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Published in:
Centaurus

DOI:
10.1484/J.CNT.5.151968

2025

Document Version:
Publisher's PDF, also known as Version of record

CENTAURUS JOURNAL OF THE EUROPEAN SOCIETY FOR THE HISTORY OF SCIENCE

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Shared Battlegrounds

War at the Crossroads of Environmental History and the History of Science

▼ **ESHS CONTRIBUTION** Barcelona ESHS 2024 Early Career Lecture

▼ **ABSTRACT** In recent years, the environmental impact of warfare has made front-page news. Discussions about "ecocide"—a term first proposed in 1970 by Yale biologist Arthur W. Galston to describe the large-scale destruction of ecosystems during the Vietnam War—have come into the spotlight. The preparation and conduct of war, along with the social, economic, and scientific reorganisation that accompany it, offer rich topics for historians of science and technology interested in the environment. At the same time, since the turn of the 21st century, the study of war has emerged as a burgeoning subfield within environmental history. Edmund Russell's *War and Nature* (2001) inspired extensive scholarly research exploring the direct and indirect impact of military operations on the environment, as well as their legacies for human and non-human life. This review article focuses on how the development of the environmental history of war subfield has intersected with the history of science. First, it highlights how Russell's work has engaged audiences in both the history of science and the history of technology. In its early years, however, the field served as a bridge between environmental history and military history and delved into a classic theme of environmental history: conservation. Second, it discusses how studies on war and environment expanded beyond the battlefield to encompass

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Cite this article: Santiago Gorostiza, 'Shared Battlegrounds', *Centaurus*, 67.1 (2025), 205–234 <https://dx.doi.org/10.1484/J.CNT.5.151968>

DOI: 10.1484/J.CNT.5.151968

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militarised landscapes and the effects of military supply chains, among other topics. Third, it highlights how research on Cold War science provided a key site for intellectual exchange between environmental history of war and the history of science. Finally, it identifies several research avenues that could foster further collaboration between these fields, including: the concept of ecocide, the study of environmental infrastructure and envirotechnical objects, the epistemic foundations of military environmentalist discourses, and the significance of environmental data production and use in warfare.

▼ **KEYWORDS** Environmental History of War, War and Nature, Conservation, Cold War Science, Ecocide

▼ **ISSUE** Volume 67 (2025), issue 1

Introduction

Sirens blare in Kyiv in broad daylight; civilians huddle together in metro stations repurposed as bomb shelters; the energy grid is under attack. Clashes around the Golo Reservoir, in northwestern Sudan, put water infrastructure at risk, while thousands are displaced throughout the country amid its civil war. The "Iron Wall" between Gaza and Israel is pierced in multiple places, Gaza's urban landscape reduced to rubble, the sanitation network in collapse. These harrowing images underscore the enduring pattern of civilian suffering in war, from Sudan to Ukraine and Gaza. War transforms landscapes, disrupts ecosystems, and can leave a durable footprint on the environment. Due to these ongoing armed conflicts, scholarly attention to the environmental dimensions of war has been renewed, including research on the impact of war on freshwater resources and sanitation infrastructure, the use of environmental warfare, the monitoring of environmental impacts via satellite imagery, and the diverse impacts of armed conflict on biodiversity, among other topics.[1] In the cases of Ukraine and Gaza, the devastation of these territories has led some observers to invoke the term "ecocide," which was first coined in 1970 by Yale biologist Arthur W. Galston to describe the large-scale destruction of ecosystems during the Vietnam War.[2]

These themes resonate with environmental historians as well as with historians of science, technology, and medicine. Considering the growing scholarly and public attention to how war and the environment mutually shape each other, a critical review of historical research on this topic is timely. This article contributes to this discussion by examining the origins and development of the environmental history of war—a subfield that explores the interconnections between war, militarisation, and

1 Shumilova et al. (2025); Weir et al. (2024); Yin, Eklund, Habash, Qumsiyeh, & Van Den Hoek (2025); Molavi (2024).

2 Graham-Harrison (2022); Ahmed, Gayle, & Mousa (2024).

environmental change. Emerging around the turn of the 21st century, it has since evolved into a rapidly expanding area of historical inquiry.[3]

Research on war exemplifies the dynamic observed by Mark D. Hersey and Jeremy Vatter, who have noted that cross-pollination between environmental history and history of science tends to occur in subfields closely related to both disciplines. Echoing the title of Hersey and Vetter's review article ("Shared Grounds"), I argue that research on war and the environment has contributed to the cross-fertilisation between these disciplines, becoming one of the "shared battlegrounds" between them.[4] Rather than offering a systematic analysis of all scholarship on war between these fields, this article focuses specifically on tracing the emergence and evolution of the environmental history of war subfield and highlighting its entanglements with the history of science. In doing so, it pays particular attention to the period between 2000 and 2015.

The article is structured as follows. I begin by exploring the origins of the book widely regarded as foundational to the environmental history of war: *War and Nature: Fighting Humans and Insects with Chemicals from World War I to Silent Spring*, by Edmund Russell (2001).[5] *War and Nature* engaged with environmental history, history of science, history of technology, and history of medicine—and, in fact, Russell's research for this book received prizes from American associations representing several of these disciplines.[6] Next, I examine how early scholarship in the environmental history of war primarily focused on the direct and indirect environmental consequences of armed conflicts, with a strong inclination toward exchanges with military history and interest in nature conservation. However, the emergence of research on militarised landscapes expanded research beyond battlefields to include other military-related sites, as well as introducing critical perspectives on the so-called "military environmentalism."

Building on this shift, I turn to research on Cold War science, arguing that this extensive literature developed in dialogue with environmental history, marking a significant turning point for cross-fertilisation between these disciplines. While the intersection between history of science and environmental history is relevant across many wartime contexts, the case of the Cold War exemplifies how historiographical dialogue has been mutually enriching. The final section of the article explores current and emerging research avenues on war at the crossroads of environmental history and history of science. Finally, I synthesise key points of convergence between these disciplines, highlighting three ironies that have emerged from research on the environmental history of war and the Cold War history of science.

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3 For general reviews on the environmental history of war, see Tucker (2012); Brady (2019). On landscape militarisation, see Pearson (2012a). Hamblin (2013b) has focused on the environmental dimensions of World War II.

4 Hersey & Vetter (2019, p. 37).

5 Russell (2001); on Russell's book as the foundation of the field, see Brady (2019).

6 Hersey & Vetter (2019, p. 14) do not specifically address war in their review, but note that Russell's book appealed to scholars of both history of science and environmental history.

Origins of the Environmental History of War: The Focus on Conservation

Looking back into the 1990s, Emmanuel Kreike has pointed out that the First Gulf War, "with its blackened skies and soils, unexploded ordinance scattered across the landscape," marked a turning point for environmental historians in their approach to the study of armed conflict.[7] Before that, calls highlighting the potential of connecting the emerging field of environmental history with military studies had largely fallen on deaf ears.[8] Edmund Russell's research on chemical warfare represented a significant shift in this regard. Based on his 1993 PhD dissertation, Russell's first book, *War and Nature: Fighting Humans and Insects with Chemicals from World War I to Silent Spring*, was published in 2001.[9]

Russell's book focused on the US Chemical Warfare Service from 1918 to 1963, and argued that war and nature coevolved:

> the control of nature expanded the scale of war, and war expanded the scale on which people controlled nature. More specifically, the control of nature formed one root of total war, and total war helped expand the control of nature to the scale rued by modern environmentalists.[10]

Underscoring the pivotal roles played by public experts, chemists, and entomologists, Russell examined the connections between the military uses of chemicals and the production of pesticides like DDT for commercial pest control, showing how "science and technology of pest control sometimes became the science and technology of war, and vice versa."[11] Acknowledged as the first book that explored "the intersections of war and nature from an environmental history perspective," *War and Nature* has time and again been described as the foundational work in the environmental history of war.[12]

The range of journals where Russell published the research later included in *War and Nature*—from *American Entomologist* and *Technology and Culture* to *Environmental History Review*—along with the awards granted to his thesis, articles, and book, illustrate the relevance of his work across different research communities at the time. His thesis was awarded the Rachel Carson Prize for the best PhD dissertation in environmental history; his article on DDT experts and environmentalism during World War II, published in *Technology and Culture*, received the prize for the best article on the history of science, awarded by the Forum for the History of Science in America; and *War and Nature* received the Edelstein Prize for an outstanding book in the history of technology, awarded by the Society for the History of Technology.[13]

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7 Kreike (2021, pp. 4–5).
8 Cowdrey (1983).
9 Russell (1993; 2001).
10 Russell (2001, p. 2).
11 Russell (1996).
12 Brady (2005, p. 443); Brady (2019).
13 Russell (1993; 1999; 2001).

These awards can be seen as examples of what John McNeill described as the "porous borders" between environmental history and the history of science and technology, as well as with other disciplines, like the history of disease.[14]

A key reason why *War and Nature*'s discussion of DDT and disease is significant is that, until World War II, far more US military personnel died from infectious diseases than from enemy action.[15] Alongside vaccines and treatments, DDT and other insecticides played a crucial role in preventing malaria, typhus, and other insect-borne diseases among the military personnel deployed in the Pacific. This was effectively illustrated in one of the cartoons discussed by Russell, which depicted mosquitoes and Japanese soldiers "as two aspects of a common enemy," emphasising that the former caused eight times as many casualties as the latter.[16] In this regard, Russell's book effectively connected disease history—along with public health and medical history—to the environmental history of war.

