CHAPTER ONE

INTRODUCTION

FOR THE PAST FOUR YEARS, I have followed 2,4-D (2,4-dichlorophenoxyacetic acid) and 2,4,5-T (2,4,5-trichlorophenoxyacetic acid) through history. Plant physiologists classify these synthetic chemical compounds as selective auxins of the phenoxyacetic herbicide family. They were the first plant killers developed by scientists to target specific "weeds"—any plants useless or counterproductive to human needs.

The discoveries that led to modern herbicides began in Charles Darwin's laboratory. Late in his life, Darwin discovered that some internal mechanism directs plants to grow toward sunlight and sources of water. American and European scientists later called this mechanism the plant's hormone system. On the eve of World War II, scientists discovered that certain chemical syntheses could enhance the growth of a plant—and in higher concentrations, kill it. Via absorption through the leaf, 2,4-D and 2,4,5-T wreak havoc on the plant's hormones.[1] Several days after exposure, the treated plant experiences uncontrolled and rapid growth, until its leaves shrivel back to a brown mass and fall off.

The biochemical specificity of these herbicides has no cultural analog: no universally accepted characteristics distinguish weeds from other plants. The designation depends on what people want from land they seek to control. On farms, sprayed applications of 2,4-D and 2,4,5-T can keep weeds out of cropland and animal pasture. After World War II, herbicides, along with pesticides, dramatically increased agricultural yields worldwide in what became known as the Green Revolution.[2] The massive application of herbicides for farming, forest management, and lawn care continues today at global annual rates exceeding a billion gallons.

This book focuses on one aspect of herbicide use that is now a relic of his-

tory. During the Vietnam War, the U.S. military combined 2,4-D and 2,4,5-T, named the 50:50 mixture Agent Orange, and defoliated approximately five million acres of forests in an attempt to expose communist guerrilla fighters loyal to the National Liberation Front (NLF, or Viet Cong) of South Vietnam. Known as Operation Ranch Hand, from 1961 to 1971 the herbicidal warfare program targeted not specific weeds but entire ecosystems. In Vietnam the forest was the weed.

The goals of agricultural use and military use of herbicides differ: one aims to increase crop yields, the other to win wars. But the logic of unburdening human labor through chemistry applies to both. For a wheat farmer determined to rid his crop of invasive weeds, an herbicide application may seem more economical in the short run than removing the plants by hand.[3] For President John F. Kennedy, determined to defend the government of South Vietnam from communist takeover, herbicidal warfare battled the NLF by chemical proxy. As part of the broader counterinsurgency mission, Kennedy sought innovative means to neutralize the NLF's ambush tactics. The president's strategy was simple: deny guerrillas their only tactical advantage with chemicals, not infantry.

Under President Lyndon B. Johnson, herbicidal warfare expanded dramatically: during a ten-year program, Ranch Hand crew members sprayed fifteen of the twenty million total gallons, or 75 percent, between 1966 and 1969. This escalation occurred generally because the "Americanization" of the war after 1965 amplified all the myriad U.S. military operations in Vietnam, but specifically because Johnson never considered his predecessor's use of herbicides to prevent—rather than to abet—an expansion of the war. The massively destructive effects of herbicidal warfare became known as "ecocide," so called by several academic scientists who protested herbicidal warfare beginning in 1964 and who ultimately won the right to inspect its effects in Vietnam six years later. What they found was not simply the elimination of "weeds" but the destruction of whole environments upon which humans depended—and the looming prospect that the chemicals themselves might harm humans and animals.

The ensuing herbicide controversy turned upside down a key component of President Richard M. Nixon's policy of détente, or relaxation of cold war tensions, with the communist world. One of Nixon's early détente initiatives attempted to establish American leadership in the global nonproliferation of chemical and biological weapons (CBW). To that end, the president unilaterally abolished the U.S. military's biological weapons program. In late

1969, he announced his plan to resubmit the Geneva Protocol of 1925 to the Senate for ratification. This international treaty binds its signatories to refrain from first use of chemical and biological weapons in war. It states that the use of "asphyxiating, poisonous or other gases, and of all analogous liquids, materials or devices, has been justly condemned by the general opinion of the civilized world."[4]

Nixon's initiative provided the critics of Operation Ranch Hand the ideal platform to end herbicidal warfare in Vietnam and in future wars. They convinced the Senate Committee on Foreign Relations (SCFR) to link renunciation of herbicidal warfare with ratification of the Geneva Protocol. Nixon rejected the deal, citing a legal rationale first advanced by the Kennedy administration: the Geneva Protocol prohibits only weapons that harm or kill people, not plants. The crux of the scientists' position was that wartime chemical destruction of plant life—the foundation of all ecosystems—could not be cordoned off as a convention of treaty interpretation. Ecologically, they argued, the rationale made little sense: herbicides sprayed in massive quantities undoubtedly harm more than plants. Further, the scientists argued that the ease of producing inexpensive herbicides made them a perfect "weapon of mass destruction," to use a current term, because virtually any state or revolutionary movement could employ herbicidal warfare wherever ecological and tactical conditions made defoliating the enemy's territory advantageous.

The scientists prevailed, thanks to support from powerful members of Congress, such as J. William Fulbright, Edward Kennedy, and others who were dismayed by the ecological destruction U.S. forces had wrought in Vietnam—and the war itself. In the run-up to the War Powers Act of 1973, the herbicide controversy served as an ideal opportunity to make a stand. At that juncture, many legislators were committed to extricating the United States from Vietnam generally and constraining the war powers of the executive branch specifically.[5] After a protracted deadlock, in 1975 President Gerald R. Ford renounced first use of herbicides in war, against the advice of military officials who remained committed to the strategic necessity of herbicides in future conflicts. By couching the antiwar protest slogan "No more Vietnams!" in ecological terms, the scientists therefore effectively codified an ethic of transnational environmental concerns into international law. The scientific movement against Agent Orange thus transcended—and helped to discredit—the bipolar cold war divisions that engendered herbicidal warfare in the first place.

The major thesis of this book explains why the scientists were able to end herbicidal warfare. Theirs was a unique achievement in the broad and diverse antiwar movement, whose members demanded change in the U.S. government's policy in Vietnam. I argue that the scientific campaign against Agent Orange succeeded because it fell squarely at the intersection of two major political transformations in the United States during the late 1960s and early 1970s: (1) the demise of interventionist anticommunism as the dominant expression of U.S. foreign policy; and (2) rising concerns that humankind's environmental impact was global in scope and a threat to international peace and even human survival. Both transformations, of course, extended beyond the herbicide controversy. The political, moral, and strategic calamity of the Vietnam War by the end of the 1960s likely would have eroded the salience of cold war containment if Operation Ranch Hand had never existed. And environmental activists and scientists likely would have raised the specter of global ecological apocalypse, as they did with the first Earth Day in 1970, had herbicides remained strictly a domestic tool of farmers and foresters.

The scientists' campaign was important not because it heralded these transformations but because it connected them in a way that expanded and reframed the meaning of international security beyond the previously dominant and singular U.S. imperative to rid the world of the communist menace. This accomplishment was an act of political prescience and fortuitous timing in which the scientists, led by Arthur Galston of Yale University, presented the ecocide of Vietnam as a product of a destructive and immoral war *and* an omen of a future techno-industrial ecological dystopia.[6] The following narrative connects trends in the cold war in the wake of Vietnam and postwar environmental consciousness that heretofore have remained almost entirely separate in the extant literature on environmental and diplomatic history.[7]

I became interested in Agent Orange and herbicidal warfare as a case study of a much broader historical question: What is the relationship between ecological issues and international relations? From a historiographical perspective, the question is largely unexamined: few environmental historians write about great power politics, and diplomatic historians have given little thought to the relationship between culture and environmental change. This project attempts to answer exhortations from within both the diplomatic and the environmental history subdisciplines to push scholarly work be-

yond its traditional parameters.[8] In recent years historians have done innovative work to bridge this divide, particularly in the area of war, diplomacy, and environmental impacts.[9]

This work examines the herbicide controversy as a struggle to control the meaning of global security in the wake of the Vietnam War. The protesting scientists were central to creating a new vision of environmental security that was at once a product of cold war destruction and a rejection of the bipolar ideology that created it. The imperative today to sustain global ecological health or risk worldwide catastrophe in the form of resource wars, global warming, drought, and massive species extinction has become an inescapable fact of modern international discourse. By suggesting that Operation Ranch Hand and its hypothetical, future incarnations could one day imperil the planet's ecological balance, the scientists helped to codify global environmental issues as a mainstay of both U.S. national policy and international diplomacy, demonstrated particularly by the launch of the United Nations Environment Programme (UNEP) of 1972.

Still, the scientists' achievement was tempered by their inability to halt the herbicide program in its heyday, which remained the staple of their agenda after 1964. If government and military officials had terminated the program at that juncture, Operation Ranch Hand would have remained a minor, mostly experimental program. Its impacts would have been limited to a relatively small land area. Instead herbicide operations expanded in lockstep with the overall war.

The logic of herbicidal warfare, repeated consistently in U.S. military evaluations throughout the war, was straightforward: the use of herbicides improved vertical and lateral vision in forested terrain, which thereby limited the guerrilla enemy's capacity to resupply its forces and to attack soldiers, convoys, and bases. Correspondingly, Operation Ranch Hand dramatically increased its geographical scope and frequency of spray missions during the war's zenith between 1966 and 1970. In the military rationale, herbicidal warfare would hasten both the end of the war and the reconstruction of a victorious South Vietnam.[10] Together with the dominant strategy of U.S. policy makers, the American military's conviction of herbicidal warfare's importance to the war effort ensured that Agent Orange and its complex legacy would remain a burning issue decades beyond the conclusion of the Vietnam War.

