

Mobilizing Nature for the First World War

An Introduction

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When future poet laureate of the United Kingdom John Edward Masefield called his 1917 account of the Somme Offensive *The Old Front Line*, he did so without irony. Thinking that the German army's withdrawal to its defensive position along the Hindenburg Line, some six miles away, marked a permanent British advance after the bloodiest battle on the Western Front, Masefield envisaged a landscape recovered from war:

All wars end; even this war will some day end, and the ruins will be rebuilt and the field full of death will grow food, and all this frontier of trouble will be forgotten. When the trenches are filled in, and the plough has gone over them, the ground will not long keep the look of war. One summer with its flowers will cover most of the ruin that man can make, and then these places, from which the driving back of the enemy began, will be hard indeed to trace, even with maps. . . . In a few years' time, when this war is a romance in memory, the soldier looking for his battlefield will find his marks gone. Centre Way, Peel Trench, Munster Alley, and these other paths to glory will be deep under the corn, and gleaners will sing at Dead Mule Corner.¹

His title misplaced hope – the spring 1918 German offensives pushed deep past the British lines – but much of what he wrote proved prophetic. Whether through human efforts or nature's work, these battlefields were largely and relatively quickly assimilated back into the countryside. The French government established agencies straightaway to restore the land to agrarian uses even before the fighting had stopped. With the desire for a familiar prewar environment most communes resumed traditional

¹ John Masefield, *The Old Front Line* (New York: MacMillan, 1917), 9.

farming practices after the armistice.² Soon dense vegetation and productive farmland covered large swaths of the Western Front. Veterans' groups touring their former posts did indeed find the blossoming terrain unrecognizable from their memories of blasted trenches. The land's swift revitalization surprised Corinna Haven Smith, an American humanitarian worker in France who visited the once war-torn regions in 1920. While driving on the Menin Road to Ypres, a track that war artist Paul Nash had memorialized with his surreal paintings of twisted landscapes, Smith remarked: "Is this the same plain? It does not seem possible. . . . Men are working in the fields. . . . Grass has grown over the shell holes and sheep and goats are grazing among abandoned tanks. . . . Only the trees have kept their record of suffering." The flourishing scenery led her to conclude that "[n]ature seem[s] always to make an effort to cover the scars of battle as soon as possible."³ So covered are some scars still today that authorities have designated those districts with high concentrations of buried, unexploded shells as "red zones," places too dangerous for cultivation, tourism, or human habitation. These restricted areas effectively serve as armed nature reserves. Weapons that once wrecked the land now guard it against development. Yet despite the drama of battle and the profusion of deadly relics, human relationships with the natural world have changed little along the former killing fields, just as Masfield predicted.

Ecological succession and eager farmers may have mostly obscured the old front lines in France and Belgium, but the war left lasting traces on the environment elsewhere around the world. Mobilizing natural resources for the production of destruction brought the war home to lands far from the fighting. The dominance of the Western Front in public exhibits, popular memory, and school textbooks notwithstanding, the First World War was a global conflict that touched a variety of biomes, from the Atlantic Ocean, to the Tyrolean Alps, the Carpathian Mountains, the Mesopotamian desert, the African savanna, the coasts of China's Shandong Peninsula, and the beaches of the Solomon Islands. The Allies, anchored by the Triple Entente of Great Britain, France, and Russia, and later joined by Italy and the United States, faced the Central Powers led by Germany, with Austria-Hungary, Bulgaria, and the

² Hugh Clout, *After the Ruins: Restoring the Countryside of Northern France after the Great War* (Exeter: University of Exeter Press, 1996), 241–272.

³ Corinna Haven Smith, *Rising above the Ruins in France: An Account of the Progress Made since the Armistice in the Devastated Regions in Re-Establishing Industrial Activities and Normal Life of the People* (New York: GP Putnam's Sons, 1920), 73–74, 141.

Ottoman Empire in tow. More than 30 countries eventually joined the conflict (most on the side of the Entente) in which some 65 million troops fought.

Combat varied. Major offensives involving masses of men and minuscule gains took place on the Western Front, where soldiers huddled in trenches that stretched from the English Channel to the Swiss border. Stalemate defined the war there with rare exceptions. Sweeping movement characterized the Eastern Front. Big German, Austro-Hungarian, and Russian armies ranged over hundreds of miles from the Baltic Sea down to the Black Sea, though despite stunning advances and tactical innovation neither side could achieve total victory. Winston Churchill later wrote, “[i]n the west, the armies were too big for the land; in the east, the land was too big for the armies.”⁴ First Lord of the Admiralty during the war, Churchill had championed the failed Dardanelles campaign and the doomed landings at Gallipoli. The Italian Front, known in some circles as the Alpine Front, witnessed war at high altitudes. Small patrols scrambled up the mountains, trying to capture the peaks and command the natural fortresses. German colonial troops engaged in guerilla warfare in East Africa, as did Arab forces fighting the Ottoman army in the Middle East.