These interdisciplinary connections, however, should not obscure a key point emphasised in both the opening and closing lines of *War and Nature*, which made the book relevant to nature conservation, one of the central concerns of environmental historians. Russell's starting point was the Rocky Mountain Arsenal near Denver, Colorado. Established in 1942 as a chemical weapons manufacturing centre, it was transformed into a National Wildlife Refuge in 1992, around the time Russell was completing his PhD. The arsenal had previously produced mustard gas and napalm, among other chemicals, and since the 1960s, the US Army had leased its facilities to private companies producing pesticides. As a result, part of the site had become highly toxic and was designated for Superfund cleanup in 1984. However, because it remained off-limits for decades due to security reasons, the Rocky Mountain Arsenal also became an attractive habitat for wildlife—similarly to other military zones where human access was restricted.[17] Nicknamed "the Nation's most ironic park," the Rocky Mountain Arsenal was discussed by environmental historian William Cronon in the volume *Uncommon Ground* (1995) as a landscape that blurred "the boundaries between 'natural' and 'unnatural.'"[18] In the conclusion of *War and Nature*, Russell drew attention to this and other military sites, such as the demilitarised zone between North and South Korea, leading him to conclude that war "helped as well as harmed the environment."[19]

The irony of a toxic military site becoming a nature preserve intrigued many environmental historians, who explored the topic further in the subsequent years. But it also raised concerns among others with a critical interest in history of science. While praising *War and Nature* for its integration of environmental history and the history of science and technology, Gregg Mitman criticised Russell's conclusion for reinforcing "boundaries between humans and nature that his book successfully undermines,"

14 McNeill (2003, pp. 10–11).
15 Cirillo (2008).
16 Russell (1996, p. 1524). For a critical assessment of the "heroic narratives" of DDT, see Clark & Brown (2022).
17 Russell (2001, pp. 1–2, 235).
18 Cronon (1995, pp. 27–28).
19 Russell (2001, p. 235).

a point also raised by Cornelia Lambert in her review for *The British Journal for the History of Science*. Additionally, Mitman noted that *War and Nature* did not really engage with "the growing body of scholarship on the history of Cold War science"—a topic to which I will return later.[20]

The Early Years of Environmental History of War: Direct and Indirect Environmental Impacts

In the early 2000s, John McNeill identified "the neglect of military dimensions of human affairs" as one of the unexplored frontiers of environmental history. Russell's book, he argued, only "took on a small slice of the subject."[21] In other geographical contexts, interest on the relation between war and the environment was beginning to emerge. In the same year *War and Nature* was published, Julia Adeney Thomas's book on the concepts of nature in Japanese political ideology discussed the "ultranational nature" of wartime Japan in one of its chapters.[22] Also in 2001, Judith Bennett began publishing research on the environmental transformations and legacies of World War II in the Pacific.[23] Additionally, around 1998, Edmund Russell and Richard Tucker started work on a collection of essays, but struggled to find authors. It was not until after they organised the first panels on war and the environment at the American Society for Environmental History's (ASEH) conference in 2002 that they were able to gather enough essays to publish an edited volume, entitled *Natural Enemy, Natural Ally: Toward an Environmental History of Warfare* (2004).[24]

McNeill had briefly addressed the relationship between war and the environment in his widely read global environmental history of the 20th century, *Something New Under the Sun*. In short, he argued that "much less was done in war than in the name of war," noting that the direct environmental impacts of combat—such as aerial bombings, destruction of dikes, and scorched-earth policies—were generally short-lived, as these areas were quickly covered by vegetation or restored through human labour. While he acknowledged exceptions like the Gulf War's oil spills or the use of chemical defoliants, he regarded the environmental scars of war as relatively ephemeral.[25] Rather, the most significant environmental changes, according to McNeill, stemmed from the "frantic drives to raise production of food, fuel, minerals and other resources" associated with industrial warfare, which led to global ecological disruption, as well as from changes in scientific practices and research questions, in the relationship between science and state, and in science and industrial production,

20 Palladino, Mitman, Jansen, & Russell (2003); Lambert (2002).
21 McNeill (2003, p. 17).
22 Thomas (2001, pp. 179–208).
23 J. A. Bennett (2001). Bennett's research culminated with one of the more complete environmental histories of war published in the 2000s, J. A. Bennett (2009).
24 Tucker & Russell (2004, p. vi); see also Palladino et al. (2003, p. 23).
25 McNeill (2000, pp. 344–347).

something that was addressed by historians of science and technology.[26] Conversely, McNeill also underlined that in some cases the socioeconomic transformations imposed by war "temporarily reduced some ordinary environmental pressures." Militarisation often implied human exclusion, which could contribute to the recovery of animal and plant life, as occurred in the Kuwaiti desert during the Gulf War; similarly, fish populations in the North Atlantic largely expanded during World War II when fishing fleets were inactive.[27]

Forest destruction during wars had interested McNeill since he wrote *The Mountains of the Mediterranean World* (1992).[28] In 2002, the same year that ASEH featured the first panels on environment and warfare, he chose "Woods and Warfare in World History" as the topic for the annual lecture of the Forest History Society.[29] Explicitly seeking to bridge the gap between forest history and military history, McNeill examined forests as a source of war materiel and as a factor in military tactics and strategy across 3,000 years of world history. He also explored the direct impacts of combats upon forests, highlighting their use as hiding places in guerrilla warfare, particularly in uprisings against colonial powers. In these cases, parties fighting against guerrillas attempted to destroy forests, starting in the Rif War by France, continuing in the Greek Civil War, and extending to the use of chemical defoliants in Malaysia and Vietnam. These combats, he argued, had more durable effects on the landscape than conventional warfare.[30]

Rather than focusing on how the military shaped the science and technology of forestry or exploring the role of forest engineers, McNeill highlighted how war could also contribute to forest conservation. Along these lines, he noted the unintended consequences of the forest preserves created by states to ensure their supplies: by keeping people out, they established "de facto nature reserves." This had similarities with the demilitarised zone between North and South Korea or the forests along the border between East and West Germany, where military restrictions to human access allowed wildlife to thrive. Similarly to border zones, he underlined how other spaces maintained by the military—from firing ranges to training grounds and bases—served as de facto nature preserves.[31] Therefore, as with Russell's introduction and conclusion to *War and Nature*, connections to conservation remained a central theme.

Between 2004 and 2009, the first anthologies published on the environmental history of war framed their intellectual endeavour explicitly as a bridge between new military history and environmental history, thus glossing over the explicit connection to history of science and technology that characterised Russell's *War and Nature*.[32] With a few exceptions, the contributions of these volumes did not engage with

26 McNeill (2000, p. 346); Dahan & Pestre (2004); Edwards (1996); Roland (1995).
27 McNeill (2000, pp. 344–347).
28 McNeill (1992, pp. 266–270).
29 McNeill (2004).
30 McNeill (1992, pp. 266–270); McNeill (2000, pp. 345–346); McNeill (2004, pp. 400–403).
31 McNeill (2004, pp. 404–405).
32 Closmann (2009, p. 3); Russell & Tucker (2004, p. 2).

the history of Cold War science nor did they give a central role to scientists and their institutional, intellectual, and material resources. Instead, as summarised below, a significant number of the chapters in these edited volumes and of the research articles published in *Environmental History* and *Environment and History* between 2003 and 2011 focused on the direct and indirect environmental consequences of warfare; the transformations that war imposed on the extraction and production of food, wood, and other resources; and the "ironic" impacts that armed conflict could have for conservation.

With chapters covering warfare in precolonial and colonial Southern Africa, war and environment in early modern India, and the two world wars, *Natural Enemy, Natural Ally* showcased the global scope of the field at a time when the field of history of science was also beginning to turn toward a global perspective.[33] Mark Fiege's chapter on the American Civil War highlighted how Sherman's key military campaign in 1864 employed a "scorched earth" strategy aimed at destroying food supplies, industry, and infrastructure to weaken the Confederacy.[34] This chapter was among the earliest environmental history publications focused on the American Civil War, a period that has since been explored in multiple monographs and edited volumes. Lisa M. Brady wrote her dissertation on the topic and examined how Sherman's targeting of Southern agricultural practices sought to weakening the Confederacy's ecological foundations.[35] She would go on to publish the first environmental history monograph on the conflict, *War Upon the Land* (2012), and served as editor of *Environmental History* between 2013 and 2019.[36]

The focus on the direct impacts of war on the physical landscape is evident in other publications from these years, such as Joseph Hupy's 2008 article on the environmental footprint of war, which characterised warfare as a form of anthropogenic disturbance capable of producing "widespread destruction over large areas in short periods of time." Hupy argued that World War II inflicted less damage on the landscape and soils compared to World War I, due to more mobile warfare tactics and fluid frontlines.[37] In contrast, the intense artillery firepower of World War I and the trench systems produced new ecologies that favoured lice and rats—"environments of death," as described by Dorothee Brantz, who explored, among other topics, soldiers' perceptions of trench warfare.[38]

33 See, for instance, Edgerton (2006a); Raj (2007).
34 Fiege (2004).
35 Brady (2005). On the origins of the environmental historiography on the American Civil War, see p. 424.
36 Brady (2009; 2012).
37 Hupy (2008, pp. 405, 414).
38 Brantz (2009).

