rachel Carson. Higgins had first hired a male biologist to produce scripts and this guy simply couldn't write for the public. He couldn't translate his technical knowledge into understandable language for the general public. Higgins was very unhappy, and he saw Rachel Carson as his salvation. If not exactly delighted with the opportunity, she wanted to do biology, not script writing, Rachel was nonetheless willing and grateful for the work. She wrote part time, about six hours a week for Higgins, and produced one radio script after the other. The scripts were wonderful. Everybody loved them, and ate more fish. So it was a very successful campaign. Needless to say, Elmer Higgins was pleased to no end. This arrangement worked for almost a year. Then, as soon as he got a Civil Service opening, and because she had taken the test, and because she was first on the list, Higgins was able to hire her as a junior Aquatic Biologist in the Bureau of Fisheries with the U. S. Department of Agriculture.

Her initial adventure with the Bureau of Fisheries was no piece of cake. Women were few in number, and at that time, their roles were as secondary support; secretaries, clerks, and the like. Of interest for today, I work for a woman who is a minority and has a Ph.D. in Fisheries Biology. There are many women. The last two Directors of the Fish and Wildlife Service were women, so a lot has happened in the time since Rachel first started out in the male world of the Fish and Wildlife Service. At first, Rachel did lab work. She did some measuring of fish, population studies and the like. But it was the closest she ever got to doing real biology.

As soon as the Agency realized that she could write, writing is what they gave her to do. Scientists would bring her field reports and Rachel had to edit them, and turn them into something readable. Having had this experience, no offense to anybody, this can be a very daunting task. It was also unusual for a woman to be so visible. But Rachel Carson was, by her very nature, very prim and proper, very ladylike. Her style was designed put others at ease. She was never confrontational, never flamboyant, very understated, but extremely knowledgeable and efficient. Men whose papers she edited, whose work she put into understandable English, had enormous respect for her. But getting that respect in a male dominated agency wasn't easy. For example, when Bob Hines, who would become her illustrator, and later her great friend, came in from Ohio, he was furious and almost quit when he found out that he had a woman for a boss. But Rachel Carson was strictly business. She put her biology background to work here as well. She would edit Bob's illustrations for technical accuracy and was always right when she asked him for something to be changed. Her knowledge

of biology brought with it respect. Bob Hines in turn hired illustrators for Rachel of capability that she badly needed. He supported Rachel's desire to have Service publications look professional; to have pretty and accurate drawings, to use glossy papers and nice typefaces, and to make them [as] beautiful as she possibly could while making them both purposeful and useful. It was, I don't have to tell you, a considerable task.

Rachel Carson seized the opportunities that the Fish and Wildlife Service offered her to travel and write and so was not only able to survive, but to thrive, and to ultimately become one of the most important voices for conservation in the nation's history.

Did Rachel Carson and the Fish and Wildlife Service benefit each other? Yes, indeed. The Service at that time desperately needed a writer who could translate the technical information produced by scientists, into something that people could understand. This gave her a chance to write. She worked in the Information Division, which is today, our External Affairs Program. Our job is to interpret the Fish and Wildlife Service to the public and to write radio scripts, brochures, monographs, booklets and press releases. It was a writing job. She loved it, and she did it with zeal. Eventually she came to see her role this way:

"My job", she said, "consists of general direction of the publishing program of the Fish and Wildlife Services Information Division, working with authors in planning and writing manuscripts, reviewing manuscripts submitted, and overseeing the actual editing and preparation of manuscripts for the printer. I have a staff of six assistants, who handle the various details of this sort. Including planning or executing illustrations, selecting appropriate typefaces, creating page layout and design. It is," she summed up, "the work of a small publishing house."

In the long run, all of the Rachel Carson writings especially her remarkable Conservation in Action series, and later her indictment of DDT, caused a new understanding of the so-called "web of life", along with a major review of the impacts of pesticides and contamination on fish and wildlife. It eventually led to a major move to develop environmental legislation that added a new dimension to the scope of responsibilities assigned to the Service.