Precise casualty figures for the war are impossible to know, but the consensus among historians is that between 8 to 9 million soldiers died and another 21 million were wounded. Considering starvation and violence on the home front, civilian deaths are even more difficult to calculate with numbers spanning from 7 to 10 million. Factor in the 1918 influenza pandemic and that range jumps to anywhere from 50 to 100 million. Whatever the gruesome arithmetic, the war ranks among the deadliest conflicts in human history. Eminent diplomat George Kennan famously called the war “the seminal catastrophe” of the twentieth century.⁵

While the war’s vast historiography centers on the “seminal catastrophe” for the main European belligerents, recent scholarship has

⁴ Winston Churchill, *The Unknown War: The Eastern Front* (New York: Scribner’s Sons, 1931), 76. Cited in Timothy Dowling, *Eastern Front*, https://encyclopedia.1914-1918-online.net/pdf/1914-1918-Online-eastern_front-2014-10-08.pdf (accessed July 24, 2017).

⁵ Among the best general histories of the war are Michael Neiberg, *Fight the Great War: A Global History* (Cambridge, MA: Harvard University Press, 2005); and Hew Strachan, *The First World War* (New York: Penguin, 2003). The most accessible English-language reference work on the war is *1914-18 Online. International Encyclopedia of the First World War* (<https://encyclopedia.1914-1918-online.net/home.html>) (accessed August 23, 2017), a website that offers hundreds of open-access scholarly articles and extensive bibliographies.

increasingly examined the conflict's peripheries in Africa, Asia, Latin America, and the Middle East.⁶ This "global turn" has widened the scope of the war to include non-European battlefields, home fronts, and experiences, and the lives of otherwise overlooked noncombatants. New studies still engage in old debates. Familiar questions about origins, continuities, and legacies loom large. What remains absent, however, is an environmental history of the war. General surveys and recent encyclopedias of the war say little about the natural world.⁷ They largely overlook the conflict's ecological disruptions and long-term environmental transformations. A growing number of environmental historians has taken an interest in war.⁸ But few have focused on the Great War.⁹

⁶ Examples include Mustafa Aksakal, *The Ottoman Road to War in 1914: The Ottoman Empire and the First World War* (New York: Cambridge University Press, 2010); Frederick Dickinson, *War and National Reinvention: Japan in the Great War, 1914–1919* (Cambridge, MA: Harvard University Press, 1999); Stefan Rinke, *Latin America and the First World War*, translated by Christopher Reid (New York: Cambridge University Press, 2017); Hew Strachan, *The First World War in Africa* (Oxford: Oxford University Press, 2004); and Guoqi Xu, *China and the Great War: China's Pursuit of a New National Identity and Internationalization* (New York: Cambridge University Press, 2005).

⁷ John Horne, ed., *A Companion to World War I* (West Sussex: Wiley-Blackwell, 2010); Gerhard Hirschfeld, ed., *Brill's Encyclopedia of the First World War* (Boston, MA: Brill, 2012); and Jay Winter, ed., *The Cambridge History of the First World War* (New York: Cambridge University Press, 2016).

⁸ For excellent introductions to studies on war and the environment, see Richard P. Tucker and Edmund Russell, eds., *Natural Enemy, Natural Ally: Toward an Environmental History of War* (Corvallis: Oregon State University Press, 2004); Charles E. Closmann, ed., *War and the Environment: Military Destruction in the Modern Age* (College Station: Texas A&M University Press, 2009); and Chris Pearson, Peter Coates, and Tim Cole, eds., *Militarized Landscapes: From Gettysburg to Salisbury Plain* (London: Continuum, 2010). See also Edmund Russell's pioneering book, *War and Nature: Fighting Humans and Insects with Chemicals from World War I to Silent Spring* (New York: Cambridge University Press, 2001).

⁹ Dorothee Brantz, *Environments of Death: Trench Warfare on the Western Front, 1914–1918*. In Charles E. Closmann, ed., *War and the Environment: Military Destruction in the Modern Age* (College Station: Texas A&M University Press, 2009), 68–91; and Joseph P. Hupy, *The Long-Term Effects of Explosive Munitions on the WWI Battlefield Surface of Verdun, France*. *Scottish Geographical Journal* 122(3) (2006), 167–184. See relevant chapters in Marco Armiero, *A Rugged Nation: Mountains and the Making of Modern Italy* (Cambridge: White Horse Press, 2011); Tait Keller, *Apostles of the Alps: Mountaineering and Nation-Building in Germany and Austria, 1860–1939* (Chapel Hill: University of North Carolina Press, 2016); and Chris Pearson, *Mobilizing Nature: The Environmental History of War and Militarization in Modern France* (Manchester: Manchester University Press, 2012). Three books in particular include some environmental angles in their analyses: Christoph Nübel, *Durchhalten und Überleben an der Westfront: Raum und Körper im Ersten Weltkrieg* (Paderborn: Ferdinand Schöningh, 2014); Avner Offer, *The First World War: An Agrarian Interpretation* (New York:

Rather than merely filling a hole in First World War historiography or recycling old tropes about the conflict, this collection offers a means to radically rethink the war's history and meaning. Together the essays expand the duration, complexity, geography, and legacy of the conflict. Since environmental transformations and global resource extraction relevant to the war began before the start of hostilities and continued after the armistice, the authors extend the traditional time frame of the conflict. Several of the essays show that within the broader context of industrialization during the modern era, the First World War continued and intensified trends from the nineteenth century, not upsetting or subverting them. From an environmental standpoint, war lands were not so different from industrial wastelands. Pollution from factories did as much to damage the natural world as the shells they produced. Along these lines, perhaps the trenches in France were not so very different from the miles upon miles of furrows across the American prairies. As with the industrial and agricultural aspects, the environmental dimension blurs the distinction between military zones and civilian sectors, resulting in the increased vulnerability of entire populations, especially impoverished and marginalized ones in Africa and the Middle East.

Recent works on the First World War have emphasized the conflict's imperial contours and colonial subjects, giving voice to subaltern and oppressed groups.¹⁰ A number of the authors in this collection show that such social and structural inequalities are inseparable from the war's ecological legacies. As a great industrial war, World War I marks a phase in the long transition from an agrarian era (based on biomass energy) to an industrial era (based increasingly on fossil fuels) that fundamentally defined geopolitics in the twentieth century. Industrial states became ever more efficient in managing raw materials and taking control of strategic resources in other parts of the globe. Major changes in the political map dictated in the peace

Oxford University Press, 1991); and William Storey, *The First World War: A Concise Global History* (Lanham, MD: Rowman and Littlefield, 2009).

¹⁰ See Sanstanu Das, ed., *Race, Empire and First World War Writing* (New York: Cambridge University Press, 2011); Richard Fogarty and Andrew Tait Jarboe, eds., *Empires in World War I: Shifting Frontiers and Imperial Dynamics in a Global Conflict* (London: I. B. Tauris, 2014); John Howard Morrow, *The Great War: An Imperial History* (New York: Routledge, 2005); Heather Streets-Salter, *World War One in Southeast Asia: Colonialism and Anticolonialism in an Era of Global Conflict* (New York: Cambridge University Press, 2017); and Timothy Winegard, *Indigenous People of the British Dominions and the First World War* (New York: Cambridge University Press, 2012).

treaties helped determine subsequent competition for access to critical commodities. The thread of colonialism and resource extraction runs through several of the essays and ties together the environmental histories of war and empires.¹¹ Mobilizing natural resources reinforced the asymmetrical power relationships between Europe and its dominions. The environmental legacies of the war and the dynamics of imperialism in the twentieth century are inextricably bound together.

Taking the natural world into consideration also adds a critical, heretofore missing, facet to “Total War” scholarship, and in doing so links the First World War to other armed conflicts that both military and environmental historians have studied, most notably the American Civil War and the Second World War. Historians have employed the term “Total War” to analyze the limits of mobilization and unrestricted warfare, albeit with little attention paid to the natural world.¹² Several recent books on the American Civil War, however, incorporate the environmental dimension as a central component of the Total War framework. Environmental historians have shown that the fundamental connections between fighting forces and the natural world were a crucial feature of that war. Each side depended on a system of extraction, production, and supply – a military ecology – to function and fight. The US Civil War was an ecological struggle between two societies as much as it was an economic one. Unlike Rebel soldiers, who had to rely on the land around them for sustenance, Union forces drew on resources from distant systems of

¹¹ For more on the environmental history of empires, see William Beinart and Lotte Hughes, *Environment and Empire* (New York: Oxford University Press, 2007); Alfred Crosby, *Ecological Imperialism: The Biological Expansion of Europe, 900–1900*, 2nd edn. (New York: Cambridge University Press, 2004); Diana Davis, *Resurrecting the Granary of Rome: Environmental History and French Colonial Expansion in North Africa* (Athens: Ohio University Press, 2007); Richard Grove, *Green Imperialism: Colonial Expansion, Tropical Island Edens and the Origins of Environmentalism, 1600–1860* (New York: Cambridge University Press, 1996); John McNeill, *Mosquito Empires: Ecology and War in the Greater Caribbean, 1620–1914* (New York: Cambridge University Press, 2010); and Corey Ross, *Ecology and Power in the Age of Empire: Europe and the Transformation of the Tropical World* (New York: Oxford University Press, 2017).