The ecological and human health legacy of Agent Orange remains today a topic of intense study.[11] Health specialists continue to debate the various

illnesses—including cancers, diabetes, and birth defects in Vietnamese civilians, U.S. and Vietnamese war veterans, and their progeny—that can be traced definitively to Agent Orange exposure. Such concerns are not limited to persons who experienced the war firsthand. Vietnamese government ecologists and Western nongovernmental organizations (NGOs) also continue to locate and repair ecological damage wrought by herbicidal warfare. Efforts to "re-green" rural areas that sustained repeated herbicide attacks began under the reunified Vietnamese government in 1976. The program has achieved some spectacular results. Swampy coastal forests called mangroves sustained the greatest herbicidal damage of any of the region's environmental systems, yet mangrove preserves have experienced ecological restoration nearly to their prewar state. One Vietnamese government scientist, Phung Tuu Boi, has created an ingenious method to rid inland rainforests of invasive species that first took root when dominant trees died following a spray attack. Boi has planted high value and nonnative commercial trees to shade native saplings until they can absorb the sun's full force. Nearby residents can then harvest the shade trees and sell them for profit.[12]

Operation Ranch Hand also created dioxin "hot spots" in heavily sprayed areas and depots that once stocked and shipped herbicide drum containers by the thousands. Dioxin, short for 2,3,7,8-tetrachlorodibenzo-para-dioxin, or TCDD, is a highly toxic by-product of military-grade 2,4,5-T, which persists in these areas.[13] This nasty and curious chemical compound has made Agent Orange notorious, while few have heard of the herbicide code names Agent Blue (an arsenic-based rice killer) and Agent White (composed mostly of 2,4-D, which is still widely used for lawn and agricultural weed control). Vietnamese scientists are generally convinced that dioxin hot spots are responsible for thousands of congenital malformations (birth defects) among Vietnamese.[14] "Peace Villages" in Vietnam, which house children and adults with such deformities, as well as public history exhibits, purport that such people, who were not alive during the war, are victims of herbicidal warfare (figure 1). Leading Western scientists are skeptical of such a link but cite the need for more research, particularly because some studies have found elevated levels of TCDD among residents near Agent Orange "hot spots."[15]

Similar uncertainties exist over the health legacy of herbicidal warfare and American soldiers who served in Vietnam. Those who associate a given cancer or genetic disorder with exposure to Agent Orange can trace the problem to the supply demands of the U.S. military machine in the midst of

Figure 1 Agent Orange exhibit, War Remnants Museum, Ho Chi Minh City. Author's photo.

an escalating war. By the mid- to late 1960s, the Pentagon's enormous herbicide orders strained the production capacity of Dow, Monsanto, and other chemical companies. In order to meet its quotas, the companies produced herbicide chemicals as quickly as possible and in the process sometimes eschewed standard production procedures. Most important, the military supply orders compelled the manufacturers to "cook" 2,4-D and 2,4,5-T at higher than normal temperatures. As one toxicological study noted, the amount of dioxin created in the production of 2,4,5-T "can be minimized by regulation of temperature, pressure, and solvent conditions, but when the production process goes out of control, large amounts of TCDD can be produced."[16] According to one U.S. official, the existence of dioxin was known to military officers at the height of the war. James Clary, a U.S. Air Force (USAF) scientist stationed in Vietnam, noted in 1988 in a letter to former senator Tom Daschle, "When we initiated the herbicide program in the 1960s, we were aware of the potential for damage due to dioxin contamination in herbicides. We were even aware that the 'military' formulation had a higher dioxin concentration due to the lower cost and speed of manufacture. However, because the material was to be used on the enemy, none of us were overly concerned."[17] Statistically, this revelation—the only one of its kind—has not realized the potential problems to which Clary admitted. Epidemiological studies on U.S. veterans dating back twenty years have so far been unable to establish a conclusive link between Agent Orange and a variety of cancers and other health maladies that some servicemen have attributed to the herbicide.[18]

But this logic can be easily turned around: no one can categorically tell a sick veteran that his illness was *not* caused by Agent Orange; consequently, the failure to establish causation, in the author's view, makes neither the U.S. government nor the corporate producers of dioxin-laden Agent Orange any less negligent in the massive procurement and dispersal of a chemical compound whose dangers were not fully understood during the war or now. This is the basic rationale behind the Agent Orange Act of 1991, in which the U.S. government determined that it would treat U.S. soldiers whose illnesses carried a "presumptive" association with Agent Orange exposure.[19] Alvin L. Young, a former project scientist for the U.S. Air Force who has been deeply involved in studying Agent Orange and its legacy, goes further. He offers what is perhaps the wisest policy prescription to avoid playing the losing game of causation: "Vietnam and Agent Orange are now public policy issues as well as medical and scientific issues. There are strong public

policies favoring our veterans, and rightly so. The [U.S.] government should have acknowledged that many Vietnam veterans do appear to be at risk for a range of diseases and health problems due to the 'Vietnam experience' as a whole. Why focus on Agent Orange instead of on providing treatment and benefit for all these veterans?"[20]

Notably, this prescription mirrors identically the policy view of one diplomat in the U.S. embassy in Hanoi, who agreed to talk with the author on the basis of anonymity. The official, a specialist in public health and development issues, noted, "Due to the widespread poverty in Vietnam and ongoing difficulties in defining who exactly counts as an Agent Orange victim, why expend energy and resources isolating these people from a broader aid package from Washington to Vietnam?"[21] This framework offers the best path to full normalization of relations between the two countries, a process that continues apace to this day.[22]

As a historical topic, Agent Orange has received surprisingly little attention by historians. But there is a robust historiography on chemicals and American national policy. Two exemplars are Thomas Dunlap's *DDT: Scientists, Citizens, and Public Policy* and Edmund Russell's *War and Nature: Fighting Humans and Insects with Chemicals from World War I to Silent Spring*. Dunlap's *DDT* examines the complex interplay of scientific knowledge and public anxiety over widespread exposure to pesticide chemicals. Like *DDT* this project crescendos in the early 1970s with an environmentally based victory over the government and corporate champions of dominating weeds and pests through chemicals. Unlike Dunlap's discussion on citizen participation, this project does not include a sustained examination of the public's reaction to the Agent Orange controversy. There are several reasons for this distinction.

The Environmental Defense Fund comprised scientists and lay citizens who led the crusade to ban DDT. There was no such complementing institution during the herbicide controversy and no blockbuster literary equivalent of *Silent Spring* to engender widespread concern. The scientists devoted to ending herbicidal warfare did not work alongside lay citizens who shared their concerns, nor did they devote much energy to influencing public perception during the course of their campaign. Instead the scientists focused first on gaining the support of scientific organizations, including the American Association for the Advancement of Science (AAAS). Then they cultivated relations in government and military bureaucracies to secure

safe passage to war zones in Vietnam to examine the effects of herbicidal warfare. Finally the scientists focused on the arcane matter of international treaty law surrounding the Geneva Protocol of 1925, which they correctly identified as the most promising avenue to banning a wartime practice that was international by definition. In this schema, the scientists saw little reason to join forces with broader environmental movements of the day.

Unlike DDT, "Agent Orange" in the early 1970s was not a household term but a wartime code name for a liquid chemical compound that the military was using on the other side of the planet. As late as 1970, well before Agent Orange became both shorthand for all the herbicides used by Ranch Hand crews and for dioxin-tainted 2,4,5-T, journalists commonly referred to the herbicides as "agents orange, white, and blue" if they used those terms at all.[23] At that juncture, Agent Orange had not achieved its status as a proper noun. Few Americans knew the extent of herbicide usage on American, let alone Vietnamese, land, and what they did know about the spray program in Vietnam came from newspaper reports based on the scientists' findings and subsequent lobbying in Washington as the war was winding down. Although Rachel Carson noted the potential dangers of herbicides in *Silent Spring*, her major focus was on DDT, the anti-mosquito chemical (which she alleged was killing birds, hence making the spring silent). That chemical compound left the greatest impression on millions of Americans, including President Kennedy, who took an active interest in the subject.[24]

Operation Ranch Hand lacked the publicity that Carson had bestowed on DDT. Agent Orange achieved widespread attention only later in the decade when Vietnam veterans began to complain of various illnesses possibly related to their exposure to the herbicide. The protesting scientists, who had been skeptical of these claims, remained aloof from the litigation. At that point, defense lawyers, dramatic by trade, embarked on one of the most complex and sensational class-action lawsuits in U.S. history. Before Agent Orange had "hit home" in America, in the form of sick and frustrated veterans, there is little reason to believe that the herbicide scientists would have enhanced their agenda had they embarked on a public relations mission to gather popular support. It is not that they saw no value in such a project. But the urgency of the scientists' agenda required them to focus their efforts on policy makers whose antipathy to the Vietnam War was well established and who were receptive to their linkage of ecological issues and international security. Public campaigning was a project the scientists left to others, most notably the organizers of the first Earth Day, who cited the herbicidal de-

struction wrought in Vietnam at the beginning of their inaugural address in 1970.[25]

Although this book maintains a chronological focus that proceeds in tandem with Dunlap's *DDT*, it also picks up where Edmund Russell leaves off in *War and Nature*. Russell shows in fascinating detail how scientists and military researchers developed chemicals that killed humans and pests side by side, to the point that the pesticides and antipersonnel chemical weapons blurred the distinction between war abroad and peace at home. Russell's narrative ends on the eve of the Vietnam War with a brief reference to Agent Orange. The herbicides 2,4-D and 2,4,5-T, as this project will show, followed a nearly identical conceptual trajectory as the one Russell traces with DDT. Researchers first understood the properties and potential of herbicides and pesticides as a direct result of the exigencies of World War II and the demands of total wartime mobilization in Europe and the United States. Both pesticides and herbicides became commercially available after the war, and chemical corporations heralded their products as miracles that defended and expanded American power in the postwar era. Russell stretches his study back to World War I, when modern science and the Industrial Revolution combined to create the horrors of chemical warfare on Europe's battlefields. The present work pushes the story to the end of the Vietnam War, when the protesting scientists ensured that the Geneva Protocol of 1925—designed by its framers to prevent chemical and biological warfare in the future—extended to protect not only humans but the environments in which they live.

Three significant works focus explicitly on Agent Orange. I also situate my work within this literature. Paul Fredrick Cecil's *Herbicidal Warfare* is based in part on the author's personal experiences—Cecil was a pilot for Operation Ranch Hand. In addition to providing valuable nuts-and-bolts information on specific missions and the command structure of the program, Cecil's account offers insight into a group of soldiers who served in one of the most unique and dangerous military programs in modern history.[26] The first U.S. Air Force deaths in Vietnam were members of Ranch Hand, and herbicide spray planes sustained the most enemy ground fire of any U.S. air operation. Cecil offers an exciting narrative concentrating on the dangers and adventures of defoliation missions. His work is an important reminder that the herbicide program, while controversial, was staffed by a dedicated and tight-knit group of soldiers who believed their operation was in the best interest of their country.

Ranch Handers, Cecil points out, were uninvolved in the high policy that launched herbicidal warfare; they were tasked with a mission to provide optimal fighting conditions for the American soldier in Vietnam, and they accomplished that mission. Critics who opposed herbicidal warfare, for whom Cecil has expressed little patience and who figure centrally in the following narrative, made their case under entirely different parameters, so different, in fact, that the ideas supporting "ecocide" and "tactical necessity" need not be seen as mutually exclusive arguments battling for sole possession of the truth. The question of herbicidal warfare's value in Vietnam simply had little to do with critics' concern regarding its ecological and human health impacts and the possibility that this cheap and widely available weapon would proliferate in wars all over the globe.