Expanding Years: From "Ironic" Conservation to Military Environmentalism

During the first decade of the field, research was conducted on the "beneficial" impacts of war and militarisation on the environment, including case studies focusing on the Japanese and Finnish environments during World War II. William Tsutsui explored the implications of war for fishing, noting that the inactivity (and destruction) of the powerful Japanese fishing fleet allowed some species to regenerate in certain regions of the Western Pacific. Overall, in line with McNeill, Tsutsui emphasised that, whether beneficial or detrimental, the effects of warfare on the environment tended to be "less lasting and less significant than we might imagine."[39] Similarly, in the case of Finland, Simo Laakkonen argued that the expansion of urban agriculture, recycling, and use of local energy sources during the war contributed to a significantly smaller ecological "bootprint" compared to peacetime. However, Laakkonen also emphasised that these changes were temporary, as the postwar surge in resource and energy consumption quickly outweighed them; moreover, environmental policy discussions that had begun during the interwar period were postponed for decades.[40] Finally, Lisa Brady's article on the Korean Demilitarised Zone (DMZ), published in *Diplomatic History* (2008), used an environmental history perspective to explore the potential environmental and diplomatic outcomes of creating an international peace park within this militarised strip of land—an initiative first proposed by the entomology professor Ke Chung Kim in 1994.[41]

Critical perspectives on the alleged positive effects of militarisation on the environment also emerged in the environmental history literature, drawing from the work of geographers Rachel Woodward and David Havlick.[42] Woodward examined discourses of military environmentalism in Britain, arguing that they operated in the framework of the paradox between the destructive and toxic impacts of military activities and the wildlife sanctuaries that sometimes developed in military sites.[43] One key component she identified was the idea of the "crater-as-habitat," which depicted military infrastructure, debris, and shell craters from heavy artillery practice as creating conditions favourable to wildlife. For example, bunkers were portrayed as homes for "rare bats" and waterlogged areas from military activities were seen as suitable environments for insects. Woodward argued that these narratives served to naturalise the presence of the military in rural areas and provide it with environmentalist credentials.

In a similar vein, David Havlick (2007) explored the conversion of more than 20 US military bases into wildlife refuges between 1988 and 2007. He identified the emergence of a discourse of "ecological militarization that frames military practices as

39 Tsutsui (2003).
40 Laakkonen (2004).
41 Brady (2008); Kim (1997).
42 Woodward (2005); Havlick (2007).
43 Woodward (2001).

compatible with and contributing to environmental protection."[44] Havlick's primary case study was the Rocky Mountain Arsenal, which had attracted the interest of Cronon and Russell for its "ironic conservation." While acknowledging the ecological value of these converted sites, Havlick critically assessed the portrayal of military-to-wildlife conversions. He argued that, before embracing these conversions as desirable outcomes, "we should also work to understand as fully as we can how questions of authority, control, contamination and justice are being resolved in these places."[45]

Woodward's and Havlick's ideas on military environmentalism contributed to shaping the "Militarized Landscapes" project, a transnational comparative study with cases from Britain, France, and the US, coordinated by Peter Coates.[46] The concept of "militarised landscapes" shifted the focus of the environmental history of war field away from the battlefield to areas under military control during peacetime, such as training grounds and shooting ranges. Around the same time, researchers exploring the connections between Cold War military needs, patronage, and the emergence of environmental sciences were beginning to promote transnational approaches to the history of science.[47]

Overall, scholars working on the "Militarized Landscapes" project called for an end to binary approaches that dismissed military environmentalism as "greenwashing" or claimed that military activity had a positive effect on the environment.[48] Marianna Dudley's PhD research examined five different training grounds in England and Wales, paying attention to how military environmentalist discourses could erase both the social history of the landscape and the history of its military use—which, in some of the cases she examined, had involved the eviction of the local population.[49] But she also highlighted the "real environmental benefits at UK training areas," noting how scientists "were often the first to speak in favour (in environmental terms) of a military presence in the landscape." Dudley's work underlined the importance of conservationists and scientists who "like the army, experienced the landscape directly," and paid attention to their "painstaking studies," from recording fungi and shrimps to carrying out annual bird counts.[50] Overall, she defended the importance of "critical and sustained" studies of militarised landscapes, arguing that such research could enhance public understanding of these sites and push military and state authorities to implement necessary remedial measures.

In the afterword to the *Militarized Landscapes* edited volume from 2010, Edmund Russell drew parallels between nature preserves and military-controlled areas, which

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44 Havlick (2007).

45 Havlick (2007, p. 162).

46 Funded by the Arts and Humanities Research Council (AHRC) under its Landscape and Environment Programme.

47 See Turchetti, Herran, & Boudia (2012), the introduction to a special issue on transnational approaches to history of science, which was part of the European Research Council project "The Earth Under Surveillance."

48 Coates, Cole, Dudley, & Pearson (2011).

49 Dudley (2010). On the double erasure of military environmentalism, see Davis (2007, p. 131). Another key influence on Dudley's work is Patrick Wright's (1995) *The Village that Died for England: The Strange Story of Tyneham*.

50 Dudley (2012, pp. 8, 85).

aligned with earlier arguments by McNeill. However, he also recognised that researchers on state building might view the fascination of environmental historians with "ironic conservation" as a form of naiveté. After all, he argued, "both bases and preserves build and project state power over people, space and nature."[51] Russell also encouraged researchers to explore the effects of wartime supply chains, noting that these are not only enduring, but also become embedded in "military institutions, culture and technology" long after conflicts have ended.[52]

Along the lines pointed by Russell, several scholars examined the environmental dimensions of the supply chains for key commodities such as wood, aluminium, and rubber.[53] The disruption of the rubber supply during World War I exposed the United States' dependence on imports, setting in motion projects to develop a synthetic form of rubber, as studied by Mark Finlay.[54] Matthew Evenden examined how demand during World War II for aluminium—a critical material for aircraft construction—contributed to the Canadian federal government's centralisation of control over the hydroelectric uses of rivers by overriding previous political constraints.[55] Evenden's later research developed a commodity chain analysis focused on aluminium, tracing its extraction, production, and processing from mines to smelting facilities and factories. This transnational analysis highlighted the global reach and environmental consequences of the new commodity chains generated by World War II. Echoing Russell and Tucker's work, Evenden underlined how wartime reforms and projects created new demand and markets which imposed path dependencies that extended beyond the end of the war.[56]

Finally, Chris Pearson—also a member of "Militarized Landscapes" project—explored forests and battlefields as symbolic landscapes. During World War II in France, the Vichy regime incorporated forests into reactionary narratives about the French nation. However, as the French resistance expanded its activities, it not only sought refuge in the woods but also appropriated them symbolically.[57] This appropriation extended to the postwar years and materialised in the creation of memorials in mountains and forests.[58] In this regard, McNeill had already pointed out that war memorials at battlefield sites can be seen as exceptions to the quick natural recovery that follows the end of armed conflicts. Rather than leaving battlefields untouched, the creation of memorials involves their partial reconstruction, as well as constant maintenance, often requiring the work of architects and engineers. Both battlefields and memorials,

51 Russell (2010).
52 Russell (2010).
53 Bankoff (2009); Tucker (2004).
54 Finlay (2009).
55 Evenden (2009).
56 Evenden (2011; 2015).
57 Pearson (2006; 2008).
58 Pearson (2008).

such as military cemeteries, can mobilise nature in remembering war and contribute to the nationalisation of the landscapes where war was fought—a process Marco Armiero has also examined in relation to the Italian mountains.[59]

Integrating Cold War History of Science in the Environmental History of War

By the early 2010s, the historical relationship between war and environment had become "one of the most buoyant areas in environmental history."[60] This attention was mostly concentrated on the direct and indirect environmental consequences of war, leading researchers to examine not only battlefields but also military bases, training grounds, and shooting ranges in times of peace.[61] In exploring polluted or militarised spaces, much was made of the irony that the exclusion of humans often benefited wildlife, even if critical perspectives also emerged on how this paradox could be exploited in discourses of military environmentalism. However, one of Gregg Mitman's criticisms of the founding book of the field, Russell's *War and Nature,* was still valid: the engagement between environmental histories of war and the expanding scholarship on the history of Cold War science remained limited.

Research on militarised landscapes pointed in the same direction. Drawing on Donna Haraway's work, Chris Pearson urged researchers to view militarised landscapes as "contact zones" between actors: "places of contact, tension and negotiation between civilians and the military, soldiers and the environment, and between humans and non-humans," with diverse cultural and material layers. As such, these landscapes were also fruitful contact zones between disciplines. Key to the intersection of environmental history with the history of science, scientists and engineers were identified by Pearson as actors deserving greater investigation, and he pointed to the importance of military funding during World War II and the Cold War in influencing the direction of research and leading to the production of new forms of scientific knowledge and research practices.[62]

For years, historians of science had been exploring how the Cold War imposed limitations on research but also offered opportunities for it. In the 1990s, David DeVorkin analysed how German V-2 missiles were repurposed in the US as scientific tools for studying the upper atmosphere, as researchers aligned their scientific agendas with efforts to strengthen defence systems.[63] Paul Forman explored how the substantial influx of military funding directed toward physicists during the Cold War shifted their research direction, influencing both the knowledge they generated and

59 McNeill (2000, p. 345); Armiero (2010); Armiero (2011, pp. 87–108). See also Gorostiza, Pérez-Olivares, Oviedo-Silva, & Sánchez-Laforet (2025).
60 Pearson (2012a, p. 116).
61 McNeill (2010, p. 358).
62 Pearson (2012a, pp. 126–127). On contact zones, see Haraway (2008).
63 DeVorkin (1992).

the issues they explored.[64] Forman's work was a key inspiration for research on similar matters in the earth sciences. In 2003, the journal *Social Studies of Science* devoted an often-cited special issue to the earth sciences during the Cold War, with contributions on the environmental sciences, oceanographic research, and meteorology, among others. Their insights, as summarised by Michael A. Dennis in the afterword, illustrated how "the reconfiguration of the earth sciences involved a reconfiguration of the earth itself."[65]

In an influential article included in that issue, Ronald Doel investigated the effects of military funding on the earth sciences and argued that it not only shaped "the questions that researchers asked and valued," but also limited interactions with the biological environmental sciences.[66] In the same issue, Kristine Harper considered how the military funding of numerical weather prediction was directed toward weather control, while Naomi Oreskes unveiled how the research program that made possible the deep-sea submersible *Alvin*—used to discover sea-floor hydrothermal vents—was originally motivated by submarine warfare.[67] Overall, Doel emphasised how US security policies during the Cold War shaped the earth sciences, which "in turn helped to constitute the intellectual landscape of the modern environmental sciences."[68] According to Michael Dennis, the earth sciences "produced a new picture of the earth and its complexities" that started to reconfigure the understanding of the planet.[69]

These insights found their way into the expanding literature on the environmental history of war. In fact, Ronald Doel argued in 2009 that environmental history had developed in close association with the biological sciences and pointed out that the physical environmental sciences could offer new perspectives. By looking at the history of interest in polar warming, for instance—a topic unquestionably worthy of the attention of environmental historians—he observed that the story that emerged was "not centered on biology, nor is about the plundering of nature, nor about sustainable development," but rather one "in which military officials argue that understanding nature is essential to US national security." Doel, who referenced McNeill's observation about the neglected role of the military in environmental history, noted that the development of new weapons and communication systems after World War II "created the need for a better understanding of the environment, from the highest regions of the atmosphere to the depths of the sea." He asked environmental historians to broaden their research to include how environmental knowledge was produced within the earth sciences and to pay attention to military

64 Forman (1987). Leslie (1993) provides a more complex picture that emphasises how institutions like MIT or Stanford University contributed to constructing the "military-industrial-academic complex."
65 Dennis (2003, p. 811); Cloud (2003).
66 Doel (2003).
67 Harper (2003); Oreskes (2003).
68 Doel (2003, p. 657).
69 Dennis (2003, p. 817).

patronage.[70] In other words, he called for greater interest in the intersections between the history of Cold War science and environmental history.