¹² The series of books edited by Roger Chickering and Stig Förster comprises the best scholarly works on the idea of Total War: *Great War, Total War: Combat and Mobilization on the Western Front* (New York: Cambridge University Press, 2000); and *A World at Total War: Global Conflict and the Politics of Destruction, 1937–1945* (New York: Cambridge University Press, 2010). See also Manfred Boemeke and Roger Chickering, eds., *Anticipating Total War: The German and American Experience, 1871–1914* (New York: Cambridge University Press, 2006).

mass production.¹³ That capacity to project power sustained troops across the globe during the Second World War. Analyzing the environmental history of the First World War illustrates just how much greater the scale of the Second World War was, particularly in Asia. Nevertheless, similar ecological needs shaped the contours of the conflict and the connections between armies and the natural world remained just as strong.¹⁴ Soldiers still required sustenance to fight and belligerent countries needed strategic resources, raw materials, and animals to pursue their military objectives. For the supreme commands in the 1940s, the First World War offered a cautionary tale of environmental constraints on global industrial warfare.

Food is one such example. All belligerents faced the dilemmas of feeding troops and civilians, along with countless draft animals conscripted for the war. As Alice Weinreb shows, by 1914, food had become a core commodity in a global network that linked continents and hemispheres in mutually dependent relationships. Most nations exported and imported vast quantities of foodstuffs, fodder, or fertilizer. Germans in 1913 imported about 25% of their food, including eggs, dairy products, vegetable oils, fish, and meat. Great Britain produced only 35% of the calories its citizens consumed. Imports supplied more than 40% of British

¹³ Mark Fiege, *Gettysburg and the Organic Nature of the American Civil War*. In Richard P. Tucker and Edmund Russell, eds., *Natural Enemy, Natural Ally: Toward an Environmental History of War* (Corvallis: Oregon State University Press), 93–109. For recent environmental history on the American Civil War, see Andrew McIlwaine Bell, *Mosquito Soldiers: Yellow Fever, Malaria, and the Course of the American Civil War* (Baton Rouge: Louisiana State University Press, 2010); Lisa Brady, *War upon the Land: Military Strategy and the Transformation of Southern Landscapes during the American Civil War* (Athens: University of Georgia Press, 2012); Brian Allen Drake, ed., *The Blue, the Gray, and the Green: Toward an Environmental History of the Civil War* (Athens: University of Georgia Press, 2015); Jim Downs, *Sick from Freedom: African-American Illness and Suffering during the Civil War and Reconstruction* (New York: Oxford University Press, 2012); Kathryn Shively Meier, *Nature's Civil War: Common Soldiers and the Environment in 1862 Virginia* (Chapel Hill: University of North Carolina Press, 2013); Megan Kate Nelson, *Ruin Nation: Destruction and the American Civil War* (Athens: University of Georgia Press, 2012); and Matthew M. Stith, *Extreme Civil War: Guerrilla Warfare, Environment, and Race on the Western Trans-Mississippi Frontier during the Civil War* (Baton Rouge: Louisiana State University Press, 2016).

¹⁴ For more on the environmental history of the Second World War, see Simo Laakkonen, Richard P. Tucker, and Timo Vuorisalo, eds., *The Long Shadows: An Environmental History of the Second World War* (Corvallis: Oregon State University Press, 2017); Micah Muscolino, *The Ecology of War in China: Henan Province, the Yellow River, and Beyond, 1938–1950* (New York: Cambridge University Press, 2016); and William M. Tsutsui, *Landscapes in the Dark Valley: Toward an Environmental History of Wartime Japan*. *Environmental History* 8(2) (2003), 294–311.

domestic meat consumption and 80% of that trade came from Argentina and Uruguay. The Russian Empire ranked as the largest producer and exporter of wheat, the mainstay carbohydrate for most Europeans. Much of the fodder consumed by European farm animals likewise came from Russia, Argentina, and the United States. Weinreb explains that this food system shaped the war, just as the war transformed the global food economy. Regulating civilian food distribution and consumption became as crucial to the war effort as training soldiers or munitions production.

Among the Central Powers, the outbreak of hostilities warped global food networks in ways that threatened people's basic level of existence. When the Ottomans declared war, they stopped Russian grain supplies from reaching Western Europe. The Entente, however, turned to the Americas to prevent starvation while blockading its enemies' food shipments. More vulnerable to the vicissitudes of agricultural markets and poor domestic harvests, the Central Powers eventually faced famine. Ernst Langthaler examines the plight of the Austro-Hungarian Empire as it tried to sustain its citizens and soldiers. Before 1914, the Dual Monarchy was largely self-sufficient in basic foodstuffs. But the war created a food crisis that further and fatally destabilized the Empire. Russian occupation of rich farmland, the decrease in labor and capital, and adverse climatic conditions crippled agricultural production. State-induced market controls that provided little motivation for farmers to maximize grain production and inefficient institutional frameworks between the Austrian and Hungarian authorities worsened the situation. Langthaler concludes that with its inability to adequately mobilize food, the Austro-Hungarian monarchy began to collapse long before its legal dissolution in 1918.