Fred Wilcox's *Waiting for an Army to Die* is an account of Vietnam veterans who fell ill after the war and who blame their illness on Agent Orange. Wilcox poignantly captures their grievous circumstances of wasting away from cancers and other horrific illnesses amid the vast and uncaring bureaucracy of the U.S. Department of Veterans Affairs and other federal agencies, which did not seriously begin to study the health effects of Agent Orange until 1984.[27] But Wilcox devotes insufficient attention to the uncertainty among health researchers regarding Agent Orange exposure and statistical correlation to specific health maladies once the federal research began. If a Vietnam veteran is dying of lung cancer, did he fall ill because of a tour of duty in Vietnam, an unlucky genetic inheritance, or a twenty-year smoking habit? Defining what makes an Agent Orange victim is trickier than Wilcox's work suggests. Still, *Waiting for an Army to Die* elevates Agent Orange as a powerful symbol of the forgotten and traumatized U.S. soldier in the post-Vietnam era. Both its title and the powerful anecdotal evidence Wilcox brings to bear serve as important reminders that the absence of "conclusive" data linking Agent Orange to almost all the health maladies that veterans and their families have claimed may say more about the limits of epidemiology than the true health legacy of herbicidal warfare in Vietnam.

Finally, Peter H. Schuck's *Agent Orange on Trial* examines the landmark litigation pitting American Vietnam veterans against the corporate producers of Agent Orange in the early 1980s. A legal scholar, Schuck elucidates many of the correlative nuances missing from Wilcox's narrative. Schuck's riveting account of the largest (and arguably most complex) civil-action lawsuit in U.S. history explains why sick Vietnam veterans could not sue

for and win court-ordered damages. First, the U.S. government exercised sovereign immunity, which made it impossible for veterans to sue any federal agency.[28] Second, the chemical companies asserted that their product conformed to government specifications, and their lawyers effectively denied any link between fatal illnesses and Agent Orange exposure.[29] Before the trial began, veteran plaintiffs settled out of court for $180 million, although lawyers for Dow and Monsanto maintained that the settlement was not an admission of guilt but a gesture of goodwill. In a partial repeat of history, down to the decision of Judge Jack Weinstein, who also presided over the court case brought by American veterans, Vietnamese nationals recently attempted to sue the chemical manufacturers of Agent Orange for a range of health illnesses and for lasting ecological damage wrought by herbicidal warfare. In 2005 Weinstein dismissed the lawsuit. He found that Operation Ranch Hand did not violate any international law (such as the Geneva Protocol) to which the United States was bound, and therefore foreign nationals had no basis to sue. In March 2009, the U.S. Supreme Court denied the Vietnamese plaintiffs' application to hear an appeal, thereby ending the lawsuit.[30] It is perhaps the only aspect of the complex legacy of Agent Orange that has ended with some degree of decisiveness.

Each of these works has greatly informed my understanding of the vast complexities and drama surrounding Agent Orange. But there is more to this story, one that should make Agent Orange resonate equally with scientists, intellectuals, cold warriors, and evolving notions of international security. This project offers a historical explanation for the rise and fall of herbicidal warfare. The narrative follows 2,4-D and 2,4,5-T along the path of scientific discovery, national-security strategy, and environmental and antiwar protest in the Vietnam era. All the actors in this narrative in some way contributed to the invention of ecocide.

CHAPTER TWO

AN ETYMOLOGY OF ECOCIDE

FROM THE PELOPONNESIAN WAR to the present-day Palestinian-Israeli conflict, combatants have accused the other side of committing atrocities. It is a unique form of propaganda — a condemnation that the enemy has crossed a normative boundary whose authority supersedes the objectives of both combatants. The Latin term for this is *jus in bello*, or justice in war.[1] To violate this principle of justice is to commit, or stand accused of committing, a war crime. *Jus in bello* is a building block of the modern international system dating back to eighteenth-century Europe, and its principles were at the core of the Nuremburg trials immediately after World War II. During the Vietnam War, a group of scientists coined and propagated the term "ecocide" to denounce the environmental destruction and potential human health catastrophe arising from the herbicidal warfare program known as Operation Ranch Hand. In the long history of war crimes allegations, the scientists' accusation was doubly unique: they leveled the charge against their *own* government and then effectively forced national policy to renounce first use of herbicides in future wars.

The movement against ecocide sparked a flurry of interest across disparate groups including legal theorists, radical demonstrators, and environmental activists. Ecocide was one of many variants of the idea that some aspect of the Vietnam War violated international law. This form of dissent was unique to whoever employed it; for example, in 1967 Martin Luther King Jr. posited his "Declaration of Independence from the War in Vietnam" as a philosophical proposition that racism at home and the war in Indochina were each illegal enterprises that could not be challenged as discrete entities.

That same year, John H. Messing, a law student at Stanford University, was among the first Americans to dissect U.S. foreign policy by the stringent criteria of international treaty law. Taking a cue from the strenuous televised debate in the SCFR in 1966 over the legality of the war, Messing found no grounds to justify a lawful source of American involvement in Vietnam.[2] But the question that truly vexed most dissenters in the Vietnam era was not *if* but rather *how* the war was illegal. That is, to challenge the entire basis of the American intervention in Vietnam required a certain intellectual detachment from the war as it was being waged day to day. Thus broad condemnations that confronted the war as a prima facie criminal enterprise generally served as a step to censure particular tactics that struck dissenters as uniquely illegal.

The connections that might have been drawn between specific atrocities and the legitimacy of the war as a whole usually remained tacit or were altogether unacknowledged. Put another way, a belief in the basic illegality of the war may have been deeply held among opponents of the war, but it was not the primary factor that compelled them to act. To denounce the actions of one's government required a more visceral aversion to any number of wartime tactics employed by U.S. forces in Indochina. Finally, as a utilitarian strategy of protest, in the later years of the war dissenters denounced particular American actions in Vietnam as specific crimes of war.

In February 1970, a conference titled "War Crimes and the American Conscience" was attended by dozens of American scholars who had gathered to survey the full gamut of war crimes committed by the United States in Vietnam.[3] Among the participants was Arthur W. Galston, a plant biologist and chair of the Department of Botany at Yale University (figure 2). It was here that Galston coined the word "ecocide," culminating four years of herbicide research and his attempts to end Operation Ranch Hand. In 1966 Galston became one of the first scientists to voice concern over the ecological and human health effects of the herbicidal warfare program in Vietnam.[4] The strategy of defoliation and crop destruction had been in effect since 1961 as an integral component of American counterinsurgency operations throughout South Vietnam and its borderlands with Laos and Cambodia. The herbicidal component of counterinsurgent doctrine sought to deny the guerrilla forces of the NLF food and forest cover, protect American soldiers from ambush, and destroy any agricultural areas thought to be under NLF control.[5]

By 1966 Operation Ranch Hand had expanded to a scale of chemical war-

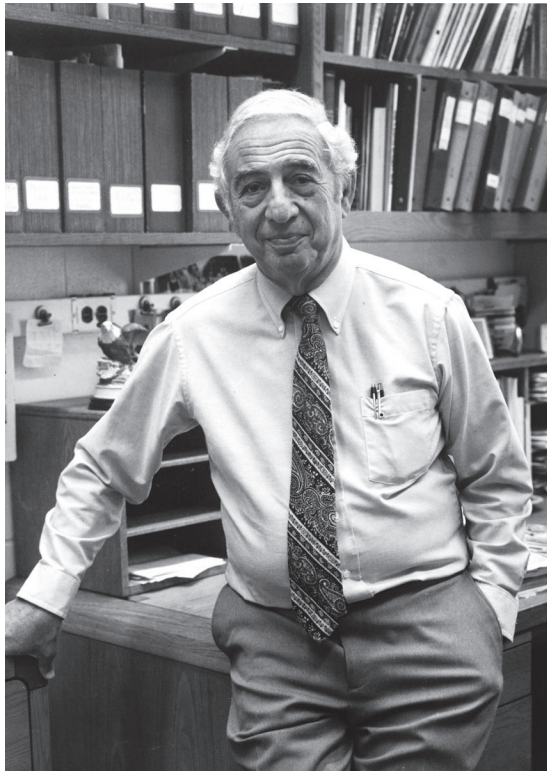

Figure 2 Arthur W. Galston in his office at Yale in the early 1990s. Galston Family photo.

fare unseen since World War I. By the end of the decade, Ranch Hand crewmen had sprayed approximately twenty million gallons of Agent Orange and other chemical herbicides over an area of South Vietnam equal in size to the state of Massachusetts.[6] Although by early 1970 there were signs that the herbicide program was drawing to a close, the ecological damage sustained in the coastal mangrove swamps, in rice paddies and croplands, and in the dense rainforests in South Vietnam's interior was only beginning to be surveyed by scientists. At the same time, reports surfaced that the chemical 2,4,5-T, which comprised one-half of the chemical compound Agent Orange, was proved mutagenic and possibly carcinogenic in lab rats.[7]

But Galston and the scientific colleagues who shared his views were not merely alarmed at the massive and deliberate environmental destruction in Vietnam and the possibility that the United States had exposed millions of people — including its own soldiers — to potentially cancer-causing chemicals. These scientists also imagined *more* ecological dystopias and human

health epidemics created by future wars fought with more sophisticated chemical weapons and advanced methods of environmental warfare.