But the fact of the matter is; we are not really sure that the Service knew what it had in Rachel Carson, other than that she was a Biologist, and a heck of a good writer. Eventually Rachel Carson felt that she had made a contribution to the Service, and had accomplished what she could. The only way for her to quit was to publish her way out, and she did. Starting in 1947 Rachel began to ease her way out, and in 1952 she resigned from the Service as a new celebrity in American letters. The partnership was over. And what did the Rachel Carson and the Service do for each other, as I asked earlier? Was Rachel disappointed that she was never able to finish her Doctorate in Biology? Probably not, in that she was able to meet her old need to write. She was also provided the opportunity to learn a tremendous amount of a wide variety of biological areas. Working for the Fish and Wildlife Service broadened Rachel's awareness of the biological world. At the same time it helped the Service to map; to help develop it's image, it helped her ability to put scientific information into a format that the general public could understand; they broadened each other's visions. Perhaps Rachel put it best in the Conservation Pledge that she wrote for children, and for which she won second prize, and one thousand dollars in a contest. It sums it up, I think, a lot about who she was, what she brought to the Service, how she felt about the environment and her contribution to it. Maybe this is what she left for the Service to use;

"I pledge myself to preserve and protect America's fertile soils, the mighty force of the rivers, the wildlife, and minerals. For on these her greatness was established, and our strength depends."

The complex business of media relations was born for the Service and continues today vigorously, innovatively, and with technical correctness and solid direction. Rachel Carson would be proud. Thank you very much. [Applause]

The Rachel Carson National Wildlife Refuge

Ward Feurt
Refuge Manager

In 1963, nearing the end of her battle with cancer, in a letter post script to Dorothy Freeman, Rachel Carson said she didn't think she would see another migration of monarchs butterflies. Every October, around the first of the month, I look out the window of my office and see a stream of orange and black wings fluttering unevenly along the Carson Trail. Local pre-school students and teachers reenact the monarch migration. Dressed in black, bedecked with wings and antennae, they swoop along the trail crying "we're migrating, we're migrating!"

My name is Ward Feurt. I am refuge manager at Rachel Carson National Wildlife Refuge. The 5000 +acre refuge stretches along 50 miles of southern Maine coast. The refuge consists of estuaries, salt marshes and related uplands.

The Carson Trail is located next to Headquarters and I walk the trail almost every day. In addition to hundreds of migratory birds, last month visitors saw black bear, coyote, turkey, and otter on the trail. Two great horned owls fledged in June after delighting hundreds of visitors with their demanding presence. Most of the people who want to 'talk to a ranger' talk to us about wildlife. Of course we get the requisite number of inquiries about "where do the Bushes live" and "where can we get good seafood," but most visitors are interested in wildlife they have seen, question us about management activities, and they ask about Rachel Carson. We distribute a fact sheet written by Linda Lear and lists of her publications web sites.

The refuge was established as the Coastal Maine National Wildlife Refuge, and it was renamed in 1970 as the Rachel Carson NWR. It was the second of three national wildlife refuges named for a woman, (Elizabeth A. Morton, Julia Butler Hansen) and it shares the distinction of being one of four named for fish and wildlife employees (J. Clark Salyer, J. N. Ding Darling, and Arthur Marshall Loxahatchee). We currently have nine people working at the refuge, the majority females.

The memorial plaque on the Carson Trail reads:
All the life of the planet is interrelated... each species has its own ties to others, and... all are related to the earth. This is the theme of "The Sea Around Us," and the other sea books, and it is also the message of 'Silent Spring.'"
Rachel Carson 1907-1964

I would like to tell you a little about the refuge and try to relate these observations to an environmental awareness stemming from Rachel Carson. I told the staff I was giving this speech and asked them what they thought about working on a refuge named for Rachel Carson. They responded, so I want to tell you what they said.

The refuge hosts about 360,000 visitors a year. Over 8 million people come to Maine every year and almost all of them come from the south to the north, so they have to come by or through the refuge. Our signs, interpretative material, trails and brochures tell the wildlife story and incorporate Rachel Carson the woman, her writings, and some life lessons.

You already know that a major attraction at refuge headquarters is the Carson Trail. About 100,000 people walk the trail every year. This year we refurbished the trail. We trim vegetation, but do not spray pesticides. The tread is stone dust, not asphalt or pavement. The public's comments are nearly always laudatory, some examples from the trail log are "Rachel Carson would be proud", "Best nature trail anywhere," and "A gift from God."

We are installing an overlook at the Goosefare Brook division. The parking area will be gravel, despite considerable pressure to pave (enough of the world is paved). There will be another stone dust trail with ferns and Rosa rugosa rather than rails to keep people on the trail. The site has been disturbed, so we have quite a bit of poison ivy to help prevent shortcutting. We try to design compliance rather than make rules and enforce them.