Belligerent states needed proteins as well as carbohydrates for their militaries, but mobilizing animals both as a food source and as muscle power presented a host of challenges. In 1914, armies still relied heavily on horses as transport and draft animals. So too did farmers. For government officials, requisitioning horses from the hinterland could be politically and economically damaging. Horses were not the only species that played a notable role in the conflict. Pigs provided meat to soldiers and civilians, as well as manure to farmers. In a move of exceptional bureaucratic blundering, German officials, however, worried about hogs competing with humans for grain, slaughtered more than 9 million animals in the great "pig massacre" of 1915. Germans enjoyed a momentary bounty of pork, but grain shortages continued, now exacerbated by the massive

reduction of fertilizer producers.¹⁵ Mules, camels, and dogs, among others, also contributed to the war effort, yet little scholarly research exists on animals in the war.¹⁶ Touched on only tangentially in this collection, the emerging field of animal studies offers exciting new avenues to analyze the mobilization of natural resources and how the war affected species besides humans.

Wartime mobilization demands drove rapid transformations in the arms manufacturing sector, as well as in mining, oil drilling, fishing, and logging. Gerard Fitzgerald analyzes the bonds among government, industry, and academe in the United States that helped to produce chemical weapons. He defines the Edgewood Arsenal facility as a militarized industrial workspace, where the manufacture of mustard gas poisoned workers in factories as it did soldiers in the fields. Environmental and public health issues, however, were largely neglected in light of the wartime national emergency. Roy MacLeod sheds light on the omnipresent but largely overlooked war over minerals as a neglected branch of environmental history. The war created new scientific and industrial organizations whose use of natural products created the tortured landscapes of Europe while transforming relationships between the civilian and military jurisdictions back home. MacLeod shows that most munitions depended upon minerals. Of the 80 known chemical elements in 1914, 30 were required in modern warfare. In many cases, the absence of small quantities of key elements could render factories useless and all but guarantee defeat. After the war, the uneven geographical distribution of key minerals played a central role in political settlements. MacLeod concludes that the conflict gave rise to a new global politics of strategic minerals, as well as a new discipline of mineral economics, and brought new forms of expertise to the care and conservation of valuable resources.

¹⁵ Roger Chickering, *Imperial Germany and the Great War, 1914–1918*, 3rd edn. (New York: Cambridge University Press, 2014), 42–43. For more on the economic role that pigs have played, see Sam White, *From Globalized Pig Breeds to Capitalist Pigs: A Study in Animal Cultures and Evolutionary History*. *Environmental History* 16(1) (2011), 94–120.

¹⁶ Several popular publications tell stories of horses and dogs in times of war. For an excellent scholarly analysis of the transatlantic horse trade, see Gene Tempest, *The Long Face of War: Horses and the Nature of Warfare in the French and British Armies on the Western Front* (PhD dissertation, Yale University, 2013). See also Alexander Morrison, *Camels and Colonial Armies: The Logistics of Warfare in Central Asia in the Early 19th Century*. *Journal of Economic and Social History of the Orient* 57 (2014), 443–485; and Andrekos Varnava, *The Vagaries and Value of the Army Transport Mule in the British Army during the First World War*. *Historical Research* 90 (2017), 423–446.

Perhaps no other natural resource became more valuable than oil. At first, in 1914, coal was the principal source of industrial energy. The progression of the war, however, accentuated the importance of petroleum. Dan Tamir argues that the First World War was a decisive moment in the appearance of petroleum in the global arena. Oil became indispensable. It propelled military innovation – tanks, airplanes, and submarines – and provided basic ingredients for TNT. In terms of quantity, oil did not play a central role in the war. But qualitatively it fueled the internal combustion engine that replaced the horse, freed more men from their work in the coal mines and the boiler rooms of ships, and enabled rapid movements for extended periods of time on land and at sea. Petroleum's emergence as the principal power source during the war provided the Entente with an energy advantage. Germany was a leading coal producer, but eventually its shortage of oil nearly immobilized both military machines and farming equipment. The Ottomans lacked the infrastructure to tap into their crude holdings. Russia had been extracting oil around the Caspian Sea for decades, but its rail system proved insufficient and the distances too vast to meet its allies' demands.¹⁷ Instead, Mexico and the United States supplied more than 80% of the world's petroleum and played a crucial role in the conflict's outcome. Some ten days after the armistice, the British government hosted a dinner with the Inter-Allied Petroleum Conference. The former viceroy of India, Persia expert for the Foreign Office, and chairman of the dinner Lord Curzon famously declared, "The Allied cause had floated to victory upon a wave of oil." The director of France's Comité Général du Pétrole, Senator Bérenger, was even more adamant, albeit overly optimistic: "Oil – the blood of the earth was the blood of victory. . . . Germany had boasted too much of its superiority in iron and coal, but it had not taken sufficient account of our superiority in oil. . . . As oil had been the blood of war, so it would be the blood of the peace."¹⁸