This shift was already underway. In 2007, the German Historical Institute in Washington, DC, organised a conference on Environmental History and the Cold War that brought together nearly 30 scholars from various disciplines, including environmental historians, historians of science, and geographers, among others. Their discussions centred around topics like the role of science in environmental planning, the geopolitical implications of environmental issues, and the connections between the Cold War and the development of environmentalism. In the closing panel, alongside John McNeill and Joakim Radkau, Sabine Höhler pointed out that one of the tasks for environmental historians of this period was to explain how the concept of "environment" had been established in the Cold War years.[71]

Following the conference, the publication of *Environmental Histories of the Cold War* (2010), edited by John McNeill and Corinna Unger, marked a turning point in the intersection between environmental history of war and the history of Cold War science.[72] Five of the essays were devoted to science and planning, including chapters by Kristine Harper and Ronald Doel, Matthew Farish, and Jacob Darwin Hamblin. In the introduction, McNeill and Unger pointed to the development of the study of Cold War science studies since the 1990s, highlighting its expansion from physics and engineering to earth sciences and social sciences.[73]

Blurred Boundaries: From Environmental Warfare to Science and Environmental Diplomacy During the Cold War

The publication of *Environmental Histories of the Cold War* marked the beginning of a period of expansion and diversification in scholarship on war and environment, during which the boundaries between history of science and environmental history began to blur. The work of Jacob Darwin Hamblin, one of the participants in the volume, illustrates this convergence. His first monograph, *Oceanographers and the Cold War: Disciples of Marine Science*, examined the relationship between marine scientists and the US Navy in the context of the expansion of oceanography between the end of World War II and 1970. Hamblin analysed the convergence of interests between these actors, noting the US Navy's interest in improving its antisubmarine capabilities and in using international scientific cooperation to gather as much environmental data as possible.[74]

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70 Doel (2009). This perspective aligns with Edgerton's (2006b) interpretation of the "warfare state" in the British context, which underlines how the state invested in military research and shaped scientific agendas not only during armed conflicts but throughout the century. On later discussions on the role of patronage in Cold War science and technology, see Oreskes & Krige (2014).

71 Robertson (2007).

72 McNeill & Unger (2010a).

73 McNeill & Unger (2010b, p. 14). McNeill and Unger cited works by John Cloud (2001) and Jacob Darwin Hamblin (2005).

74 Hamblin (2002; 2005).

From his work on the history of Cold War oceanographic science, Hamblin's research evolved toward the study of environmental warfare during the Cold War—the topic of his chapter in *Environmental Histories of the Cold War*. In the monograph *Arming Mother Nature: The Birth of Catastrophic Environmentalism* (2013), he argued that US military planning for a potential Third World War relied on environmental warfare, with research on weather control, the manipulation of ocean currents, crop destruction, and the creation of earthquakes and tsunamis, among others.[75] The objective of "arming Mother Nature" against the US's enemies required further knowledge about the oceans, the atmosphere, and the lithosphere—topics of study shaped by military funding and aims. However, this new knowledge about how humans could impact the Earth also contributed to the emergence of ideas about catastrophic environmentalism. Hamblin's book, which was well received by environmental historians and historians of science, can be seen as a synthesis of research on the history of Cold War science and the influence of military priorities on oceanography, ecosystem ecology, and geology. But it also demonstrated the significant role of military technologies and research in shaping the history of environmentalism.

Hamblin's research also explored environmental diplomacy during the Cold War, particularly the environmental initiatives of the North Atlantic Treaty Organization (NATO). He noted that historians studying the environmental diplomacy efforts of US President Richard Nixon had not paid attention to his involvement in the creation of NATO's Committee on the Challenges of Modern Society in 1969. This Committee, established specifically to address environmental concerns, adopted issues like air or sea pollution as part of its agenda but primarily promoted East–West collaboration, in line with Nixon's policy of détente. However, it failed to gain support among NATO allies or establish any meaningful collaboration with the Soviet Union.[76]

In parallel to Hamblin's work, Simone Turchetti's research into NATO's scientific and environmental initiatives has revealed a fertile field for scholarship in both the history of science and environmental history: the connections between military surveillance and environmental monitoring. Writing in 2012, Simone Turchetti traced the development of NATO's Subcommittee on Oceanographic research, founded in 1959. He argued that NATO's naval command funded collaborative oceanographic research largely because environmental conditions affected the performance of surveillance equipment, which was key to tracking enemy submarines. Similar motivations justified funding disciplines like meteorology, for instance, to improve radar operation under adverse atmospheric conditions. Turchetti emphasised the need for further research into the motivations behind the military patronage of science, as well as into the transition from scientific initiatives to environmental analysis. Objects like buoys, he observed, though initially conceived as a tool to track enemy vessels, became part of environmental surveillance systems. In a later monograph,

75 Hamblin (2010a); Hamblin (2013a, p. ix).
76 Hamblin (2010b).

he expanded his work on NATO's scientific initiatives to cover its environmental programs.[77]

Other scholars who participated in the volume *Environmental Histories of the Cold War* also explored the intersections between science and environmental diplomacy during the Cold War, speaking both to history of science and environmental history. In the context of the relations between India and the United States, Harper and Doel examined how physical environmental sciences—especially oceanography and meteorology—were used as diplomatic tools. During the 1965–1966 drought in India, the Johnson administration collaborated with the Indian government to test weather manipulation techniques. The project involved targeting large, high-altitude clouds with silver iodide to induce rain. Although unsuccessful, this initiative provided the US a diplomatic tool to show support for the Indian government, and to the US military an opportunity to test this technology.[78]

David Zierler, focusing on the Vietnam War, explored the scientific opposition in the US to the use of herbicidal warfare and pointed to its diplomatic ramifications. He showed how US biologists and ecologists linked environmental devastation to human health concerns and played a role in mobilising international opposition to the use of Agent Orange. Zierler argued that the scientists' advocacy contributed to the US government's decision to abandon the use of herbicides and ratify the Geneva Protocol in 1975. More broadly, he noted that their efforts helped launch the concept of "ecocide" on the global stage; the term was coined in 1970 by Yale biologist Arthur W. Galston, who defined it as "the willful and permanent destruction of environment in which a people can live in a manner of their own choosing."[79] At the 1972 Stockholm UN Conference on the Human Environment, Swedish Prime Minister Olof Palme denounced the United States' ecocide in Vietnam. According to Zierler, the controversy regarding environmental warfare was foundational to the discussions that led to the adoption of the United Nations "Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques" (ENMOD) in 1977, which was signed by both the US and the USSR. Following his contribution to the *Environmental Histories of the Cold War*, Zierler expanded his research in the monograph *The Invention of Ecocide: Agent Orange, Vietnam, and the Scientists Who Changed the Way We Think about the Environment*.[80]

Finally, the emergence of studies on extreme environments and their militarisation during the Cold War also contributed to blurring the boundaries between history of science and environmental history. In the volume edited by J.R. McNeill and Corinna Unger, geographer Matthew Farish examined the role of US laboratories in simulating extreme environments (arctic, desert, and tropical) and testing their effects on soldiers during the Cold War.[81] Farish had also worked on the militarisation of Canadian environments and considered how military funding during the Cold War

77 Turchetti (2012; 2018); see also Turchetti & Roberts (2014).
78 Doel & Harper (2006); Harper & Doel (2010). See also Harper's (2018) monograph on weather control.
79 Quoted in Zierler (2011, p. 114).
80 Zierler (2010; 2011).
81 Farish (2010).

had shaped not only the physical environmental sciences, but also social sciences like geography.[82] He later investigated acclimatisation experiments conducted at the Arctic Aeromedical Laboratory in Alaska, in an article published in *Isis*.[83] Over the remainder of the 2010s, several edited volumes and studies further explored the histories of extreme climatic environments during the Cold War, focusing on science, technology, and natural resource management under conditions of militarisation.[84]

Research Avenues

Research on the history of Cold War science contributed to broadening the environmental histories of war, moving beyond the focus on direct and indirect impacts of warfare toward a more comprehensive understanding of the environmental dimensions of militarisation. This included the unexpected transformations brought by environmental warfare and expanded surveillance, as well as the rise of environmental diplomacy and the militarisation of extreme environments. At the same time, it entailed more attention directed toward scientists, engineers, their patrons, their forms of organisation, their material culture, and their transnational practices. I now briefly examine some research avenues in which both disciplines could mutually benefit from further collaboration.