As Galston understood, soldiers at every rank and with direct knowledge of the tactical and political value of herbicidal warfare had produced assessment reports from the field that extolled its virtues since the beginning of the operation.[8] The reports convinced officials at the Pentagon to include herbicidal warfare in contingency planning for future conflicts in which the United States might face insurgents.[9] Throughout the presidential administrations of John F. Kennedy, Lyndon B. Johnson, and Richard M. Nixon, civilian government leaders assured the military advocates of defoliation that the United States would never relinquish its herbicidal capacity despite charges that it constituted chemical warfare and as such was prohibited by international treaties such as the Geneva Protocol of 1925.[10] In the words of one newspaper editorial, against these odds how might one stop the U.S. military from "defoliating the world?"[11]

Arthur Galston was determined to ensure both the ecological reconstruction of Vietnam and the prohibition of herbicidal destruction in future wars: the Agent Orange controversy remained Galston's cause célèbre until his death in 2008.[12] Galston's colleagues have characterized his concern with herbicidal warfare as something of a mania; Galston himself surmised that his interest stemmed from a guilt complex arising from his inadvertent contribution to the development of herbicides during research on his doctoral dissertation in 1942–43.[13]

The scientists who campaigned to end herbicidal warfare, wholly committed as they were to limiting the ecological destruction of Vietnam and in future war zones, never considered themselves part of the environmental movement as they understood it. Indeed, the scientists' discomfort with the label "environmentalist" was one ideological platform uniting a group that is otherwise difficult to narrate with a single voice. E. W. "Bert" Pfeiffer of the University of Montana — among the first scientists to demand action against Operation Ranch Hand — readily identified himself as a socialist. Matthew Meselson of Harvard University, who led the major scientific herbicide investigation in Vietnam in 1970, counted among his friends and allies the elite among Washington's foreign-policy establishment. What linked these disparate scientific actors beyond their efforts to terminate herbicidal warfare was their insistence that the antiherbicide campaign was not an expression of contemporary environmentalism.[14]

Arthur Galston summarized the sentiment best during an interview with the author:

> I wasn't a big part of Earth Day or the Sierra Club, [and] I did not consider environmental agitation as "where it was at"; we have finite energy, finite time . . . you want to apply the pressure where it's likely to do the most good. To my way of thinking it wasn't environmentalism but a bioethical approach. In other words, every time you make a scientific advance, you have a potential to create problems for society. You discover a new antibiotic; it has the potential for good to prevent disease, or it has the potential for being misused so it's going to favor the evolution of resistant varieties. Environmentalists to me . . . there are some kooks in that movement . . . dilettantes . . . people who want to pick up Coke bottles from a stream. That's fine . . . these people call themselves environmentalists, but that's not where I'm at. I want to pursue things that are of greater biological impact.[15]

Galston went on to offer a critique of the environmental movement, using the public uproar over DDT to illustrate what he saw as a Manichean anti-intellectualism that pervaded environmental "agitation," as he called it: "To say something is natural does not mean that it's good. Those two [terms] are not equitable. If I could get rid of mosquitoes, I would. Well, that's anti-natural, and yet it's pro-human."[16]

In other words, Galston was not motivated to preserve some indigenous ecological Eden from Western technological predations. If Ranch Hand was an operation of resource extraction, it would not be ecocide. Galston's framework illustrates one of the founding distinctions (and tensions) between environmentalists and environmental historians. The former tend to advance a duality between active and destructive humans and passive and fragile nature. Further, modern environmentalists generally equate nature with leisure — something to be enjoyed, not exploited. Environmental historians complicate this separatism by emphasizing the interconnectedness of human culture and natural change throughout history.[17] In shunning the environmental movement, the scientists made a self-conscious decision to avoid what they saw as the simplistic entrapments of "agitation."

Yet the fact that the scientists did not actively identify with environmentalism does not automatically exclude them from such a broad and ideologically diverse club — one that Galston caricatured somewhat crudely. Still, the scientists' actions matched their ideologies: they did not seek an alliance with the major environmental organizations of the day, nor did they couch

the travesty of herbicidal warfare in fashionable phrases such as the "rape" of the land in order to whip up popular indignation. Moreover, the scientists correctly predicted that by emphasizing the "cide" over the "eco" in their lobbying effort, policy makers and jurists would be more likely to recognize Operation Ranch Hand as a preventable ecological war crime. Under the mantle of international law, the scientists determined that ecocide could become categorically banned by treaties governing the rules of warfare. This plan thus served two closely related goals: preserving global security in a world facing grave environmental threats and protecting human populations living in areas suitable for unleashing herbicides in future wars.

Finally, we cannot underestimate the scientists' sense of intellectual vanity when assessing their motivations. Galston made no effort to mask his disdain for "kooky" and parochial environmentalists; for him and his colleagues, the company of Hannah Arendt and Jean-Paul Sartre at European war crimes symposia, and J. William Fulbright in the U.S. Senate, was far more preferable.

During a panel at the "War Crimes and the American Conscience" conference, titled "Technology and American Power," Galston defined ecocide:

> After the end of World War II, and as a result of the Nuremburg trials, we justly condemned the willful destruction of an entire people and its culture, calling this crime against humanity *genocide*. It seems to me that the willful and permanent destruction of environment in which a people can live in a manner of their own choosing ought similarly to be considered as a crime against humanity, to be designated by the term *ecocide*. I believe that the most highly developed nations have already committed autoecocide over large parts of their own countries. At the present time, the United States stands alone as possibly having committed ecocide against another country, Vietnam, through its massive use of chemical defoliants and herbicides. The United Nations would appear to be an appropriate body for the formulation of a proposal against ecocide.[18]

At the relatively late juncture of 1970, Galston's indictment fit tightly within a strong antiwar activist movement in Europe that emphasized war crimes, but in the United States the specter of Nuremberg had only begun to loom large. Only a few months earlier, the investigative reporter Seymour Hersh had broken the story of the My Lai massacre, which the army had covered up since the occurrence of the incident in March 1968.[19] Hersh's reporting received headline coverage around the country, earned him a

Pulitzer Prize, and provided chilling testimony to millions of Americans that U.S. forces would kill defenseless civilians if their village was suspected of harboring "Viet Cong."[20] In a letter to the editor of *Life*, one reader lamented, "If the principles of the Nuremberg War trials mean anything at all, then these men who killed women, children and old men should never be allowed to hide behind the excuse that 'I was just following orders.'"[21]

In Western Europe, and particularly in Sweden, France, and Britain, intellectuals opposed to the war had generally grappled with the notion of American war crimes earlier than their counterparts in the United States; for them My Lai was not a starting point that helped spur war crimes symposia such as that attended by Galston but the logical culmination of an industrialized power intent on the destruction of an agrarian peasant country.[22]

The British moral philosopher Bertrand Russell — who had built his reputation as a staunch anticommunist with the 1920 screed *Practice and Theory of Bolshevism* — founded the International War Crimes (IWC) Tribunal for the Vietnam War in November 1966. The title of the published book resulting from the tribunal was *Prevent the Crime of Silence*, reflecting its premise that unpunished war crimes are bound to be repeated. Jean-Paul Sartre, IWC Tribunal executive director, explained the group's mission: "A tribunal such as that of Nuremberg has become a permanent necessity . . . before the Nazi trials, war was lawless." Sartre went on: "The judgment of Nuremberg had necessitated the existence of an institution to inquire into war crimes, and if necessary, to sit in judgment." The decisions were intellectual only; the group, of course, had no enforcement capacity. But the group did claim ownership of the legal relevance of the judgment at Nuremburg: the Nazi defendants in 1945 stood accused of perpetuating war crimes, not "just following orders." For the IWC Tribunal, protesting to end an ongoing criminal war was Nuremburg's mandate.[23]

Edgar Lederer, a Parisian biology professor, first raised the issue of chemical warfare at an IWC Tribunal meeting. Lederer provided a broad overview of the environmental destruction and human suffering wrought by herbicidal warfare in Vietnam and made a strong case that Operation Ranch Hand encapsulated nearly every criminal dimension of the American war in South Vietnam, namely, the lavish use of advanced technology to subdue an unidentifiable enemy, thereby negating any practicable distinction between obliterating civilians and enemies.[24] Lederer went on to contribute to the resolution of the "International Meeting of Scientists on Chemical Warfare in Viet Nam" in Orsay, France, in December 1970. The resolution

commended American scientists for "their courageous stand" taken against their government in protest of herbicidal warfare: "In the face of the terrible and widespread destruction of the ecology of Viet Nam whose extent passes [*sic*] the human imagination, we launch this appeal . . . to offer appropriate and helpful assistance to the Vietnamese people and to extend the study of the poisonous effects of the chemical substances used in this war, and to find means of fighting those effects."[25]

The Orsay resolution associated ecocide with genocide more explicitly: "The volume of human loss and the widespread destruction of nature lead us to the conclusion that we are not only faced with genocide but *biocide*."[26] Neither Galston nor any of the American scientists involved in the herbicide controversy were comfortable with this conflation. Agent Orange, in their view, was ecocidal to humans insofar as humans were ecologically connected to their surroundings. There was no moral or legal equivalence between the deliberate destruction of plants and humans.

Galston invented ecocide within a broader transatlantic dialogue on American war crimes and in an intellectual atmosphere that valued scientific authority on moral and political matters. But it was the NLF — the *target* of herbicidal warfare — and its allies in the Democratic Republic of Vietnam (North Vietnam) that most vigorously brought the resulting calamities to the world's attention. Although the propagandistic value in making public the horrors of herbicidal warfare was obvious enough, the word "propaganda" is not an adequate description. The tone and purpose of NLF documents, leaflets, and speeches denouncing herbicidal warfare were remarkably similar to those of Americans and Europeans writing on the same subject. If one allows for a degree of hyperbole and anti-American rhetoric in the NLF materials, those generated by protesting Americans and their European counterparts shared the same objective: to spread the word on how the United States was fighting its war in Vietnam.

One of the earliest such examples of a Vietnamese denunciation of herbicidal warfare came in April 1963 in a radio message broadcast by the Liberation Press Agency of the NLF. Broadcast out of Hanoi, the message challenged official American assertions of the safety of herbicides for human exposure and its limited use in counterinsurgency operations: "The fact is that the United States and the Ngo Dinh Diem administration have used these chemicals to carry out reprisals against the people, destroy the crops and vegetation, and plunge the inhabitants into misery and compel them to join 'strategic hamlets.'"[27] In a September 1965 speech titled "We Are

Determined to Defeat the U.S. War of Destruction," Colonel-General Van Tiên Dung of the NLF described herbicides as a "test ground," or a kind of military laboratory to prepare for future wars, against the people of Vietnam and a "policy of terror" that was destined to fail.[28]

In the early years of the war, Vietnamese communists were keenly aware of the value in establishing a common purpose between their own political objectives and the concerns voiced by dissenters in the United States and elsewhere.[29] In 1966 researchers in Hanoi compiled an impressive collection of international reactions to the American use of chemicals in Vietnam. With denunciations pouring in from Japan to Italy and from Lebanon to Tanzania, the Hanoi government portrayed the isolation that the United States was creating for itself by its actions in Vietnam. Notably, it was clear that the international condemnations directed against the United States did not conform to the ideological divide of the cold war. Insofar as reactions to the U.S. military's use of chemicals in Vietnam was a reliable gauge of general sentiment in the international arena, the United States early on had alienated allies and enemies alike.[30] By 1967 the NLF had organized its own war crimes committees, apparently modeled after the Russell tribunal, and the following year the North Vietnam Social Sciences Institute issued a wide-ranging survey on American war crimes. The section on chemical warfare cited a 1966 petition created by Arthur Galston and sent to Lyndon Johnson urging the president to halt the use of herbicides as evidence that Americans understood the catastrophe in Vietnam and protested that it was being carried out in their name.[31]

Throughout the war, the literature and broadcasts coming out of communist Vietnam strove to establish the existence of solidarity with the majority of the world's peoples on the issue of herbicides. But coverage in newspaper articles on Operation Ranch Hand brought the issue to public attention in the West only in 1965, and it took another year before the defoliation issue began to rouse the consciences of antiwar activists, of which there were few in 1965–66.[32] Hanoi and the NLF counted on wide-ranging solidarity against herbicidal warfare largely as a presupposition that the severity and inhumane character of Ranch Hand would forge a dissenters' bond across the first, second, and nonaligned worlds. The Vietnamese communists' persistence indicates that it was not only the American military that set out to "win hearts and minds"; when herbicidal operations reached their peak in 1967 and 1968, the NLF could also boast a veritable alliance with the war crimes movement as it positioned itself against the U.S. government. By that

time, the herbicide controversy figured prominently — even centrally — in the litany of cited reasons for why and how the American war amounted to a criminal enterprise.