Oil provided the means to modernize civilian fleets as well as military forces. Ingo Heidbrink offers a new perspective on the maritime environmental history of the North Sea. Previous accounts frame the First World War as beneficial to fish stocks since naval warfare and the conscription of

¹⁷ For the specific problems of oil supply in Austria but also of other Central Powers, refer to Alison F. Frank, *Oil Empire: Visions of Prosperity in Austrian Galicia* (Cambridge, MA: Harvard University Press, 2005), 173–204.

¹⁸ Cited in Daniel Yergin, *The Prize: The Epic Quest for Oil, Money, and Power* (New York: Free Press, 2008), 167.

steam trawlers reduced overfishing. Heidbrink challenges these histories with a longer view of North Sea fishing. Although fishing came to a near halt in autumn 1914, developments after 1918 led to massive overfishing. Fishing companies lost large numbers of their fleets with the outbreak of hostilities, but after the armistice they could purchase heavily discounted high-end ships from the navy and convert them into trawlers. With better technology the average catch per trawler exceeded prewar levels. Improved fishing fleets increased the total catch capacity, threatening fish stock levels in the North Sea.

Trees also faced overharvesting. Armies relied on lumber in countless ways. Timber beams kept trenches from collapsing. Wood planks saved soldiers from wallowing or drowning in mud. Trees provided the basic building material for wharves where soldiers disembarked, warehouses for munitions, barracks, railroad ties, telephone poles, and key airplane parts. Pit timber for coal mines, fuel wood, and pulp for paper supplies also aided the combatants' war efforts. As a result, deforestation accelerated among the belligerents, but in an uneven fashion. Ottoman forces leveled cedar forests in Lebanon. The British cut down nearly half of their productive forests, more than 450,000 acres, during the war. Desperate requests from London, along with major capital investment, expanded logging operations in western Canada, despite German submarines. The Panama Canal, opened in 1914, lowered import costs from Pacific ports. Soon British Columbia became Canada's leading timber exporter.¹⁹ German and French timber stands fared better. German forces chopped down trees in occupied territories, exacting 5 million cubic meters of wood from Lithuania, nearly 5% of the Białowieża Forest. Most of France's forests lay well behind the front lines. With manpower diverted to the army, logging rates in those forested zones soon fell below prewar levels. Only after the arrival of American forestry divisions, the Tenth Engineering and the Twentieth Engineering Corps, did the forests in western France sustain heavy cutting. In the United States, American logging companies responded to rising lumber prices by expanding mechanized clear cutting operations. Lumber

¹⁹ A. Joshua West, *Forests and National Security: British and American Forestry Policy in the Wake of World War I*. *Environmental History* 8 (2003), 270–293; and Richard P. Tucker, *The World Wars and the Globalization of Timber Cutting*. In Richard P. Tucker and Edmund Russell, eds., *Natural Enemy, Natural Ally: Toward an Environmental History of War* (Corvallis: Oregon State University Press, 2004), 110–141. For a broader discussion of forestry and warfare, see Andrée Corvol and Jean-Paul Amat, eds., *Forêt et guerre* (Paris: L'Harmattan, 1994); see also John McNeill, *Woods and Warfare in World History*. *Environmental History* 9(3) (2004), 388–410.

companies cared little for investing in reforestation programs or practicing selective cutting. But army generals saw similarities between the barren lands on the Western Front and the worst cutover areas back home and called for better forest management. Knowing that lumber held economic value, but realizing also that trees were critical to national security, several governments initiated conservation schemes to sustain timber stands.

Such geostrategic thinking and the desire to command more natural resources played into Japan's imperial expansion during the First World War. Jack Hayes examines the environmental footprint of military actions, as well as political and economic trends in East Asia, with a focus on the Japanese empire. Broadly speaking, the conflict sparked mostly indirect transformations of East Asia's physical environment and ecosystems as combat only reached a few limited locations and the European colonial powers could not exploit the region due to the vast distances involved. But as Hayes explains, the war afforded a strategic opening in East Asia for the Japanese. Expansion along the Asia Pacific rim entailed extracting the region's raw materials at new levels, along with lengthened reach of corporate and government-business systems. The war's environmental legacy in East Asia evolved into a political ecology of targeted and invasive natural resource exploitation in Japan's imperial ascent.

