

The Natural Environment as an Object of Public Health Law: Addressing Health Outcomes of Climate Change through Intersections with Environmental and Agricultural Law

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I. Introduction

In order to reduce the health impacts of climate change, attention to the natural environment is essential. Yet, to date, the power to change the natural environment has received comparatively little attention in public health law in the United States. This is particularly striking as the public health profession has grown increasingly adept and sophisticated in recent years in its efforts to influence the built environment in order to improve health. Indeed, one of the most influential frameworks in public health law recognizes the power to change the built environment as one of the fundamental tools of public health law, but it does not recognize the power to change the natural environment in a similar way.¹ Just as the public health sector in the United States has been able to partner with other sectors and learn from other legal disciplines to address the built environment, we may partner with and learn from other sectors and other legal disciplines to improve the natural environment.

Public health has transformed its approach to chronic disease over the past twenty years, to transition from a focus on individual nutrition education and tobacco cessation counseling to more upstream strategies to promote commercial tobacco control, healthy eating and active living. Upstream approaches include smoke-free and clean indoor air laws, removing sugar sweetened beverages from government-owned vending machines, improved lighting in stairwells, establishing community gardens, and building walking paths. Through these efforts, the built environment has come to be regarded as a central part of public health and public health law.

This article will focus on the potential intersection of public health law with environmental law and agricultural law in efforts to change the natural environment in order to mitigate and adapt to the health impacts of climate change. In Part II, the discussion examines definitions and appropriate objects of public health law, including some reasons that the natural environment might be viewed as falling outside the proper scope of public health law. Part III discusses examples of how incorporating the power to change the natural environment within the core of public health law could advance mitigation and adaptation

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efforts with respect to the health impacts of climate change. In Part IV, the discussion turns to examples from environmental law with the potential to reduce and more effectively address the health impacts of climate change. In Part V, the discussion turns to the potential for agricultural law to support efforts to ameliorate the health impacts of climate change. Part VI explores how these legal perspectives could enrich and supplement the public health and public health

In a list of the types of legal interventions to improve public health, Gostin and Wiley identified the power to tax and spend, the power to alter the information environment, the power to alter the built environment, the power to alter the socioeconomic environment, direct regulation, indirect regulation through tort liability in civil lawsuits, and deregulation.³ In the discussion that follows, Gostin and Wiley note the dilemma faced by public health and public health law — if defined too narrowly, they lack a vision powerful enough to address the root causes of preventable death, disease, and injury, but if defined too broadly, their reach may exceed their grasp. Nonetheless, Gostin and Wiley themselves refer to an article published in the year 2000 that identifies the need to “clean up and protect the environment” as one of ten public health challenges for the twenty-first century.⁴ Beyond its first chapter addressing theory and definitions of public health

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law toolbox, broadening the options and strengthening the capacity for public health law to reduce the health impacts of climate change, and perhaps utilize the law to produce environmental, agricultural, and health co-benefits.

II. Definitions and Appropriate Objects of Public Health Law

One widely influential definition of public health law comes from the textbook, *Public Health Law: Power, Duty, Restraint*, whose third edition is co-authored by legal scholars Lawrence O. Gostin and Lindsay F. Wiley. The authors write that,

Public health law is the study of the legal powers and duties of the state to assure the conditions for people to be healthy (to identify, prevent, and ameliorate risks to health in the population) and the limitations on the power of the state to constrain the autonomy, privacy, liberty, proprietary, or other legally protected interests of individuals for the common good.²

This definition provides an important, and broad, baseline for what may be considered within the scope of public health law. When a government entity exercises its legal authority, whether at the federal, Tribal, state, or local level, to address climate change and to prevent and prepare for natural disasters, that government entity is striving to assure the conditions for people to be healthy, and it is operating under the big umbrella of public health law.

law, Gostin and Wiley’s text acknowledges the “direct relevance” of the law of environmental protection to public health, drawing primarily upon examples of direct regulation.⁵ Gostin and Wiley also briefly discuss climate adaptation within the context of public health emergency preparedness, and they discuss environmental justice as a recent movement focused on eliminating health disparities.⁶

This article urges a view of the public health law toolbox which treats the power to alter the natural environment as a cornerstone. Legal scholars have suggested that a field of law should be possessed of both “commonality” within the field and “distinctiveness” from other fields in four dimensions: factual context, policy trade-offs, values and interests, and legal doctrines.⁷ Arguably, while the natural environment is a principal concern for environmental and agricultural law, incorporating it as a principal concern of public health law could undermine the commonality of the field, as well as possibly undermining the distinctiveness of environmental and agricultural law, within a traditional siloed view.

Nonetheless, both the current impact of the natural environment on human health, and the projected devastating impact if climate change is not slowed and reversed, demands that those engaged with public health law consider, develop, and exercise its power to change the natural environment, in order to achieve its central purpose of creating the conditions for people to be healthy. Climate change involves weather-related phenomena such as extreme heat, more intense and unpredictable severe weather events

such as hurricanes and floods, and increasing air pollution. Health impacts of climate change include heat stroke, heat exhaustion, increased respiratory disease, increased infant mortality, heightened exposure to allergens, drowning, injuries, foodborne illness, vector-borne illness, zoonotic disease, water-borne disease, food insecurity, malnutrition, anxiety, depression, and posttraumatic stress. To the extent that public health practitioners and lawyers may lack capacity, in either financial resources or subject matter expertise, to fully address health impacts of climate change, it is essential to collaborate with others in order to enhance capacity.