As a case of deliberate ecological destruction in which civilians had clearly suffered enormously, Operation Ranch Hand united activists in the West and communists in Vietnam in opposition without reference to the ideological battle that had precipitated the Vietnam War in the first place. If the first notable similarity in the war crimes literature and Vietnamese communist propaganda is the indignation expressed at the inhumanity of leveling high-technology destruction against a rural peasantry, the second is the shared absence of almost all reference to the cold war. To those who saw undeniable evidence of war crimes in Vietnam, the question of American containment versus communist expansion in Southeast Asia remained almost irrelevant throughout the herbicide controversy. In the West, it was possible to denounce Operation Ranch Hand without calling into question the fundamental tenets that had guided American foreign policy since 1947 or even the "logical culmination" of those tenets in the form of American intervention in Vietnam.[33] For herbicidal warfare protestors, debating the merits of containment detracted from their cause — there were more pressing issues. This was powerfully expressed by Paul Ehrlich, a biologist who achieved fame in 1968 with his neo-Malthusian book *The Population Bomb*. Ehrlich estimated that natural resource extraction and food production would soon fail to keep pace with human needs. In 1971 he determined that the crop-destruction variant of the herbicide program was a grave but preventable omen of a future global catastrophe.[34]

The week after the "War Crimes and the American Conscience" conference, where Galston had introduced ecocide, the American Bar Association (ABA) reasserted its decades-long opposition to the United Nations (UN) Genocide Convention of 1948.[35] Although the United States played an instrumental role in bringing the convention before the UN General Assembly, interest groups had repeatedly blocked Senate ratification.[36] In February 1970, ABA officials surmised that the time was appropriate to display the organization's lobbying clout again. According to a *New York Times* editorial, an ABA resolution held that Senate ratification of the Genocide Convention would "enable Communist countries to haul American citizens before an alien court on charges arising out of racial practices at home and military actions in Vietnam."[37] The *Times* took sharp issue with this position; the editorial avowed that the United States had not violated the Genocide

Convention, and the ABA's stance reinforced the perception that the United States was vulnerable to the charge of genocide. Meanwhile, the second part of the editorial strongly endorsed Galston's proposal on ecocide: "A world that is increasingly mindful of the threat to all life inherent in heedless tampering with the environment cannot be indifferent to the consequences of deliberate interference with the ecological balance."[38]

It was a curious line of reasoning. First, the *Times* editorial board apparently did not recognize the logical connection between the mounting war crimes movement in the United States and subsequent efforts such as that by the ABA to ensure that the United States did not legislate itself into a war crimes charge issued by the International Court of Justice (ICJ) or some other official body. As the ABA perceived the situation, nongovernmental groups like the Russell tribunal might have been an embarrassment to the United States, but an ICJ case would have been serious indeed. Second, the editorial operated on a cognitive dissonance: the *Times* asserted that the United States had not violated the Genocide Convention but simultaneously supported Galston's solution to ban ecocide. Galston had not meant to be as quaint as perhaps the *New York Times* had thought — ecocide was not merely a crime against trees such as that caused by overdevelopment.[39] To Galston, Operation Ranch Hand amounted to a crime against humanity.[40] As the ABA likely recognized, foreign communists were not the only activists who sought to haul the United States into an "alien court."

As a biologist and a humanitarian, Galston had staked a claim well beyond the reaches of his expertise; his major concern was that U.S. reconstruction efforts in Vietnam would not abandon the lives and land ruined by Agent Orange and, of course, that his government would renounce herbicidal warfare for all time.[41] But in the absence of any evidence that U.S. officials had such plans in the offing, implementing the legal mechanisms to enshrine ecocide as a crime required expertise in international law. It was Richard Falk, Milbank Professor of International Law at the Woodrow Wilson School at Princeton University, who laid out the case.

In 1968 Falk published an article titled "United States Policy and the Vietnam War: A Second American Dilemma." The title referred to the 1944 book *An American Dilemma: The Negro Problem and Modern Democracy*, by the Swedish economist Gunnar Myrdal. Taking an "objective" stance as a foreign observer, Myrdal had identified America's basic dilemma as the gap between "conduct and creed," that is, between America's guiding principles of liberty and equality with the racist realities of everyday life in a white-

dominated society. Falk identified the Vietnam War as America's *second* dilemma because it replicated in foreign policy the gap Myrdal had identified in domestic affairs. In Vietnam, Falk charged, the United States departed radically from its creed in the realm of international relations; the war had proved so disastrous that the United States should "give up its pretensions about creating a world order."[42]

Falk's critique was devastating, yet compared to his writings following Arthur Galston's identification of ecocide, the notion of a second American dilemma seemed timid. By the early 1970s, Falk had come to believe that the United States stood guilty of war crimes in Vietnam that amounted to genocide. But why ecocide? For Falk, the strategy of environmental destruction for military purposes represented "the demonic logic of counterinsurgency warfare," a logic that proceeded on the "basic rationale of separating the people from their land." Paraphrasing Mao's famous likening of guerrillas to fish swimming in a sea of peasants, Falk characterized counterinsurgency doctrine as an "attempt to dry up the sea of civilians . . . This drying up process is translated militarily into making the countryside unfit for civilian habitation."[43]

The most pertinent questions had far transcended the intramural debates on U.S. foreign policy that had occupied Falk's attention in earlier years. With the knowledge of ecocide, the stakes of the war had become, in Falk's mind, elevated from a bankrupt adventure to an act of genocide. By contextualizing ecocide as a central component to the wider strategy of the destruction of South Vietnam, Falk identified "Agent Orange as an Auschwitz for environmental values . . . And just as the Genocide Convention came along to formalize part of what had already been condemned and punished at Nuremberg, so an Ecocide Convention could help carry forward into the future a legal condemnation of environmental warfare in Indochina."[44] Falk went on to argue that Operation Ranch Hand violated international treaty law and the U.S. Army's own laws of land warfare, contradicted overwhelming majority opinion as expressed in several UN General Assembly resolutions, and threatened to nullify the precedent of the Nuremberg trials.[45] On this last point, Falk was hardly the only legal scholar to grapple with the implications of Nuremberg for the Vietnam War.[46] Nor does it appear that lawyers were the first to consider Nuremberg as an avenue to protest American actions: beginning in 1965 college radicals and dissident U.S. servicemen routinely invoked Nuremberg to justify their resistance to American policy in Vietnam.[47]

Vietnamese communist pronouncements regularly characterized the American war generally and herbicidal warfare specifically as a genocidal act in the making.[48] At the Scientists' Conference on Chemical Warfare in Vietnam organized by Edgar Lederer, NLF Central Committee member Nguyen Van Hieu declared that scientific fears regarding the mutagenicity (or birth defect–causing) properties of Agent Orange had elevated the idea of genocide even beyond that seen during World War II. His prediction remains unsubstantiated: "Observations regarding chromosomic mutations and congenital malformations confirm the theoretic forecasts . . . The American Army is thus attacking not only the present generation but future generations as well, a crime never before committed in any war, not even that waged by the Nazis."[49] The theme of genocidal genetic warfare had become a staple by the late 1960s and early 1970s. In 1968 the Boston-based Committee of Concerned Asian Scholars titled an essay "Defoliation: The War against the Land and the Unborn." Citing Arthur Galston and other Western scientists, North Vietnam's English language *Vietnam Courier* ran numerous stories on the genetic destruction of Vietnam.[50]

No simple precedent existed for comparison with the ecological effects of herbicidal warfare. The denuded landscapes formed in the days and weeks after a Ranch Hand spray mission created a bizarre spectacle of destruction unlike anything that occurred in the course of peacetime activity. War, as recent studies have demonstrated, is always damaging to natural environments, yet few contemporary observers made reference to the "moonscape battlefields" of World War I or other potential analogs.[51] Accounts during and after the war were far more likely to draw parallels to the atomic attacks that laid waste to Hiroshima and Nagasaki, which leveled urban rather than rural environments.[52] Noam Chomsky was among the first Western observers to articulate why the Japanese precedent offered a more forceful analogy than other wars: "Three times in a generation American technology has laid waste a helpless Asian country. In 1945 this was done with a sense of moral rectitude that was, and remains, almost unchallenged. In Korea, there were a few qualms. The amazing resistance of the Vietnamese has finally forced us to ask, 'what have we done?'"[53]

The basis for the pattern drawn by Chomsky might be understood in racial terms, that is, that a racist presumption of white superiority had some basis in America's destructive wartime tactics against its Asian enemies, and more generally, that racism exerts an excessive and dangerous influence in international relations.[54] This is undoubtedly true. Yet in the case

of herbicidal warfare, the explanatory power of race must be considered salient but not preeminent. Operation Ranch Hand worked in tandem with the Army of the Republic of Vietnam. ARVN officers proved to be energetic participants in the herbicide strategy who also believed that Ranch Hand would hasten the defeat of the NLF and hence the reconstruction of rural South Vietnam.[55] Accordingly, racial factors ranked low in characterizations of Operation Ranch Hand as an ecocidal or genocidal act. As Chomsky's analysis suggests, the basis for establishing a pattern of American tactics focused instead on the toxic and indiscriminate character of herbicidal warfare made possible by the fusion of science and air power.[56] For this reason, the case of Hiroshima figured prominently, even though the devastated coastal mangrove swamps and highland rainforests of Vietnam represented a calamity more visually and ecologically akin to the fields of the American South in the Civil War and France in World War I. For participants in the war crimes movement, it was never the ecological destruction *in itself* that mandated denunciations of Operation Ranch Hand as an act of genocide; it was the centrality of herbicides to a war strategy that portended the deliberate technological destruction of a nation.[57]