Imperial networks turned the War in the Middle East and Africa into cataclysm. Graham Pitts and Zachary Foster discuss famine in the Levant. Pitts explores the international dimension of the catastrophe. The war made the famine and created a landscape of enormous violence in Lebanon, which suffered more deaths per capita than any belligerent nation. Where food was contraband, starvation resulted as an "externality" of the war. Locusts did not help. They devoured ten to fifteen percent of the wheat and barley fields and eighty percent of fruits and vegetables. Incorporation into the global capitalist market in the nineteenth century had offered protections against famine, but Foster finds that the undoing of those safety nets during the war helps explain the magnitude of starvation. Dependence on the global system became a liability when the locusts hit. Steven Serels highlights how the war further destabilized food systems of the African Red Sea coasts. Structural weaknesses in the global food market left those populations vulnerable. On account of poor harvests and a currency crisis, many African communities struggled to purchase sufficient sustenance. His contribution also emphasizes that environmental and economic troubles continued after the armistice. Droughts and inflation crippled recovery in the region even when the guns fell silent. In sub-Saharan Africa, imperial exploitation transformed landscape cover, upset disease ecologies, and changed the colonial powers'

perceptions of Africa's importance as a resource supplier. Thaddeus Sunseri emphasizes how population disruptions and livestock loss had significant repercussions on the environment. All colonial territories were expected to provide military labor, and forced recruitment upset local economies severely with long-term consequences for the spread of disease. Guerrilla war prevented animal controls, such as quarantine, culling infected cattle, and the strategic application of vaccines that had kept diseases in check. Rinderpest, along with tick and tsetse vectors of other diseases, now spread rapidly along military routes. Humans also suffered a panoply of disease, including bubonic plague, dysentery, sleeping sickness, smallpox, and malaria. Sunseri concludes that the war continued the overall African population decline that had begun in the 1880s.

The 1918 influenza pandemic had the greatest impact on population decline in Africa and around the world. The war environment spread ancient diseases; it also created conditions for the spread of more virulent ones. The movement of millions created the perfect conduit for the influenza H1N1 virus. Although long overlooked by historians of the First World War, the pandemic of 1918–1919 and the war are inseparable. Even so, influenza's appearance and mutation in 1918 were seemingly coincidental. Virologists cannot prove that wartime conditions produced the causative virus. Neither can scientists show that the war turned a rather mild H1N1 virus into a pathogen of unprecedented lethality.²⁰ However, densely packed humans – in trenches, barracks, transport ships, troop depots, factories, mine shafts, and the like – did serve as ideal transporters for the virus, accelerating its spread. The war turned a local outbreak into a global pandemic. Evidence also suggests that influenza's infectiousness worsened the German army's already depleted state and contributed to its offensive failures in 1918. The pandemic was certainly a cataclysmic event but as a breath-borne disease the virus was only marginally environmental and thus not included in this collection.²¹

²⁰ For the latest debates on the pandemic's origins, see Mark Humphries, Paths of Infection: The First World War and the Origins of the 1918 Influenza Pandemic. *War in History* 21 (1) (2014), 55–81; Ann H. Reid and Jeffery K. Taubenberger, The Origin of the 1918 Pandemic Influenza Virus: A Continuing Enigma. *Journal of General Virology* 84 (2003), 2285–2292; Dennis G. Shanks, No Evidence of 1918 Influenza Pandemic Origin in Chinese Laborers/Soldiers in France. *Journal of Chinese Medical Association* 79 (2016), 46–48; and Viroj Wiwanitkit, 1918 Influenza Pandemic Origin in Chinese Laborers/Soldiers: Medical Historical Analysis. *Journal of Chinese Medical Association* 79 (2016), 116.

²¹ See David Killingray and Howard Phillips, eds., *The Spanish Influenza Pandemic of 1918–1919: New Perspectives* (New York: Routledge, 2013); Carol Byerly, *The Fever*

The high rates of death and destruction from industrial warfare on a global scale taught military planners that carefully managing natural resources was crucial; so too was safeguarding them from overexploitation. Civic nature protection groups arose in many industrializing countries during the late nineteenth century. Largely bourgeois and elite in social composition, these associations struggled, often vainly, to reduce industrial pollution. The First World War granted greater political legitimacy to these organizations through collusion with state governments to administer natural resources, but the conflict upset the trajectory of international environmentalism. Raf De Bont and Anna-Katharina Wöbse show how the war disrupted international preservationist networks. They argue that the conflict is partly to blame for the failure of elite environmental networks to function in the world of intergovernmental diplomacy. Distrust among nature protectionist elites seemed to prevent the League of Nations from initiating environmental reform. But witnessing the devastation of industrial warfare also galvanized international environmentalism in terms of which nature protection projects received priority and who promoted them. The unspoken military-industrial angle of nature conservation remained a tacit feature of environmental agendas long after the war's end.