Working with the University of New England, we are refurbishing a ca.1785 cape to serve as a quarters and environmental education classroom. The scope of work specifies non toxic materials, certified sustainable lumber where available and energy efficiency. Since we don't budget for life cycle costs, so it is frequently an uphill battle to invest now for savings later. In fact, when we and the Sustainability Center at the University first raised our concerns about green construction, the FWS engineer in charge of funding said, "Why are we insistant on environmental sustainable products on small project? We are having a tough time with this in large projects... Why bother? " So here was an opportunity to educate. Our frequently expressed commitment to ecological integrity, based on Rachel Carson's teachings, helped convince this engineer, and others that, at least at Rachel Carson NWR, environmental sustainablity is integral to our management, it is 'worth the bother'.

There are those who come to the refuge as a pilgrimage of sorts, who are richly rewarded in very personal ways. And there are those, many more than I ever thought, who look blankly back at me with no conception of who Rachel Carson was and why she should possibly matter to them.

In land management, invasive plant control is a never-ending struggle. Purple loosestrife, Japanese barberry, phragmities, autumn olive, Russian Olive, knotweed, bittersweet, garlic mustard, multiflora rose, common mullein, non-native honeysuckles, and buckthorn are our most problematic species. These plants outcompete native plants and form monocultures which are never benefical to wildlife. For some of these species, especially phragmites, herbicides are not only the conventional response, the plants are difficult to control using other methods. Largely because of Silent Spring, we do not use pesticides on Rachel Carson NWR. We realize that Ms Carson's message was not "avoid all pesticides." FWS has a policy to move to zero pesticides on Service lands. So, we burn and mow Phragmites and have some success in reducing plant vigor and controlling spread, but we do not eliminate the plant.

We have been controlling purple loosestrife on the refuge for five year using insect vectors, (beneficial natural enemies), i.e. Galerucella beetles and Hylobious weevils. This year, with practically no funding, we partnered with 13 land trusts, garden clubs, conservation commissions, etc., to control loosestrife off the refuge. We transplanted purple loosestrife into gallon buckets and raised the plants in 13 kiddy swimming pools next to the office. Our biologist found 'discount beetles' in New Jersey so we bought them, placed 12 beetles on each plant and enclosed the plants in fine net sleeves. The beetles completed their oviposit, egg, larval stage, and adult cycle in about 4 weeks. Our partners picked up the plants, or, in the words of one partner "we got our beetles from Rachel Carson" and placed them in infected areas throughout southern coastal Maine. The response from our partners was terrific, and we hope to expand the program next year.

Rachel Carson somehow touches their lives. My father's generation somehow knew her. We get letters addressed to Rachel Carson—her name draws more visitors than Coastal Maine NWR.

Habitat protection is a major program at Rachel Carson NWR. [We are anxiously awaiting the results of the House-Senate conference on Land and Water Conservation Fund appropriations for FY 2002.] We feel the approach we have used for land protection is consistent with Rachel Carson's theme of interconnectedness based on good science. We had great geographic information system environmental data sets or themes for the 14 towns in southern coastal Maine. The themes include land cover, hydrology, bathymetry, soils, roads, improvements, conservation lands, etc. We identified declining trust species, species that USFWS by law, treaty and act is responsible for such as migratory birds, threatened and endangered species, anadromous fish, interjurisdictional species and some marine mammals. Species were determined to be declining if they were listed as T/E federally or in 2 of 3 states (MA, NH, ME), or if they were experiencing persistent declines in population over much of the United States.

Working with Maine Inland Fisheries and Wildlife, we mapped occurrence data for all 43 declining species. Next we created descriptions of the habitat needs for each species, i.e. Grasshopper sparrows occupy intermediate grassland habitat, preferring drier sparse sites with open or bare ground for feeding; Upland Sandpipers requirements may range from about 20 to 150 acres per pair, etc. These habitat models and the occurrence data were overlaid on the geographic information system themes resulting in a map showing the best habitat for our declining trust species, and showing us where to concentrate our operation and acquisition efforts. This approach has been expanded to the Gulf of Maine Rivers Ecosystem and we believe it should be used by the northeast region and the nation. People understand this 'species to habitat' approach; it starts with needs of individual species and integrates layers of other species needs, with the realities of what different types of habitat can provide.

This area in Maine has been settled for 400 years. The refuge is at the edge of the sea. Each piece of the refuge, new and old, becomes more valuable every year.

Upon my initial appointment at Rachel Carson NWR I had not really explored the meaning of working at a refuge named in honor of a great environmentalist. I was thrilled to have finally landed a permanent job as a wildlife

biologist at a refuge that I really wanted to work at! The longer I am here, though, and the more I learn about Rachel Carson, the author, I find that it is becoming increasingly central in my thinking.