In the years since the end of the Vietnam War, the term "ecocide" has entered the popular lexicon, almost invariably without reference to its original context. It has proved a versatile term. Environmental activists soon adopted ecocide as their own. In 1971 one writer declared: "The message of our day is ecocide, the environment being murdered by mankind . . . Our dense, amber air is a noxious emphysema agent; farming — antihusbandry — turns fertile soil into a poisoned wasteland; rivers are sewers, lakes cesspools, and our oceans are dying."[58] More recent works have deployed the word to condemn the Euro-American destruction of American Indian cultures; the destruction of rainforests around the equatorial world; the corporate takeover and consequent destruction of a Pacific island; the neoliberal debt crisis in developing countries; the alarming trend of accelerated species extinction in recent decades; and the environmental ravages wrought across Eurasia in the pursuit of a totalitarian command economy.[59] Two works have described ecocidal military activities in the post-Vietnam era.[60] *Collapse*, a recent book by the evolutionary biologist Jared Diamond, frames ecocide as the organizing principle of his study. Diamond defines ecocide as "unintended ecological suicide," which has ended many great civilizations.[61] Finally, ecocide has found its way into what is probably the overriding environmental concern of the present day: global warming. Activists have more recently taken to

the phrase "climate genocide" in denouncing carbon dioxide–emitting corporate operations and the governments that have hesitated to place strong curbs on emissions rates.[62]

These unique definitions should not obscure the original meaning and context of ecocide. The story of environmental destruction in Vietnam and the protests demanding and ultimately securing the termination of herbicidal warfare point to strong connections between America's counterinsurgency war in South Vietnam, antiwar protest, and environmental consciousness and activism in the 1960s and 1970s.

The work of the protesting scientists, as well as the political atmosphere that gave rise to ecocide, can be understood as a whole when one considers *how* the movement arose in the first place, and more crucially, *why* it succeeded in achieving its stated objectives. Although the concept of ecocide was always at the heart of the scientists' actions throughout the herbicide controversy — whether they concentrated on clarifying weapons disarmament policy, articulating the intersections of international law and science, or exposing government perfidy — ecocide alone did not and cannot provide an all-encompassing explanatory framework. The scientists most closely involved with the herbicide controversy were operating more broadly in a historical period that saw, as a result of the political, strategic, and moral calamity of the Vietnam War, a fundamental reorientation of the meaning of international security and human survival. By pointing at once to the criminality of American tactics in Vietnam and the rippling effects those tactics might have at a global level, the concept of ecocide fit squarely within a much broader political transformation over the course of the Vietnam era.

No one captured this change more powerfully than George Kennan, architect of the strategy of containment against the Soviet Union after World War II, who came to believe that his ideas on the cold war had been usurped by an excessively militant ideology that had led to the morass in Southeast Asia.[63] By 1966 Kennan was convinced that the Vietnam War threatened America's long-term viability. In a speech in support of Eugene McCarthy, senator from Minnesota and antiwar presidential aspirant in the 1968 election, Kennan devoted his talk to protesting President Lyndon B. Johnson's policies in Vietnam: "My friends . . . I do not see how we can view what our government has done with relations to Vietnam as anything other than a massive miscalculation and an error of policy, an error for which it is hard to find many parallels in our history, an error rendered doubly serious and

inexcusable by the number and quality of the warning voices that have been raised against it."[64]

As a foreign-policy theorist, Kennan was less concerned with the counterinsurgency tactics in Vietnam that had exercised the conscience of so many antiwar activists; in his more global view such methods were symptomatic of the fundamental intellectual bankruptcy that had gotten the United States into this situation in the first place. If Vietnam had become the dominant symbol of American resolve to defeat the international expansion of communism, then the time had come to rethink America's purpose in world affairs. Kennan reached further: he incorporated the war within a broader matrix of issues that indicated, in his view, that the United States had lost its way. Kennan wrote and spoke repeatedly of the alienation of America's "Negro population" and "the steady process of destruction and pollution of [America's] natural resources," and finally, "the extremely disturbed and excited state of mind of a good portion of [the country's] student youth, floundering around . . . in its own terrifying wilderness of drugs, pornography and political hysteria."[65]

In a 1970 article appearing in the same journal that published "X," Kennan identified impending ecological doom as the preeminent security threat facing humankind. Environmental issues, Kennan observed, required an international oversight body such as the UN because the basis of global environmental protection required international cooperation. Kennan hoped that such an institution could avoid what the political scientist Robert Jervis has defined as a classic international-security dilemma, in which, given "the absence of a supranational authority that can enforce binding agreements, many of the steps pursued by states to bolster their security have the effect — often unintended and unforeseen — of making other states less secure."[66] The security threats that Kennan had in mind were immense: "Indeed, the entire ecology of the planet is not arranged in national compartments; and whoever interferes seriously with it anywhere is doing something that is almost invariably of serious concern to the international community at large."[67]

For Kennan the specter of some future "world wasteland" and the present reality of the American catastrophe in Vietnam were inseparable: both problems had arisen because of short-sighted and misplaced priorities. Militant anticommunism, as it was being applied in Vietnam, had damaged America's national security and at the same time threw into question the primacy of communist expansion as the dominant security threat facing the

United States. Even more worrisome in Kennan's view was that the decade-long fixation on Vietnam had obscured a threat that, if left unchecked, pointed to a struggle for human survival that would render irrelevant the ideological conflicts that had animated the cold war. Therefore, the scientific movement that invented ecocide — which simultaneously minimized the strategic relevance of the cold war and sought through legal mechanisms to prevent future environmental catastrophes — must be understood directly within the transformative context that Kennan had illustrated.

To demonstrate the magnitude of this transformation, we can examine popular conceptions of global destruction only ten years earlier. The newly elected John F. Kennedy vowed in his inaugural address that America should "pay any price, bear any burden, meet any hardship, support any friend, oppose any foe, in order to assure the survival and the success of liberty."[68] In the struggle against communism, what was the new president prepared to pay? Could the Kennedy administration maintain President Dwight Eisenhower's record of avoiding nuclear confrontation with the Soviet Union, while promising a fundamental shift from his predecessor's cold war strategy?[69] If a crisis situation erupted into intercontinental nuclear war, would human life on Earth continue? On this last point, at least, John Kennedy and his advisors had the semblance of a concrete answer to these untested questions. According to Herman Kahn, a researcher for the RAND Corporation, both the notion of survival in a postnuclear environment and the possibility of a U.S. victory in a nuclear war became entirely conceivable.

In 1960 Kahn published *On Thermonuclear War* to instant acclaim in the media and Washington's foreign-policy establishment. His ideas were given close attention in the Kennedy administration, which had hired many of Kahn's colleagues from RAND.[70] The title was an unsubtle reference to *On War*, a major treatise on military strategy written by the Prussian theorist Karl von Clausewitz in the early nineteenth century. In the book's famously chilling question, "Will the survivors envy the dead?" after a nuclear holocaust, Kahn offered an emphatic no.[71] What is significant is not how Kahn arrived at his conclusion — which relied on a mind-boggling sequence of genetic algorithms to calculate human survival rates — but in the author's noninterest in the ideological underpinnings that would precipitate a war of "mutually assured destruction." For Kahn, the point was to devise a strategy for the United States to "win" a nuclear war.[72] Stanley Kubrick based his macabre comedy and title character *Dr. Strangelove* (1964) on Kahn; the final

scenes depicting mushroom clouds demonstrated in Kubrick's view what nuclear "victory" looked like.

Over the course of the decade, two major developments rendered Kahn's study irrelevant. First, in 1963 the Limited Nuclear Test Ban Treaty helped reduce nuclear tensions between the superpowers after the Cuban missile crisis pushed the United States and the Soviet Union to the brink of war.[73] That same year multilateral assurances of a nonnuclear West Germany virtually cemented the impossibility of strategic nuclear war between the United States and the Soviet Union.[74] Second, by the end of the decade the Vietnam War had essentially destroyed the idea that a policy of militant anticommunism was worth risking the physical survival of the United States or, for that matter, the world. At the same time, widespread ecological concerns reoriented the basic meaning of survival—both in the United States and globally. Taking a cue from the wider environmental movement that had steadily gained steam since Rachel Carson published *Silent Spring* in 1962, George Kennan was among the first to articulate the relationship between the decline of cold war fears and the rise of ecological fears.[75]

By 1970 visions of global environmental calamities thus bore scant resemblance to the postnuclear holocaust world imagined by Herman Kahn only a decade earlier. What had changed was not the extent of imagined destruction but its source. In place of nuclear devastation came a more gradual but no less apocalyptic vision of planetary environmental destruction that included desertified cropland, clear-cut forests, smog-filled air, and oil-slicked beaches.[76] The idea that humans were altering the planet's ecology for the worse and that something needed to be done about it had become a widely held belief—and for many it was an issue that had more salience and urgency than America's prosecution of the cold war. The historian John McNeill locates the realization that humans were creating "something new under the sun" as a process in the 1960s that depended, in large measure, on the fact that all over the world "received wisdom and constituted authority came under fierce attack" during that turbulent decade.[77]

But where was the evidence that the sum of the various environmental problems that had caused widespread concern by the late 1960s had justified the vision of a world wasteland? Was the very idea of humans slowly but surely destroying the world merely a reincarnation of unrealized anxieties born in the chaos of nineteenth-century industrialization? Furthermore, did this idea advance a false divide between rapacious humans and a passive nature that discounted the dynamism of the natural environment?[78] In

Vietnam many environmentalists saw strong evidence that such apocalyptic fears were not merely hypothetical. Channeling the introductory sentences of *Silent Spring*, the Sierra Club *Bulletin* published what amounted to an environmental obituary of a nation: "Once upon a time there was a small, beautiful, green and graceful country called Vietnam." The article went on to survey the mammoth environmental destructiveness of the "Orwellian" and "macabre" Operation Ranch Hand, concluding: "By the time deformed fetuses began appearing and signs of lasting ecological damage were becoming increasingly apparent success had been achieved. Vietnam had been saved. But the country was dead."[79] The theme of a "dead" country as an omen of things to come was struck repeatedly among environmentalists; one author suggested that the destruction of Vietnam offered a blueprint of planetary death.[80]

The scientists who identified ecocide fashioned themselves as neither specialists in security affairs nor environmental activists. But their agenda existed at the center of a complex transformation of priorities over the course of the Vietnam War. At a broad level, an examination of this transformation situates the herbicide controversy beyond the narrow parameters set by activist scientists and their supporters who protested ecocide, first as an ecological calamity in need of independent scientific investigation, and soon afterward as an ecological variant of genocide. The significance of the scientists' actions thus has wider ramifications for our understanding of the interplay between the counterinsurgency tactics of the Vietnam War and the protest it engendered.