Historicising Ecocide

More than 50 years after Arthur W. Galston coined the term "ecocide," the concept has returned to prominence. Since 2010, social and environmental movements have called for ecocide to be recognised as the fifth crime against peace, inspired by the activism of the late Scottish lawyer Polly Higgins (1968–2019).[85] However, beyond its origins in the Vietnam War, ecocide has received little attention within the fields of history of science or environmental history, aside from the contribution of David Zierler.[86]

From an institutional perspective, the codification of ecocide as a crime in countries such as Vietnam, Ukraine, or Russia contrasts with the unsuccessful efforts to include it in the Rome Statute of the International Criminal Court. Further research is needed to trace the development of the concept from the Vietnam War to the present. This includes examining how the notion of ecocide was mobilised by various actors during the 1980s and 1990s in response to disasters such as Chernobyl and the Exxon Valdez oil spill.

Following the trajectory of the scientists who opposed herbicidal warfare in the 1970s could help to historicise the development of ecocide as a concept. The case

82 Barnes & Farish (2006); Whitney Lackenbauer & Farish (2007).
83 Farish (2013).
84 Herzberg, Kehrt, & Torma (2019); Bocking & Heidt (2019).
85 Gauger, Rabatel-Fernel, Kulbicki, Short, & Higgins (2012); Higgins (2010).
86 Zierler (2011).

of Arthur H. Westing (1928–2010), who collaborated with Galston, offers valuable insights on the origins of research on the environmental consequences of war. After conducting fieldwork on the impact of herbicidal warfare in Vietnam, Westing travelled to Stockholm in 1972, where he participated in the alternative events and NGO forums held alongside the official UN Conference on the Human Environment. While in Stockholm, Westing briefed Swedish Prime Minister Olof Palme about ecological destruction in Vietnam.[87] A former US Marine who had served in the Korean War, Westing went on to become a renowned researcher on the environmental impacts of warfare, working first at the Stockholm International Peace Research Institute (SIPRI) and later at the Peace Research Institute Oslo (PRIO). His work is cited in foundational works on the environmental history of war, including those by Edmund Russell, Lisa Brady, and John McNeill.[88]

War, Environmental Infrastructure, and Envirotechnical Systems

Christophe Bonneuil and Jean-Baptiste Fressoz have argued that the strategic and tactical importance of environmental destruction deserves further attention beyond the case of Vietnam.[89] While the environmental history of war has expanded in the last decade—with edited collections on both World Wars highlighting their global environmental dimensions—there is still potential to broaden its geographical and chronological scope, including more research on earlier periods and non-Western contexts.[90]

In order to explore past "ecocidal practices," Emmanuel Kreike has proposed the hybrid concept of "environmental infrastructure," defined as the "homes and stables, fields, fences, soils … wells, dams, canals and sluices" produced and maintained both by human and non-human actors.[91] Kreike argued that destruction of, damage to, or denial of access to environmental infrastructure constitutes "environcide"—a term meant to capture the "simultaneous and interactive impact of war on environment and society." Drawing on examples from the 16th to the early 20th century across Europe, Asia, Africa, and the Americas, Kreike shows how military campaigns have historically targeted environmental infrastructure, rendering populations much more vulnerable to famine and epidemics. His conceptual framing, along with his expanded geographical and temporal scope, opens up new directions for environmental histories of war centred on environmental infrastructure.

This approach resonates with Sara Pritchard's concept of envirotechnical systems as hybrids of nature, culture, and technology, which has had significant influence

87 Zierler (2011, p. 166).

88 For a compilation of Westing's work, see Westing (2013).

89 Bonneuil & Fressoz (2016). While it considers the US military intervention only in its last chapter, David Biggs's (2010) *Quagmire* explores nation-building projects in the Mekong Delta since pre-colonial times, combining environmental history and history of science.

90 See, among others, Tucker, Keller, McNeill, & Schmid (2018); Laakkonen, Tucker, & Vuorisalo (2017). On the environmental history of war in Latin America, see Bonada Chavarría (2024).

91 Kreike (2021, p. 2). On environmental infrastructure, see also Kreike (2013).

on environmental history and history of technology.[92] Recent works, such as Kevin Passmore's study of the Maginot Line, demonstrate the potential of this framework in the analysis of fortification systems and combine it with a historical perspective on the science of organisation, the forerunner to modern management science.[93] Similarly, the study of wartime infrastructure—including bunkers, trench networks, and air-raid shelters, among others—could benefit from envirotechnical perspectives, especially in urban contexts, which remain comparatively understudied in environmental histories of war.[94] Together, the concepts of environmental infrastructure and envirotechnical systems offer valuable tools to examine the planning, execution, and impact of wartime assaults on critical infrastructures such as dams, dikes, and levees—a theme already explored in the environmental history of war.[95]

The Epistemic Foundations of Military Environmentalism

From the early interest of environmental historians in the "ironic conservation" on militarised lands, researchers have increasingly turned their attention to the production of knowledge about biodiversity in these spaces and its mobilisation for diplomatic uses. Lisa Brady's recent work on the Korean demilitarised zone as a "scientific landscape," in a special issue on "Biodiversity and the History of Scientific Environments," illustrates this shift.[96] Building on this, research at the crossroads of the history of science and environmental history could critically examine the epistemic foundations of military environmentalist discourses, as well as the processes by which former military sites are converted into environmentally protected spaces.[97]

Considering the defence ministry's role as a major landowner in many countries, environmental history perspectives could examine the military as a long-term actor in land management.[98] Such research could explore how scientific knowledge about the effects of warfare on biodiversity is produced and enrolled in discourses portraying the military as a steward of nature, and thereby justifying its continued presence in rural areas. At the same time, this work should also address the histories of displacement and the toxic legacies associated with military uses of land, as well as the mobilisation of environmental movements denouncing them. Similarly, environmental histories of postwar reconstruction could incorporate analysis of how scientific knowledge about the recovery of fauna and flora is produced and politicised.[99]

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92 Pritchard (2011); Pritchard & Zimring (2020).

93 Passmore (2024). On fortification systems and the nationalisation of nature, see also Gorostiza (2018).

94 On the urban environmental history of war, see Laakkonen et al. (2019). On the politics of air-raid shelters as underground infrastructure, see Valentines-Álvarez (2025).

95 For examples of studies addressing these themes, see Muscolino (2014, pp. 21–58) on the production of the 1938 Yellow River flood; Snowden (2006, pp. 186–197) on the destruction of the pumps and canals of the Pontine Marshes by the German Army; or Gorostiza, March, & Sauri (2015) on the water infrastructure during the siege of Madrid in 1936–1937.

96 Brady (2021).

97 See Havlick (2018).

98 On the UK and French defence estate, see Dudley (2012); Pearson (2012b).

99 Lachmund (2003); Vuorisalo & Kozlov (2019).

Environmental Information and War

When conceiving the first edited volume on the environmental history of war in the 2000s, Edmund Russell and Richard Tucker aimed to show that war was "a major and distinctive force in environmental change" and that environment was "a force in shaping warfare."[100] In order to prioritise new perspectives in the emerging field, when collecting the contributions for the book they decided to exclude studies on the impact of weather on military campaigns, because they considered that these perspectives were already well established among military historians.[101]

Beyond the influence of weather and other environmental factors on warfare, the production and control of environmental information—ranging from weather forecasts to sea states and river flows—and its use in military operations represents another path through which to explore the intersections between environmental history of war and the history of science. Jacob Darwin Hamblin, for example, has highlighted the importance of scientific collaboration between American and British scientists in the British Admiralty's Swell Forecasting Section, which contributed to the D-Day forecasts in Normandy in June 1944. This team was later transferred to the Pacific to help prevent disastrous landings that had previously ignored local tide conditions. In addition to showing the relevance of environmental data for military operations, this case illustrates how oceanographers experienced the value of international cooperation—something that would become vital in the postwar period.[102] The involvement of scientists and engineers in this kind of military operation and in targeting environmental infrastructure, as well as their postwar institutional trajectories, offers a fruitful path for examining how scientific practices are connected to environmental warfare.

Finally, the strategic role of satellites in the ongoing war in Ukraine, including the involvement of private actors like Starlink, underlines the importance of environmental data in modern armed conflicts. Moreover, as discussed in this review article, research on the history of science has shown how surveillance technologies also contributed to efforts on environmental monitoring.[103] In the context of war in Ukraine and Gaza, with limited access to the zones of conflict, satellite data has been used to evaluate war-induced damage to agricultural land and water infrastructure.[104] This type of study can be extended to historical cases such as the aftermath of the First Gulf War, when satellite data was used to assess environmental damage for the calculation of reparations, or the Vietnam War, for which declassified spy-satellite im-

100 Russell & Tucker (2004, p. 2).
101 Tucker & Russell (2004). See also Palladino et al. (2003, p. 23).
102 Hamblin (2005, pp. 42–43).
103 Turchetti & Roberts (2014).
104 Yin et al. (2025); Shumilova et al. (2025).

agery has been made available.[105] These case studies could help explore how political power has been embedded "within the production, analysis and instrumentalization of satellite imagery."[106]

Conclusion

When the volume *A Field on Fire: The Future of Environmental History* was published in 2019, Lisa Brady contributed a chapter focused on war and environment, titled "War from the Ground Up: Integrating Military and Environmental Histories." As illustrated by the title, the field of environmental history of war was portrayed as a scholarly endeavour bridging environmental history and military history, with no explicit connection to history of science.[107] Since the turn of the century, by studying war at a time when its environmental dimensions were increasingly in the spotlight, environmental historians have engaged with issues that, in the words of John McNeill, "other historians care about." Additionally, venturing into this territory allowed environmental historians to move beyond self-referential "green ghettos," as Marco Armiero expressed it.[108]

This review has argued that literature on the history of Cold War science has contributed to broadening the environmental history of war, moving toward a more comprehensive understanding of the environmental dimensions of militarism. Despite its foundational ties to the history of science and technology, literature on environmental history of war tended to focus on the direct and indirect environmental impacts of war during its first years. From these origins, the field of environmental history of war has expanded to encompass environmental diplomacy, strategic planning for environmental warfare during the Cold War, and the militarisation of extreme environments. These developments underscore the growing influence of the history of science on environmental history.