I think the refuge should acknowledge our connection to Rachel Carson by supporting wildlife and habitat research which documents the current health of these populations. We can play an important role in providing data on the impact of industrial by-products on wildlife (and people) and perhaps indicate areas where we can improve. At the Rachel Carson Refuge, I think we have a special responsibility to document changes in environmental health and also to educate the public by informing them what they can do to promote a healthy environment.

Salt marsh management and restoration is a major program on the refuge. In southern Maine, the marshes were grid ditched early this century for salt hay. The hay was desirable fodder for cattle and was used as winter mulch on gardens. The ditches dried the marsh enough for wagons, but they also caused spring tides to drain immediately rather than slowly soaking into the marsh, exchanging detritus and minerals. We have made several adaptations in our restoration work, but our activities have always been guided by a minimalist approach. One technique that has proven successful is plugging ditches. We use marsh material immediately adjacent to the ditch plug sites and create pannes, gradually sloping pools with a deep end. The deep water, about three feet, allows small fish like mummichog to over-winter. The fish eat mosquitos and provide a food source for wading birds. This dramatic evidence of the interconnectedness of the marsh, the tides and the creatures that depend on this habitat is one of the stories we tell though site visits, interpretative signs, and press releases. .

Rachel Carson and neighboring Parker River NWRs are collaborating to become a research demonstration site for salt marsh management, which will enable world-class research on open water marsh management. This high visibility program will be a lot of work, but it will help us do a better job of marsh management. The manager at Parker River said "It's fitting that a refuge named for Rachel Carson would be a pioneer and take a non-traditional approach. She did it."

Censuses, monitoring, and surveys are the mainstays of our business. Everyone values good data, but we are adamant about it. You must have good science. The refuge is involved with three national initiatives to acquire better data. Our drive is to make better management decisions based on the best understanding of the data, and to share these decisions with others.

All NWRs are, or soon will be, writing comprehensive conservation plans (CCP). The CCP for Rachel Carson NWR, like so much that we do, acknowledges her guidance. The vision statement reads, in part:

"The Rachel Carson NWR is inspired by our namesake and defined by the National Wildlife Refuge System. As one of over 500 national wildlife refuges, we are committed to conserve, manage, and restore southern coastal Maine migratory birds, anadromous fish, wetlands and endangered species. As champions for Rachel Carson's principles, and in recognition of the connectedness of all living things, we are committed to find reasonable accommodation for the needs of humans and wildlife."

There is so much more we do and would like to do. Every May 27 we have a birthday party for Rachel Carson. All employees and various other conservationist mark the occasion with food, refreshment, cake and conversation. There are reminders of Rachel Carson in virtually every office. All of our activities have to pass the litmus test of "is this appropriate on a refuge named for Rachel Carson?"

The staff has been talking about this symposium for some time. As you have heard, the staff wrote something about what its like to work on a refuge named for Rachel Carson, and I have inter-spaced quotes throughout this speech. I would like to end with what our maintenance worker wrote:

My experience at this refuge is broken into three parts. First, almost fifteen years ago I visited the refuge with some of the folks from Parker River NWR. I had some idea of who Rachel Carson was, but the people I was with made it more memorable for me because of the attachment to Rachel Carson they had. It seems that when someone is telling you about Rachel Carson they interject so many of their own feelings that they are more passionate about what they are telling you. My first experience here surrounded the feelings people have for Rachel Carson. Like me, they didn't really know a lot about her personal history, but the idea of what she represents is overwhelming. The group that I was with 15 years ago included some teachers. They inherently carry with them a passion for what they are saying. They transmitted to me their respect for Rachel Carson and what she stood for.

The second phase of my experience here included bringing my kids to walk on the trail named after Rachel Carson. My own feelings about Rachel Carson made me tell my kids what I knew about her. Just the fact that you are walking around a place named for someone doesn't necessarily obligate you to try and make a connection with the person it was named after. But somehow at this refuge, the conservation message presented by Rachel Carson is for most people an emotional attachment to her. I found in my own case that walking around in a place named

after someone whose commitment to the environment is so monumental that regardless of the position you take, people are drawn to her side of the issue.

The last phase of my connection to this refuge is as an employee of the Fish and Wildlife Service. This chapter for me is separated into two parts. My connection to the service is concrete. I am bound by my commitment to the mission of the service. But I am excited by the opportunity to work at a refuge named for a person whose own commitment to preserving the environment is inspiring. I believe that this refuge, unlike others that I know, carries with it a connection to a famous person as well as a connection to what they are famous for.