NOTES

CHAPTER ONE. Introduction

1. The process by which herbicides kill plants is known in plant physiology as the herbicidal mode of action.

2. The question of whether the benefits of the postwar chemicalization of agriculture have outweighed the liabilities remains hotly debated. For a critique of the Green Revolution, see, for example, Sonnenfeld, "Mexico's 'Green Revolution,'" and Yapa, "What Are Improved Seeds?" A more positive (and self-serving) analysis is Ford Foundation, *Richer Harvest*. For a broader overview, see Cullather, "Miracles of Modernization."

3. Whether herbicidal applications are actually more economical than mechanical or manual weeding is a separate question.

4. The full text of the Geneva Protocol is available from the Department of State, "Text of the Geneva Protocol," at http://www.state.gov/t/isn/4784.htm.

5. The full text of the resolution is available from the Avalon Project at Yale University, http://avalon.law.yale.edu/20th_century/warpower.asp. See also http://www.fas.org/nuke/control/geneva/text/geneva1.htm.

6. See especially K. Moore, *Disrupting Science*; and Wisnioski, "Inside the System."

7. For scholarship on environmental politics and activism, see, for example, Hays, *Beauty, Health, and Permanence*; Rome, *Bulldozer in the Countryside*; Gottlieb, *Forcing the Spring*; and Sale, *Green Revolution*.

On the impact of Vietnam on cold war politics see, for example, Suri, *Power and Protest*; Woods, *J. William Fulbright*; Schulzinger, *Time for Peace*; Garthoff, *Détente and Confrontation*; Buzzanco, *Vietnam and the Transformation of American Life*; and Neu, *After Vietnam*.

8. The best challenge to move beyond these boundaries is Dorsey, "Dealing with the Dinosaur."

9. See, for example, A. Nelson, *Cold War Ecology*; R. P. Tucker and Russell, *Natural Enemy, Natural Ally*; and McNeill, "Woods and Warfare." One of the few books devoted exclusively to environmental history and international diplomacy is Dorsey, *Dawn of Conservation Diplomacy*.

10. This line of reasoning is most clearly spelled out in U.S. Military Assistance Command, Vietnam, *Herbicide Policy Review*, 35.

11. The most recent examination of the state of Agent Orange environmental remediation and compensation for U.S. veterans and Vietnamese nationals is a collaborative effort by the Ford Foundation, the New America Foundation, and the news outlet *Washington Monthly*. A transcript of a panel discussion, held in Washington, D.C., on January 6, 2010, discussing these efforts, is available at http://www.c-spanarchives.org/program/291101–1.

12. Phung Tuu Boi, interview with the author, August 23, 2007, Hanoi, Vietnam. Boi was profiled in Aschwanden, "Through the Forest."

13. Dwernychuk, "Dioxin Hot Spots in Vietnam."

14. Dr. Tuan Vo, a Vietnamese obstetrician, is one of the country's leading researchers on Agent Orange and birth defects. Interview with the author, August 4, 2007, Ho Chi Minh City, Vietnam.

15. See, for example, Schecter and Constable, "Commentary." See also Schecter et al., "Recent Dioxin Contamination."

16. Halperin, Honchar, and Fingerhut, "Dioxin," 285.

17. Clary, quoted in Grotto and Jones, "Agent Orange's Lethal Legacy." A wartime reference to the toxicity of Agent Orange as determined in laboratory tests on animals corroborates Clary's charge. See U.S. Military Assistance Command, Vietnam, "Use of Herbicides in Vietnam," folder 201–30 (3), box 2, RG 472, Records of the U.S. Forces in Southeast Asia, National Archives and Records Administration (hereafter NARA), College Park, Maryland. See also Joyce, "American Government."

18. The most accessible executive summary of the relationship between cancer and Agent Orange exposure is available from the American Cancer Society at http://tinyurl.com/3yq6urd.

The Institute of Medicine of the National Academies periodically updates its study *Veterans and Agent Orange*. While eschewing the word "conclusive," the 2004 edition identifies "sufficient evidence of an association" between Agent Orange exposure and the incidence of soft-tissue sarcoma, non-Hodgkin's lymphoma, chronic lymphocytic leukemia, and Hodgkin's disease.

19. President George H. W. Bush's directive signing the act into law is available at *The American Presidency Project,* University of California at Santa Barbara, http://www.presidency.ucsb.edu/ws/index.php?pid=19283.

20. A. L. Young, *History, Use, Disposition*, 11. Young's book combines materials on Agent Orange that he has worked on or collected over the past forty years, many of which are available online in the "Alvin L. Young Collection on Agent Orange" at the National Agricultural Library, http://www.nal.usda.gov/speccoll/findaids/agentorange/index.htm. For a more pointed argument on the "debasement" of science amid the policy of Agent Orange financial compensation without proved causation, see Gough, "Agent Orange."

21. A U.S. diplomat, interview with the author conducted off-the-record, August 23, 2007, Hanoi, Vietnam.

22. The U.S. embassy in Vietnam offers a useful primer on the milestones achieved in the U.S.-Vietnamese bilateral relationship since 1991, available at http://vietnam.usembassy.gov/chronology.html.

23. See, for example, Vinnedge, "Let's Hear It for Pollution."

24. Kennedy's reaction to *Silent Spring* and subsequent policy study is detailed by the Environmental Protection Agency, in "Rachel Carson," by Frank Graham Jr., *EPA Journal*, November/December 1978, available at http://www.epa.gov/history/topics/perspect/carson.htm.

25. Hayes et al., *Earth Day*, 2–3.

26. Complementing Cecil's emphasis on the tactical and operational aspects of Ranch Hand is the official air force history of the program, Buckingham, *Operation Ranch Hand*.

27. The law that launched federal research on the health effects of Agent Orange was H.R. 1961 (October 24, 1984). See President Ronald Reagan's statement, "Signing the Veterans' Dioxin and Radiation Exposure Compensation Standards Act," available at http://www.reagan.utexas.edu/archives/speeches/1984/102484e.htm.

28. See also Berenstein, "Comment"; and Lacey and Lacey, "Agent Orange.".

29. For the legal defense position of Dow Chemical Company, see Hanes, "Agent Orange Liability." Hanes was associate general counsel for Dow.

30. For Weinstein's full decision, see Judge Jack B. Weinstein, U.S. District Court, Eastern District of New York, *In re "Agent Orange Product Liability Litigation*," March 10, 2005, available at http://www.ffrd.org/AO/10_03_05_agentorange.pdf. A useful collection of pertinent court documents pertaining to the lawsuit and the appeals process is available from the War Legacies Project at http://www.warlegacies.org/court.htm. For an analysis of the legal basis of the lawsuit, see Zierler, "Vietnamese Plaintiffs." For a socioeconomic analysis of the impact of Agent Orange on Vietnamese in heavily sprayed areas (which provides context for the basis of the plaintiffs' lawsuit), see Palmer, "Legacy of Agent Orange."

CHAPTER TWO. An Etymology of Ecocide

1. Walzer, *Just and Unjust Wars*, 21.

2. Messing, "American Actions in Vietnam."

3. The meeting, held in Washington, was organized by the Congressional Conference on War and National Responsibility, at the initiative of U.S. representatives Abner Mikva (D-Ill.) and Robert Kastenmeier, (D-Wis.).

4. Galston et al., "Scientists' Petition to President Johnson."

5. Buckingham, *Operation Ranch Hand*, 11.

6. These figures are cited by the first independent American scientists to survey

the effects of herbicidal warfare in Vietnam. See E. W. Pfeiffer and Gordon H. Orians, "Military Use of Herbicides in Vietnam," in Neilands et al., *Harvest of Death*, 117–76, at 120–21.

7. B. Nelson, "Studies Find Danger."

8. For example, see Westmoreland (Commander of Military Assistance Command, Vietnam) to President Johnson, "Assessment for the Month of October 1967," box 234, Vietnam Country file, National Security file, Lyndon Baines Johnson Presidential Library (hereafter LBJL).

9. Excerpts of a leaked report detailing Pentagon contingency plans to conduct herbicide missions on every continent in the world appear in "Defoliation: Secret Army Study Urges Use in Future Wars."

10. U.S. Congress, House, Report to the Subcommittee on Science, Research and Development, *Technology Assessment*, 61.

11. "Defoliating the World."

12. Pearce, "Arthur Galston."

13. Arthur Galston, interview with the author, March 9, 2007, New Haven, Conn. Galston successfully demonstrated that a chemical compound called 2,3,5-triiodobenzoic acid (TIBA) sped up the flowering cycle of soy plants. Galston also found that TIBA in higher dosages was a powerful herbicide.

14. The best analysis of 1960s environmental activism is Rome, "Give Earth a Chance." Rome cites the centrality of a possible nuclear holocaust to the development of a globally oriented environmental platform.

15. Galston, interview.

16. Ibid.

17. See especially Cronon, "Uses of Environmental History"; and Richard White, "Are You an Environmentalist or Do You Work for a Living?': Work and Nature," in Cronon, *Uncommon Ground*, 171–85.

18. The conference proceedings are reprinted in Knoll and McFadden, *War Crimes*. Galston's quote appears on pp. 71–72.

19. Hersh expanded his original investigative series into book form the following year; see Hersh, *My Lai 4*. For a contemporary survey that rooted My Lai within a larger matrix of American war crimes, see Herman, *Atrocities in Vietnam*.

20. "Viet Cong" is the derogatory moniker apparently invented by the regime of President Ngo Dinh Diem, president of the Republic of Vietnam (1955–63). American soldiers quickly adopted the term, often shortening it to VC, "Victor Charlie," or simply "Charlie."

21. Quoted in Cookman, "American Atrocity," 160. The most comprehensive and best-researched work on My Lai to date is Belknap, *Vietnam War on Trial*.

22. Recent scholarship indicates that the gap in transatlantic attitudes toward the Vietnam War was even greater than scholars had previously thought. See Ricard, "Feature

Review." For a discussion of the sharpest bilateral break in transatlantic relations over Vietnam, see Logevall, "Swedish-American Conflict over Vietnam."

23. Limqueco and Weiss, *Prevent the Crime of Silence*. Russell's quote appears on pg. 57; Sartre's quote appears on pg. 63.