Throughout the present article, two ironies emerge as central to the development of the environmental history of war and the history of Cold War science. First, since the 1990s, Edmund Russell and others have noted the irony that spaces controlled by the military—a force for destruction—have become parks and wildlife preserves. This paradox, which continues to motivate research, has shaped the interests of the field of the environmental history of war. Second, in the early 2000s, Michael Dennis closed an often-cited special issue on earth sciences and the Cold War by pointing out "a profound irony" that sums up the relevance of the history of Cold War science for environmentalism:

105 On the First Gulf War, see Payne & Sand (2011, pp. 100, 135). On Vietnam, see Barthelme, Darbyshire, Spracklen, & Watmough (2024). For a review of the use of remote sensing to monitor the environmental degradation caused by war, see Kaplan, Rashid, Gasparovic, Pietrelli, & Ferrara (2022).

106 M. Bennett, Chen, Alvarez León, & Gleason (2022, p. 729).

107 Brady (2019).

108 Armiero (2016, p. 47); McNeill (2011).

> Going about the task of understanding how to destroy the enemy, the earth sciences produced a new picture of the earth and its complexities. Amidst the materiality of destruction came the possibility of reconfiguring our understanding of our own planet.[109]

A third and final irony concerns the disciplinary tensions between the fields. Edmund Russell, author of the foundational work on the environmental history of war and recipient of a prize from the Forum for the History of Science in America, has expressed criticism towards some historians of science. In 2019, he argued against "historians [who] say that scientific ideas have changed over time, so we have no way of knowing if today's scientific ideas are true, so we should not use science in our work." According to Russell, these voices have grown louder "as historians of science migrated into environmental history."[110]

However, as this review has argued, the influence of history of science has been essential for broadening the environmental history of war toward a more comprehensive and critical understanding of the environmental dimensions of militarisation. In doing so, it has reconnected to the origins of the field—and to Russell's early work—which are intimately linked to the history of science, technology and disease. In the words of John McNeill, environmental history continues to profit from its "porous borders" with other disciplines.[111] This fluidity can only help in strengthening studies of war and environment, which are poised to remain relevant in the years to come.

Acknowledgements

The author gratefully acknowledges support from the European Research Council (grant number H2020-ERC-StG101042252) and from the project "From Military to Civil Crime: An Environmental History of Ecocide" (grant number 2024-00611), funded by Formas, the Swedish Research Council for Sustainable Development.

The author thanks Gemma Cirac-Claveras, Marco Armiero, John McNeill, Jaume Valentines-Álvarez, and Ekaterina Chertkovskaya for their comments and constructive criticism on earlier versions of this article.

References

Ahmed, K., Gayle, D., & Mousa, A. (2024, March 29). "Ecocide in Gaza": Does scale of environmental destruction amount to a war crime? *The Guardian*. Retrieved from https://www.theguardian.com/environment/2024/mar/29/gaza-israel-palestinian-war-ecocide-environmental-destruction-pollution-rome-statute-war-crimes-aoe

109 Dennis (2003).
110 Russell (2019).
111 McNeill (2003).

Armiero, M. (2010). Nationalizing the mountains: Natural and political landscapes in World War I. In M. Armiero & M. Hall (Eds.), *Nature and history in modern Italy* (pp. 231–249). Athens, OH: Ohio University Press.

Armiero, M. (2011). *A rugged nation: Mountains and the making of modern Italy*. Cambridge, UK: White Horse Press.

Armiero, M. (2016). Environmental history between institutionalization and revolution. In S. Oppermann & S. Iovino (Eds.), *Environmental humanities: Voices from the Anthropocene* (pp. 45–59). London, UK: Rowman & Littlefield.

Bankoff, G. (2009). Wood for war: The legacy of human conflict on the forests of the Philippines. In C. E. Closmann (Ed.), *War and the environment: Military destruction in the modern age* (pp. 32–48). College Station, TX: Texas A&M University Press.

Barnes, T. J., & Farish, M. (2006). Between regions: Science, militarism, and American geography from World War to Cold War. *Annals of the Association of American Geographers, 96*(4), 807–826. https://doi.org/10.1111/j.1467-8306.2006.00516.x

Barthelme, P., Darbyshire, E., Spracklen, D. V., & Watmough, G. R. (2024). Detecting Vietnam War bomb craters in declassified historical KH-9 satellite imagery. *Science of Remote Sensing, 10*, 100143. https://doi.org/10.1016/j.srs.2024.100143

Bennett, J. A. (2001). War, emergency and the environment: Fiji, 1939–1946. *Environment and History, 7*(3), 255–287. https://doi.org/10.3197/096734001129342487

Bennett, J. A. (2009). *Natives and exotics: World War II and environment in the southern Pacific*. Honolulu, HI: University of Hawaii Press.

Bennett, M., Chen, J. K., Alvarez León, L. F., & Gleason, C. J. (2022). The politics of pixels: A review and agenda for critical remote sensing. *Progress in Human Geography, 46*(3), 729–752. https://doi.org/10.1177/03091325221074691

Biggs, D. A. (2010). *Quagmire: Nation-building and nature in the Mekong Delta*. Seattle, WA: University of Washington Press.

Bocking, S., & Heidt, D. (Eds.). (2019). *Cold science: Environmental knowledge in the North American Arctic during the Cold War*. London, UK: Routledge. https://doi.org/10.4324/9781315172736

Bonada Chavarría, A. (2024). Historia ambiental de la guerra, un campo emergente: Horizontes desde Latinoamérica. *Letras Históricas, 29*, 1–27. https://doi.org/10.31836/lh.29.7426

Bonneuil, C., & Fressoz, J.-B. (2016). *The shock of the Anthropocene: The earth, history and us*. London, UK: Verso Books.

Brady, L. M. (2005). The wilderness of war: Nature and strategy in the American Civil War. *Environmental History, 10*(3), 421–447. https://doi.org/10.1093/envhis/10.3.421

Brady, L. M. (2008). Life in the DMZ: Turning a diplomatic failure into an environmental success. *Diplomatic History, 32*(4), 585–611. https://doi.org/10.1111/j.1467-7709.2008.00714.x

Brady, L. M. (2009). Devouring the land: Sherman's 1864–1865 campaigns. In C. E. Closmann (Ed.), *War and the environment: Military destruction in the modern age* (pp. 49–67). College Station, TX: Texas A&M University Press.

Brady, L. M. (2012). *War upon the land: Military strategy and the transformation of southern landscapes during the American Civil War*. Athens, GA: University of Georgia Press.

Brady, L. M. (2019). War from the ground up: Integrating military and environmental histories. In M. D. Hersey & T. Steinberg (Eds.), *A field on fire: The future of environmental history* (pp. 250–262). Tuscaloosa, AL: University of Alabama Press.

Brady, L. M. (2021). From war zone to biosphere reserve: The Korean DMZ as a scientific landscape. *Notes and Records*, *75*(2), 189–205. https://doi.org/10.1098/rsnr.2020.0023

Brantz, D. (2009). Environments of death: Trench warfare on the Western Front, 1914–1918. In C. E. Closmann (Ed.), *War and the environment: Military destruction in the modern age* (pp. 68–91). College Station, TX: Texas A&M University Press.

Cirillo, V. J. (2008). Two faces of death: Fatalities from disease and combat in America's principal wars, 1775 to present. *Perspectives in Biology and Medicine*, *51*(1), 121–133.

Clarke, S., & Brown, R. J. E. (2022). Pyrethrum and the Second World War: Recontextualising DDT in the narrative of wartime insect control. *HoST: Journal of History of Science and Technology*, *16*(2), 89–112. https://doi.org/10.2478/host-2022-0017

Closmann, C. E. (2009). Introduction. In C. E. Closmann (Ed.), *War and the environment: Military destruction in the modern age* (pp. 1–9). College Station, TX: Texas A&M University Press.

Cloud, J. (2001). Imaging the world in a barrel: CORONA and the clandestine convergence of the earth sciences. *Social Studies of Science*, *31*(2), 231–251.

Cloud, J. (2003). Introduction: Special guest-edited issue on the earth sciences in the Cold War. *Social Studies of Science*, *33*(5), 629–633.

Coates, P., Cole, T., Dudley, M., & Pearson, C. (2011). Defending nation, defending nature? Militarized landscapes and military environmentalism in Britain, France, and the United States. *Environmental History*, *16*(3), 456–491.

Cowdrey, A. E. (1983). Environments of war. *Environmental Review*, *7*(2), 155–164. https://doi.org/10.2307/3984498

Cronon, W. (1995). Introduction: In search of nature. In W. Cronon (Ed.), *Uncommon ground* (pp. 23–56). New York, NY: W. W. Norton.

Dahan, A., & Pestre, D. (Eds.). (2004). *Les sciences pour la guerre*. Paris, France: Editions de l'Ecole des Hautes Etudes en Sciences Sociales.

Davis, J. S. (2007). Introduction. Military natures: Militarism and the environment. *GeoJournal*, *69*(3), 131–134. https://doi.org/10.1007/s10708-007-9109-5

Dennis, M. A. (2003). Earthly matters: On the Cold War and the earth sciences. *Social Studies of Science*, *33*(5), 809–819. https://doi.org/10.1177/0306312703335007

DeVorkin, D. H. (1992). *Science with a vengeance: How the military created the US space sciences after World War II*. New York, NY: Springer.