Many visitors make comments to me about how nice it is to have this area protected, but they almost invariably make a comment about Rachel Carson. Most people, like me, don't know the specifics of her life but they share in the commitment that she had. This refuge is not blessed with a spectacular natural wonder like Yellowstone or Glacier. We have our own "Sense of Wonder" in the connection that Rachel Carson made with the science community and the general public at the same time. That dual connection is rarely made. Many famous people are known for their achievements in their fields. But Rachel Carson is known for her work as an environmentalist but more so for her connection with the public and the love that they share for the environment.

Rachel Carson Homestead Association

By Sandy Andrews
Rachel Carson Homestead Association

High on a hillside overlooking the Allegheny River at Springdale, PA, some 16 miles north of Pittsburgh, sits the birthplace home of Rachel Louise Carson.

The 150 year old clapboard farmhouse resting on a stone foundation was once surrounded by 65 acres dotted with apple and pear orchards. The four room house typically had a fireplace in each room, no indoor plumbing nor electricity. The Carson family lived there from 1900 to 1930. In the later years natural gas heaters and lighting were added. Rachel Carson, the youngest of three children, was born in the upstairs bedroom (now painted blue) on May 27,1907. She and older sister, Marion, slept in this room with their parents, while brother, Robert, had the smaller bedroom. For a time, when her siblings were married and living away from the house, Rachel had the smaller bedroom (now painted pink) to herself. Here from the window she could gaze out over the Allegheny River where she, her brother and sister along with the family cows, had waded so often.

Was it here that she began pondering the sea? When sister Marion returned home now the mother of two small children, Rachel removed herself to the downstairs parlor to sleep nights on the couch. In these rooms at age 14 she wrote those first successfully published stories for St. Nicholas magazine.

This video is actually three separate time frames and was initially taken by myself as a "home movie" for personal reference. However, it seems to be the only video taken within the past year of August 2000 through August 200 1. In this time span I began filming my first visit to the Homestead in nearly 25 years.

One can easily identify the Parlor by its more detailed fireplace mantel and lone closet. During the Carson era it was papered in a white with pink pattern and we will strive to replace it. The dining room yields a simple mantel and recessed cupboard. A quick glance up the stairway may reveal the deeply worn wooden stair treads which rise to the second floor in the center of the house. While no furnishings or artifacts of the Carson family remain, a number of tributes to her are displayed within. A life size bronze bust on a pedestal, a copy of her Presidential Medal of Freedom Award of 1988 from President Jimmy Carter and a "Peanuts" cartoon strip featuring Miss Carson and signed by cartoonist Charles Schultz. This one is a favorite. A shadow box frame holds a large piece of fan coral found by Rachel and donated to the Homestead by her long time friend Shirley Briggs. Posters with photos and text of the Carson family early years in addition to Rachel in her professional life dot the walls of the house throughout. Copies of her four major books and those published after her passing are also displayed. Included are two in Japanese that the visiting Rachel Carson Society of Japan donated to our house museum. The most surprising piece of furniture in the house is an 1874 Steinway piano. It replicates the one Mrs. Carson used to give lessons to local students. It is massive, taking up more than its share of space in the small Parlor.

In August 2001 the Homestead received word that it would be receiving a visit by then Vice President Al Gore. A long time admirer of Carson and an environmental writer himself, Gore made the Homestead a part of his Presidential bid campaign stop. What a whirlwind week it was. It was like having him come into your home. Secret Service everywhere, extra telephone lines installed, the Democratic committee brainstorming, all for a few hours of one day. And then the VP arrived. Touring the Homestead and signing the guest book, Gore was quick to note the high points of the museum displays. These he inserted into his campaign speech which was given behind the house on the grounds of Springdale High School. It was soon over and within two hours everyone was gone and the house empty again.

As a result of this visit several labor unions who had attended the rally, contacted our association and offered their services to make repairs on the historic site. Over the next five months a new roof with custom gutters and downspouts were installed. In addition, repairs were made

to the interior and completed inside and out with a special no VOC paint. We are indebted to these unions who gave freely of their time and solicited local industry to pay for the materials. The last segment of the film shows the obvious changes and improvements to the interior and exterior. Appropriate early 20th century furnishings are being added to create the ambiance of the childhood of a young Rachel. From the outside view one can note an obvious addition to the house. This was added by a later owner and serves today as an education room and office. At some time in the future it is thought that the house could be reverted back to the simple four room dwelling known to the Carson family.

Until then the Homestead will continue to receive and inspire visitors from around the globe on the life and legacy of Rachel Louise Carson
Thank you,