The desire to protect natural resources and repair ruined lands reflected emotional attachments to nature, as much as military priorities and agricultural needs. Lush lands connoted innocence, peace, and a return to normalcy. The use of nature to mask death and destruction became increasingly popular after the armistice. Poppies, heroes' groves, and memorial trees symbolized resurrection and rejuvenation. Described as "clothed in the finest of human sentiment . . . a simple symbol to keep forever green the memory of those in whose honor it is planted," memorial trees became especially popular in the United States.²² The American Legion worked together with the American Tree Association to distribute seedlings. Some groups started a "Roads of Remembrance" campaign, planting shade trees along highways. This was a timely effort since many states had begun to plan extensive systems of roads. Others traveled to France to plant memorial trees in honor of those who never made it home. Recent centennial commemorations have likewise

of War: The Influenza Epidemic in the US Army during World War I (New York: New York University Press, 2005); John Barry, *The Great Influenza: The Epic Story of the Deadliest Plague in History* (New York: Penguin, 2004); and Alfred Crosby, *America's Forgotten Pandemic: The Influenza of 1918* (New York: Cambridge University Press, 2003).

²² Charles Lathrop Pack, *Trees as Good Citizens* (Washington, DC: The American Tree Association, 1922), 108.

employed nature to symbolize the cycles of death and rebirth. Among the more notable tributes was a public art installation, “Blood Swept Lands and Seas of Red,” at the Tower of London. Between July and November 2014, organizers gradually planted 888,246 ceramic red poppies, each of which represented those who died serving the British Empire between 1914 and 1918. A few art critics accused the installation’s designers of masking the war’s horror with pretty flowers instead of presenting gory scenes with barbed wire and bones, but that did not stop an estimated 5 million people from visiting the memorial. Nearly as many visitors also attended Michael St Maur Sheil’s *Fields of Battle – Lands of Peace* commemorative photographic exhibits in London and Paris. A professional photographer and battlefield tour guide, his contemporary pictures of the Somme, Ypres, and Messines, among dozens of famous battlegrounds, captured the eeriness of outwardly tranquil lands still haunted by hidden armaments.²³

Reactions to the poppies and photographs, what John Edward Masefield foresaw as “a romance in memory,” speak to Frank Uekötter’s call to view the environment not only as a reflection of memories but also as a distinct mode of memory. Environmental historians have long emphasized that nature is more than a backdrop to human history. However, as Uekötter observes, the discipline of memory studies has remained largely unimpressed; it rests firmly within the province of cultural studies. Cultural historian Jay Winter wrote that “remembrance is part of the landscape,” but he meant war memorials and cemeteries.²⁴ In his stark and unsentimental poem, published posthumously in 1916, Charles Hamilton Sorley instructed mourners not to give praise, spend tears, or bestow honor on the fallen, yet the “millions of the mouthless dead” do indeed give meaning to nature.²⁵ Soldiers’ cemeteries consecrated former sites of carnage. War graves commissions collected human remains and organized parcels of land, such as Tyne Cot in Belgium, the largest British Commonwealth war cemetery in the world. Authorities from all the former belligerent countries established war cemeteries throughout Europe, as well as in India, Australia, New Zealand, and

²³ Mark Brown, Blood-Swept Lands: The Story behind the Tower of London Poppies Tribute. *The Guardian*, December 28, 2014, www.theguardian.com/world/2014/dec/28/blood-swept-lands-story-behind-tower-of-london-poppies-first-world-war-memorial (accessed July 31, 2017). See Michael St Maur Sheil, *Fields of Battle – Lands of Peace, 1914–1918* (Baden: Edition Lammerhuber, 2016).

²⁴ Jay Winter, *Sites of Memory, Sites of Mourning: The Great War in European Cultural History* (New York: Cambridge University Press, 1995), 1.

²⁵ Tim Kendall, ed., *The Poetry of the First World War: An Anthology* (New York: Oxford University Press, 2014), 191.

the Middle East, and across North America. Burial sites provided enduring oases of memory amid recuperating lands. Designed to withstand ecological change caused by natural succession and placed on land granted in perpetuity, the cemeteries soon became sites of pilgrimage and a century later remain lasting fixtures in the countryside. But one need not amble contemplatively through quiet cemeteries on the old front lines to try to comprehend the catastrophe of the First World War. As the essays in this volume show, reminders of the conflict's environmental legacies are all around us; we need only look.