Doel, R. E. (2003). Constituting the postwar earth sciences: The military's influence on the environmental sciences in the USA after 1945. *Social Studies of Science*, *33*(5), 635–666. https://doi.org/10.1177/0306312703335002

Doel, R. E. (2009). Quelle place pour les sciences de l'environnement physique dans l'histoire environnementale? *Revue d'histoire moderne & contemporaine, 56*(4), 137–164. https://doi.org/10.3917/rhmc.564.0137

Doel, R. E., & Harper, K. C. (2006). Prometheus unleashed: Science as a diplomatic weapon in the Lyndon B. Johnson administration. *Osiris*, *21*(1), 66–85. https://doi.org/10.1086/507136

Dudley, M. (2010). A fairy (shrimp) tale of military environmentalism: The "greening" of Salisbury Plain. In C. Pearson, P. Coates, & T. Cole (Eds.), *Militarized landscapes: From Gettysburg to Salisbury Plain* (pp. 135–149). London, UK: Continuum.

Dudley, M. (2012). *An environmental history of the UK defence estate, 1945 to the present*. London, UK: Continuum.

Edgerton, D. (2006a). *The shock of the old: Technology and global history since 1900*. London, UK: Profile Books.

Edgerton, D. (2006b). *Warfare state: Britain, 1920–1970*. Cambridge, UK: Cambridge University Press.

Edwards, P. N. (1996). *The closed world: Computers and the politics of discourse in Cold War America*. Cambridge, MA: MIT Press.

Evenden, M. (2009). Mobilizing rivers: Hydro-electricity, the state, and World War II in Canada. *Annals of the Association of American Geographers, 99*(5), 845–855. https://doi.org/10.1080/00045600903245847

Evenden, M. (2011). Aluminum, commodity chains, and the environmental history of the Second World War. *Environmental History, 16*(1), 69–93.

Evenden, M. (2015). *Allied power: Mobilizing hydro-electricity during Canada's Second World War*. Toronto, ON: University of Toronto Press.

Farish, M. (2010). Creating Cold War climates: The laboratories of American globalism. In C. R. Unger & J. R. McNeill (Eds.), *Environmental histories of the Cold War* (pp. 51–84). Cambridge, UK: Cambridge University Press. https://doi.org/10.1017/CBO9780511730382.003

Farish, M. (2013). The lab and the land: Overcoming the Arctic in Cold War Alaska. *Isis, 104*(1), 1–29. https://doi.org/10.1086/669881

Fiege, M. (2004). Gettysburg and the organic nature of the American Civil War. In R. P. Tucker & E. Russell (Eds.), *Natural enemy, natural ally: Toward an environmental history of warfare* (pp. 93–109). Corvallis, OR: Oregon State University Press.

Finlay, M. R. (2009). *Growing American rubber: Strategic plants and the politics of national security*. New Brunswick, NJ: Rutgers University Press.

Forman, P. (1987). Behind quantum electronics: National security as basis for physical research in the United States, 1940–1960. *Historical Studies in the Physical and Biological Sciences, 18*(1), 149–229. https://doi.org/10.2307/27757599

Gauger, A., Rabatel-Fernel, M. P., Kulbicki, L., Short, D., & Higgins, P. (2012). *The Ecocide Project: "Ecocide is the missing 5th crime against peace."* London, UK: Human Rights Consortium.

Gorostiza, S. (2018). "There are the Pyrenees!" Fortifying the nation in Francoist Spain. *Environmental History, 23*(4), 797–823. https://doi.org/10.1093/envhis/emy051

Gorostiza, S., March, H., & Sauri, D. (2015). "Urban ecology under fire": Water supply in Madrid during the Spanish Civil War (1936–1939). *Antipode, 47*(2), 360–379. https://doi.org/10.1111/anti.12111

Gorostiza, S., Pérez-Olivares, A., Oviedo-Silva, D., & Sánchez-Laforet, J. M. (2025). The long shadow of the pines: Vegetation in the birth, destruction and reconstruction of Madrid's university city (1927–1956). *Environment and History*. https://doi.org/10.3828/whpeh.63861480327359

Graham-Harrison, E. (2022, August 27). Toxins in soil, blasted forests: Ukraine counts cost of Putin's "ecocide." *The Observer*. Retrieved from https://www.theguardian.com/world/2022/aug/27/destroyed-nature-ukrainians-race-to-gather-evidence-of-putins-ecocide

Hamblin, J. D. (2002). The navy's "sophisticated" pursuit of science: Undersea warfare, the limits of internationalism, and the utility of basic research, 1945–1956. *Isis*, *93*(1), 1–27. https://doi.org/10.1086/343244

Hamblin, J. D. (2005). *Oceanographers and the Cold War: Disciples of marine science*. Seattle, WA: University of Washington Press.

Hamblin, J. D. (2010a). A global contamination zone: Early Cold War planning for environmental warfare. In C. R. Unger & J. R. McNeill (Eds.), *Environmental histories of the Cold War* (pp. 85–114). Cambridge, UK: Cambridge University Press. https://doi.org/10.1017/CBO9780511730382.004

Hamblin, J. D. (2010b). Environmentalism for the Atlantic alliance: NATO's experiment with the "challenges of modern society." *Environmental History*, *15*(1), 54–75. https://doi.org/10.1093/envhis/emq008

Hamblin, J. D. (2013a). *Arming mother nature: The birth of catastrophic environmentalism*. Oxford, UK: Oxford University Press.

Hamblin, J. D. (2013b). Environmental dimensions of World War II. In T. W. Zeiler & D. M. DuBois (Eds.), *A companion to World War II* (pp. 698–716). Hoboken, NJ: John Wiley & Sons.

Haraway, D. J. (2008). *When species meet*. Minneapolis, MN: University of Minnesota Press.

Harper, K. C. (2003). Research from the boundary layer: Civilian leadership, military funding and the development of numerical weather prediction (1946–1955). *Social Studies of Science*, *33*(5), 667–696. https://doi.org/10.1177/0306312703335003

Harper, K. C. (2018). *Make it rain: State control of the atmosphere in twentieth-century America*. Chicago, IL: University of Chicago Press.

Harper, K. C., & Doel, R. E. (2010). Environmental diplomacy in the Cold War: Weather control, the United States, and India, 1966–1967. In C. R. Unger & J. R. McNeill (Eds.), *Environmental histories of the Cold War* (pp. 115–138). Cambridge, UK: Cambridge University Press. https://doi.org/10.1017/CBO9780511730382.005

Havlick, D. (2007). Logics of change for military-to-wildlife conversions in the United States. *GeoJournal*, *69*(3), 151–164. https://doi.org/10.1007/s10708-007-9086-8

Havlick, D. (2018). *Bombs away: Militarization, conservation, and ecological restoration*. Chicago, IL: University of Chicago Press.

Hersey, M. D., & Vetter, J. (2019). Shared ground: Between environmental history and the history of science. *History of Science*, *57*(4), 403–440. https://doi.org/10.1177/0073275319851013

Herzberg, J., Kehrt, C., & Torma, F. (Eds.). (2019). *Ice and snow in the Cold War: Histories of extreme climatic environments*. New York, NY: Berghahn Books.

Higgins, P. (2010). *Eradicating ecocide: Laws and governance to prevent the destruction of our planet*. London, UK: Shepheard-Walwyn.

Hupy, J. P. (2008). The environmental footprint of war. *Environment and History*, *14*(3), 405–421.

Kaplan, G., Rashid, T., Gasparovic, M., Pietrelli, A., & Ferrara, V. (2022). Monitoring war-generated environmental security using remote sensing: A review. *Land Degradation & Development*, *33*(10), 1513–1526. https://doi.org/10.1002/ldr.4249

Kim, K. C. (1997). Preserving biodiversity in Korea's demilitarized zone. *Science*, *278*(5336), 242–243. https://doi.org/10.1126/science.278.5336.242

Kreike, E. (2013). *Environmental infrastructure in African history: Examining the myth of natural resource management in Namibia*. Cambridge, UK: Cambridge University Press.

Kreike, E. (2021). *Scorched earth: Environmental warfare as a crime against humanity and nature*. Princeton, NJ: Princeton University Press.

Laakkonen, S. (2004). War—an ecological alternative to peace? Indirect impacts of World War II on the Finnish environment. In R. P. Tucker & E. Russell (Eds.), *Natural enemy, natural ally: Toward an environmental history of warfare* (pp. 175–194). Corvallis, OR: Oregon State University Press.

Laakkonen, S., McNeill, J. R., Tucker, R. P., & Vuorisalo, T. (2019). *The resilient city in World War II: Urban environmental histories*. Cham, Switzerland: Palgrave Macmillan.

Laakkonen, S., Tucker, R. P., & Vuorisalo, T. O. (Eds.). (2017). *The long shadows: A global environmental history of the Second World War.* Corvallis, OR: Oregon State University Press.

Lachmund, J. (2003). Exploring the city of rubble: Botanical fieldwork in bombed cities in Germany after World War II. *Osiris*, *18*, 234–254.

Lambert, C. (2002). [Review of the book *War and nature: Fighting humans and insects with chemicals from World War I to Silent Spring*, by Edmund Russell]. *The British Journal for the History of Science*, *35*(3), 347–379. https://doi.org/10.1017/S0007087402424788

Leslie, S. W. (1993). *The Cold War and American science: The military-industrial-academic complex at MIT and Stanford*. New York, NY: Columbia University Press.

McNeill, J. R. (1992). *The mountains of the Mediterranean World*. Cambridge, UK: Cambridge University Press.

McNeill, J. R. (2000). *Something new under the sun: An environmental history of the world in the 20th century*. New York, NY: W. W. Norton.

McNeill, J. R. (2003). Observations on the nature and culture of environmental history. *History and Theory*, *42*(4), 5–43. https://doi.org/10.1046/j.1468-2303.2003.00255.x

McNeill, J. R. (2004). Woods and warfare in world history. *Environmental History*, *9*(3), 388–410.

McNeill, J. R. (2010). The state of the field of environmental history. *Annual Review of Environment and Resources*, *35*, 345–374. https://doi.org/10.1146/annurev-environ-040609-105431

McNeill, J. R. (2011). Future research needs in environmental history: Regions, eras, and themes. *RCC Perspectives*, *2011*(3), 13–15.