24. Lederer, "Report of the Sub-committee."

25. "Resolution: Reunion internationale des scientifiques sur la guerre chimique au Viet Nam," personal manuscript collection of Egbert W. Pfeiffer, Missoula, Mont. (hereafter EWP papers).

26. Ibid. Because the terms "biocide" and "ecocide" were newly minted and designed for political impact, antiwar activists thereafter came to use them interchangeably.

27. U.S. Army Foreign Science and Technology Center, "Extract from Foreign Broadcast Information Service Daily Report," folder 11, box 197, National Security file, John F. Kennedy Presidential Library (hereafter JFKL).

28. Colonel-General Van Tiên Dung, "A Statement of the National Liberation Front of South Vietnam," 1965, Vietnam files, American Friends Service Committee Central Archives (hereafter AFSC Central Archives), Philadelphia.

29. Brigham, *Guerrilla Diplomacy,* xi.

30. *American Use of War Gases*.

31. The Committee to Denounce the War Crimes of the U.S. Imperialists and Their Henchmen in South Vietnam published *The Biggest War Criminal of Our Time* in 1967. The section on chemical warfare was reissued in 1970 in expanded form under the title *The U.S. Imperialists' Plan and Methods regarding the Chemical Warfare in South Vietnam*, box 13, Arthur W. Galston Papers (hereafter AWG Papers), Yale University Library Manuscript and Archives. The reference to Galston appears in Juridical Sciences Institute, *U.S. War Crimes in Viet Nam*, 217.

32. The earliest account of Operation Ranch Hand located by the author is Bigart, "U.S. Spray Strips Foliage." It would take three more years and more intense news coverage before scientists became aware of the issue. The article that most likely caught Galston's attention was Raymond, "Weed Killers Aid War." The story ran after Secretary of State Dean Rusk, in an early attempt to stanch criticism of the herbicide program, made a statement (quoted in the article) assuring Americans of the harmlessness of military herbicides, which were vital to winning the "mean, dirty war" in South Vietnam.

33. Robert A. Divine, "Forward," in Herring, *America's Longest War*, vii.

34. Ehrlich and Holdren, "Starvation as a Policy," 91.

35. For an explication of the events leading up to the UN Convention, see Power, *Problem from Hell*, 47–60.

36. The major study on this topic is LeBlanc, *United States and the Genocide Convention*.

37. "ABA on Genocide."

38. Ibid.

39. The question of whether natural environments have certain legal rights that can be protected in courts ("standing," in legal parlance) is addressed in Stone, "Do Trees Have Standing?"

40. The first work to place ecocide within the larger framework of America's alleged genocidal policies in Vietnam was Weissberg, *Ecocide in Indochina.* The anthology opened with Jean-Paul Sartre's essay "On Genocide" reprinted from *Ramparts*. For an analysis on the impact of ecocide on the broader chemical warfare policy of the United States, see L. Johnston, "Ecocide and the Geneva Protocol."

41. Galston, interview. See also Galston, "Herbicides."

42. Falk, "United States Policy and the Vietnam War," 82.

43. Falk, "Environmental Warfare and Ecocide," 80. Mao Zedong's analogy first reached English-speaking audiences in *Mao Tse-tung on Guerilla Warfare*.

44. Falk, "Environmental Warfare and Ecocide," 84.

45. See also Falk, "Ecocide, Genocide."

46. For contemporary and politically diverse discussions of Nuremberg and Vietnam, see D'Amato, Gould, and Woods, "War Crimes and Vietnam"; Farer et al., "Vietnam and the Nuremberg Principles"; Ferencz, "War Crimes Law"; and T. Taylor et al., "War Crimes, Just and Unjust Wars."

47. Read, "Nuremberg Statement of the Vietnam Day Committee," box 40, DG series 58, Swarthmore College Peace Research Collection (hereafter SCPC). Students for a Democratic Society (SDS) adopted a Nuremberg-style defense that same year to justify its antiwar activities. For a Nuremberg defense within the military, see Roger Priest, "A Call to Resist Illegitimate Authority," 1–3, files G–P, SCPC Alternative GI Newspaper Collection.

48. The most comprehensive overview of the Vietnamese charge in English is "Genocide — Ethnocide — Ecocide," in *Viet Nam: Destruction/War Damage*, 9–19.

49. Quoted in Griswold, "Agent Orange Story." For a photographic essay of third-generation Vietnamese children born with a variety of physical and mental defects, see Griffiths, *Agent Orange*.

50. See, for example, "Defoliation in South Viet Nam"; and Committee of Concerned Asian Scholars, *Indochina Story*, 111–22.

51. On the environmental effects of war, see especially R. P. Tucker and Edmund, *Natural Enemy, Natural Ally*. On environmentally based wartime tactics, see Brady, "Wilderness of War"; McNeill, "Woods and Warfare."

52. See, for example, Chu Thao, "Resuscitation of the Dead Earth," 53–61, in Ly Qui Chung, *Between Two Fires*, 53–61; and "Vietnam: A Chemical Hiroshima."

53. Chomsky, *American Power*, 12.

54. See, for example, Dower, *War without Mercy*; Lauren, *Power and Prejudice*; and Hunt, *Ideology and U.S. Foreign Policy*, especially pp. 46–91.

55. ARVN commanders often initiated requests for spray operations and provided lo-

gistical support during the mission. See, for example, letter dated October 19, 1965, from Robson to Vien approving crop destruction and forest defoliation targets in Phuoc Thanh, box 10, Herbicide Operations Plans, Chemical Operations Division, RG 472, NARA. See also United States-Vietnam Joint Development Group, *The Postwar Development of the Republic of Vietnam*, box 10, Confidential files 1969–74, White House Central files, Nixon Presidential Materials Project (hereafter Nixon Project), NARA.

56. See Gibson, *Perfect War,* 13–21.

57. In May 1963, Senator Barry Goldwater suggested on a television news program that in Vietnam "defoliation of the forests by low-yield atomic weapons could well be done." Quoted in Barnes, "Barry Goldwater, GOP Hero, Dies."

58. Editors' introduction, in Fadiman and White, *Ecocide — and Thoughts toward Survival*, 9.

59. Regarding American Indian cultures, see Grinde and Johansen, *Ecocide of Native America*; and Churchill, *Struggle for the Land*. Regarding equatorial rainforest destruction, see McCuen, *Ecocide and Genocide*. Regarding corporate destruction of a Pacific island, see Gillespie, "Ecocide." Regarding the debt crisis in emerging nations, see George, "Financing Ecocide." Regarding species extinction, see Broswimmer, *Ecocide*. Regarding totalitarian economies in Eurasia, see Feshbach and Friendly, *Ecocide in the USSR*.

60. Eisendrath, *Military Ecocide*; and Cutter, "Ecocide in Babylonia."

61. Diamond, *Collapse*, iv.

62. Activists carrying signs with this message can be viewed in the documentary *The Great Global Warming Swindle*, available at http://tinyurl.com/26nba9t.

63. "X" [George Kennan], "Sources of Soviet Conduct." For an eye-opening analysis of Kennan's writing style, see Costigliola, "Unceasing Pressure For Penetration." A full treatment of Kennan's alienation from national-security politics is offered in Hixson, *George F. Kennan*.

64. "Introductory Remarks by the Hon. George F. Kennan," Newark, N.J., 29 February 1968, folder 6, box 265, George F. Kennan Papers (hereafter GFK Papers), Seeley Mudd Library, Princeton University, Princeton, N.J.

65. All quotes from George Kennan, "The United States, Its Problems, Impact and Image in the World," folder 13, box 266, GFK Papers. See also Kennan, "Rebels without a Program."

66. Jervis, "Was the Cold War a Security Dilemma?" 36.

67. Kennan, "To Prevent a World Wasteland," 401–2.

68. "Inaugural Address of John F. Kennedy," January 20, 1961, available from the Avalon Project of Yale University Law School at http://avalon.law.yale.edu/20th_century/kennedy.asp.

69. Bowie and Immerman, *Waging Peace.*

70. Ghamari-Tabrizi, *Worlds of Herman Kahn*, 20.

71. Kahn, *On Thermonuclear War*, 40–95.

72. Nuclear war and the very existence of nuclear weapons were vigorously protested across the globe during the cold war. The definitive history of this phenomenon is Wittner's three-volume study *The Struggle against the Bomb*. See especially vol. 2, *Resisting the Bomb*. For a brief rebuttal of Kahn's survival estimates, see Commoner, "Feasibility of Biological Recovery."

73. For the text and negotiating history of the test ban treaty, see "Treaty Banning Nuclear Weapons Tests, in the Atmosphere, in Outer Space and Under Water," available at http://www.state.gov/www/global/arms/treaties/ltbt1.html#2. For an analysis of the negotiating history behind the treaty, see Loeb, "Limited Test Ban Treaty."

74. Trachtenberg, *Constructed Peace*.

75. The prevalence of nuclear fears among Americans in the early cold war is examined in Boyer, *By the Bomb's Early Light*. For a discussion of Carson's impact on the environmental movement, see Gottlieb, *Forcing the Spring*, 81–114.

76. A useful contemporary catalog of environmental problems is Horowitz et al., *Eco-Catastrophe*.

77. McNeill, *Something New under the Sun*, 337. On the tensions between cold war authority and 1960s protest, see Suri, *Power and Protest*.

78. For an analysis of these tensions, see Isenberg, "Historicizing Natural Environments." The critique itself is best represented in William Cronon, "The Trouble with Wilderness; or, Getting Back to the Wrong Nature," in Cronon, *Uncommon Ground*, 69–90. See also Bailey, "Earth Day Then and Now."

79. "A Fable for Our Times."

80. Allman, "How to Kill the Earth." See also Schell, "Silent Vietnam."

CHAPTER THREE. Agent Orange before Vietnam

1. Darwin, *Power of Movement in Plants*, 547–48.

2. Botanists have long considered Darwin among their ranks and despair the politicized nature of his early work. See, for example, Robbins, "Expanding Concepts," 13.

3. On the early history of plant growth research, see Kirby, *Hormone Weedkillers*, 7–11; and Roberts and Hooley, *Plant Growth Regulators*, 4–7.

4. Went and Thimann, *Phytohormones*, 111.

5. The excitement created by the nascent field of synthetic hormones is detailed in Tukey, *Plant Regulators in Agriculture*. A more recent account is Busch and Lacy, *Science, Agriculture*.

6. Skoog and Thimann, "Further Experiments."

7. Researchers at the time were also exploring the benefits of arsenical compounds in controlling agricultural pests such as the boll weevil. See Dunlap, *DDT*, 31–35.

8. A. W. A. Brown, *Ecology of Pesticides*, 7.

9. Troyer, "In the Beginning," 290.