McNeill, J. R., & Unger, C. (Eds.). (2010a). *Environmental histories of the Cold War.* Cambridge, UK: Cambridge University Press.

McNeill, J. R., & Unger, C. R. (2010b). Introduction: The big picture. In C. R. Unger & J. R. McNeill (Eds.), *Environmental histories of the Cold War* (pp. 1–18). Cambridge, UK Cambridge University Press. https://doi.org/10.1017/CBO9780511730382.001

Molavi, S. C. (2024). *Environmental warfare in Gaza: Colonial violence and new landscapes of resistance*. London, UK: Pluto Press.

Muscolino, M. S. (2014). *The ecology of war in China: Henan province, the Yellow River, and beyond, 1938–1950*. Cambridge, UK: Cambridge University Press.

Oreskes, N. (2003). A context of motivation: US Navy oceanographic research and the discovery of sea-floor hydrothermal vents. *Social Studies of Science*, *33*(5), 697–742. https://doi.org/10.1177/0306312703335004

Oreskes, N., & Krige, J. (Eds.). (2014). *Science and technology in the global Cold War*. Cambridge, MA: MIT Press.

Palladino, P., Mitman, G., Jansen, S., & Russell, E. (2003). Chemicals in the field. Edmund Russell, *War and nature: Fighting humans and insects with chemicals from World War I to Silent Spring. Metascience*, *12*(1), 3–23. https://doi.org/10.1023/A:1024423712787

Passmore, K. (2024). Organizing the terrain: The Maginot Line, 1919–1939. *Environmental History*, *29*(1). https://doi.org/10.1086/727788

Payne, C. R., & Sand, P. H. (2011). *Gulf War reparations and the UN Compensation Commission: Environmental liability*. Oxford, UK: Oxford University Press.

Pearson, C. (2006). "The age of wood": Fuel and fighting in French forests, 1940–1944. *Environmental History*, *11*(4), 775–803.

Pearson, C. (2008). *Scarred landscapes: War and nature in Vichy France*. New York, NY: Palgrave Macmillan.

Pearson, C. (2012a). Researching militarized landscapes: A literature review on war and the militarization of the environment. *Landscape Research*, *37*(1), 115–133. https://doi.org/10.1080/01426397.2011.570974

Pearson, C. (2012b). *Mobilizing nature: The environmental history of war and militarization in modern France*. Manchester, UK: Manchester University Press.

Pritchard, S. B. (2011). *Confluence*. Cambridge, MA: Harvard University Press.

Pritchard, S. B., & Zimring, C. A. (2020). *Technology and the environment in history*. Baltimore, MD: Johns Hopkins University Press.

Raj, K. (2007). *Relocating modern science: Circulation and the construction of knowledge in South Asia and Europe, 1650–1900*. New York, NY: Palgrave Macmillan.

Robertson, T. (2007, July). [Review of the conference "Environmental history and the Cold War," at the German Historical Institute, March 22–25, 2007]. *H-net Reviews in the Humanities & Social Sciences*. Retrieved from https://www.h-net.org/reviews/showrev.php?id=29103

Roland, A. (1995). Science, technology, and war. *Technology and Culture*, *36*(2), S83–S100. https://doi.org/10.2307/3106691

Russell, E. (1993). *War on insects: Warfare, insecticides, and environmental change in the United States, 1870–1945* (Doctoral dissertation, 2 Vols.). University of Michigan, Ann Arbor, MI.

Russell, E. (1996). "Speaking of annihilation": Mobilizing for war against human and insect enemies, 1914–1945. *Journal of American History*, *82*(4), 1505–1529. https://doi.org/10.2307/2945309

Russell, E. (1999). The strange career of DDT: Experts, federal capacity, and environmentalism in World War II. *Technology and Culture*, *40*(4), 770–796.

Russell, E. (2001). *War and nature: Fighting humans and insects with chemicals from World War I to Silent Spring*. Cambridge, UK: Cambridge University Press.

Russell, E. (2010). Afterword. In C. Pearson, P. Coates, & T. Cole (Eds.), *Militarized landscapes: From Gettysburg to Salisbury Plain* (pp. 229–237). London, UK: Continuum.

Russell, E. (2019). Low-hanging fruit: Science and environmental history. In M. D. Hersey & T. Steinberg (Eds.), *A field on fire: The future of environmental history* (pp. 227–236). Tuscaloosa, AL: University of Alabama Press.

Russell, E., & Tucker, R. (2004). Introduction. In R. P. Tucker & E. Russell (Eds.), *Natural enemy, natural ally: Toward an environmental history of warfare* (pp. 1–14). Corvallis, OR: Oregon State University Press.

Snowden, F. M. (2006). *The conquest of malaria: Italy, 1900–1962*. New Haven, CT: Yale University Press.

Shumilova, O., Sukhodolov, A., Osadcha, N., Oreshchenko, A., Constantinescu, G., Afanasyev, S., Koken, M., & Grossart, H.-P. (2025). Environmental effects of the Kakhovka Dam destruction by warfare in Ukraine. *Science*, *387*(6739), 1181–1186.

Thomas, J. A. (2001). *Reconfiguring modernity: Concepts of nature in Japanese political ideology*. Oakland, CA: University of California Press.

Tsutsui, W. M. (2003). Landscapes in the dark valley: Toward an environmental history of wartime Japan. *Environmental History*, *8*(2), 294–311. https://doi.org/10.2307/3985713

Tucker, R. P. (2004). The World Wars and the globalization of timber cutting. In R. P. Tucker & E. Russell (Eds.), *Natural enemy, natural ally: Toward an environmental history of warfare* (pp. 110–141). Corvallis, OR: Oregon State University Press.

Tucker, R. P. (2012). War and the environment. In J. R. McNeill & E. S. Mauldin (Eds.), *A companion to global environmental history* (pp. 319–339). Hoboken, NJ: John Wiley & Sons. https://doi.org/10.1002/9781118279519

Tucker, R. P., Keller, T., McNeill, J. R., & Schmid, M. (Eds.). (2018). *Environmental histories of the First World War.* Cambridge, UK: Cambridge University Press. https://doi.org/10.1017/9781108554237

Tucker, R. P., & Russell, E. (Eds.). (2004). *Natural enemy, natural ally: Toward an environmental history of warfare*. Corvallis, OR: Oregon State University Press.

Turchetti, S. (2012). Sword, shield and buoys: A history of the NATO Sub-Committee on Oceanographic Research, 1959–1973. *Centaurus*, *54*(3), 205–231. https://doi.org/10.1111/j.1600-0498.2012.00258.x

Turchetti, S. (2018). *Greening the alliance: The diplomacy of NATO's science and environmental initiatives*. Chicago, IL: University of Chicago Press. https://doi.org/10.7208/chicago/9780226595825.001.0001

Turchetti, S., Herran, N., & Boudia, S. (2012). Introduction: Have we ever been "transnational"? Towards a history of science across and beyond borders. *The British Journal for the History of Science*, *45*(3), 319–336. https://doi.org/10.1017/S0007087412000349

Turchetti, S., & Roberts, P. (2014). *The surveillance imperative: Geosciences during the Cold War and beyond*. New York, NY: Palgrave Macmillan. https://doi.org/10.1057/9781137438744

Valentines-Álvarez, J. (2025). A mirrored city underground: Air-raid shelters as political architectures in Barcelona and London, 1936–1940. *Technology and Culture*, *66*(2), 321–355.

Vuorisalo, T., & Kozlov, M. V. (2019). Where have all the pigeons gone. In S. Laakkonen, J. R. McNeill, R. P. Tucker, & T. Vuorisalo (Eds.), *The resilient city in World War II: Urban environmental histories* (pp. 177–200). Cham, Switzerland: Palgrave Macmillan. https://doi.org/10.1007/978-3-030-17439-2_9

Weir, D., Durant, S. M., Bühne, H. S., Hoffmann, M., Petrovych, O., Carvajal, B. S., & Fernandes Elizalde, S. (2024). Conservation policies must address an overlooked issue: How war affects the environment. *Nature*, *634*(8034), 538–541. https://doi.org/10.1038/d41586-024-03341-1

Westing, A. H. (2013). *Arthur H. Westing: Pioneer in the environmental impact of war*. Heidelberg, Germany: Springer.

Whitney Lackenbauer, P., & Farish, M. (2007). The Cold War on Canadian soil: Militarizing a northern environment. *Environmental History*, *12*(4), 920–950. https://doi.org/10.1093/envhis/12.4.920

Woodward, R. (2001). Khaki conservation: An examination of military environmentalist discourses in the British Army. *Journal of Rural Studies*, *17*(2), 201–217. https://doi.org/10.1016/S0743-0167(00)00049-8

Woodward, R. (2005). From military geography to militarism's geographies: Disciplinary engagements with the geographies of militarism and military activities. *Progress in Human Geography*, *29*(6), 718–740. https://doi.org/10.1191/0309132505ph5790a

Wright, P. (1995). *The village that died for England: The strange story of Tyneham*. London, UK: J. Cape.

Yin, H., Eklund, L., Habash, D., Qumsiyeh, M. B., & Van Den Hoek, J. (2025). Evaluating war-induced damage to agricultural land in the Gaza Strip since October 2023 using PlanetScope and SkySat imagery. *Science of Remote Sensing*, *11*, 100199. https://doi.org/10.1016/j.srs.2025.100199

Zierler, D. (2010). Against protocol: Ecocide, détente, and the question of chemical warfare in Vietnam, 1969–1975. In C. R. Unger & J. R. McNeill (Eds.), *Environmental histories of the Cold War* (pp. 227–256). Cambridge, UK: Cambridge University Press. https://doi.org/10.1017/CBO9780511730382.009

Zierler, D. (2011). *The invention of ecocide: Agent Orange, Vietnam, and the scientists who changed the way we think about the environment*. Athens, GA: University of Georgia Press.