How might the history of public health and public health law inform a project of centering the natural environment as an object of public health law? Perhaps it will be helpful to pause for a brief definition of terms, including the “built environment” and the “natural environment.” The built environment has been defined as follows:

Distinct from the natural environment, the built environment is comprised of manmade components of people’s surroundings, from small-scale settings (e.g., offices, houses, hospitals, shopping malls, and schools) to large-scale settings (e.g., neighborhoods, communities, and cities), as well as roads, sidewalks, green spaces, and connecting transit systems. The development of the built environment involves many sectors, including urban planning, architecture, engineering, local and regional governments, transportation design, environmental psychology, and land conservation.⁸

This definition suggests the broad scope of the concept of the “built environment.” The reference to the role of human intervention and inclusion of “green spaces” within the definition might raise the question whether any place which has been influenced by human activity would be disqualified thereby from classification as part of the natural environment. In this article, the natural environment includes natural ecosystems which are affected, managed or restored by human activity. This conceptualization of the “natural environment” would include most “green spaces” in urban and rural environments, including the plants and animals located within them, as well as outdoor air, water, and soil.

Certainly, there is precedent for centering the built environment in public health and public health law, dating back to Jon Snow at the Broad Street pump. Indeed, public health was long concerned primarily

with sanitation and hygiene to control communicable disease, as made physically manifest in sinks, toilets, and sewage treatment systems. With the emergence of chronic disease as a leading threat to public health, elements of the built environment such as sidewalks, walking paths, stairways, grocery stores, and convenience stores have come into view as key parts of the public health infrastructure.

If we look for them, historical examples of laws that addressed the natural environment for the purpose, at least in part, of improving human health can be readily identified. For example, the U.S. Centers for Disease Control and Prevention (CDC) was originally founded in Atlanta, Georgia, following World War II in order to focus on the eradication of malaria. While one key strategy involved the use of insecticides via aerial sprays and direct application to house walls and interiors, the overall approach also included draining stormwater and standing water in agricultural fields and removing mosquito breeding sites.⁹ The Agricultural Adjustment Acts of the 1930’s and 1940’s included a number of provisions intended to address the Dust Bowl, restore productivity to farmland, and rebuild the food supply. Major environmental laws in the United States, such as the Clean Water Act and the Clean Air Act, formed pillars of a regulatory framework which centered human health impacts in setting limits on contamination of the natural environment.

More recently, concepts such as the social determinants of health describe the powerful influence of factors such as the quality of air, water, and soil upon health outcomes and provide a strong rationale for including the natural environment within the scope of public health law. Similarly, health equity identifies the need to remedy disparities in opportunity to have access to clean air, water, and soil, as well as access to nature for physical activity, recreation, and stress relief, if communities and the nation as a whole are to achieve equitable outcomes. The Health in All Policies framework suggests that policies addressing every aspect of human life may have positive or negative impacts on health, such that the health impacts ought to be anticipated and evaluated, to the extent possible, as any policy is being crafted and implemented.¹⁰ Finally, Public Health 3.0 is an approach to public health which emphasizes the role of public health leaders and officials as the “chief health strategist” for their community. According to this modern approach to public health, public health leaders should actively cultivate knowledge, relationships, and legal and policy strategies to address all potential influences on population health, including the natural environment. Public health law must stretch to meet the demands

of public health practitioners and of the moment, by providing legal scaffolding for these efforts.

III. The Power To Change The Natural Environment As A Means To Mitigate And Adapt To The Public Health Impacts Of Climate Change

Alterations to the built environment have historically been used to mitigate harms from extreme weather events. However, many human-engineered, built solutions, treat the effects of climate change, rather than the root causes. Public health interventions that recognize the strength of the natural environment can shift the focus upstream, and utilize more preventative and equitable methods to mitigate and adapt to the public health impacts of climate change.

A. Recognizing Primary Prevention and Moving Upstream In Confronting Public Health Problems

Just as other areas of public health increasingly utilize upstream prevention efforts, environmental public health interventions are moving upstream, with a focus on reducing the cause of the hazard, rather than just limiting exposure to the hazard. The use of such upstream measures is particularly important where, as is often the case, the cause or source of the environmental health hazard cannot be easily controlled by impacted persons.¹¹ This shift aligns with efforts to eliminate disparities in exposure to public health hazards by mitigating the hazard rather than shifting public health burdens to different individuals or communities.

These upstream public health measures fall within the broad category of primary prevention measures that work on a population level to prevent a disease or health outcome before it develops.¹² For example, laws and policies establishing minimum standards for indoor air quality in the places people live, learn, and recreate, can mitigate conditions that cause asthma and the associated burden of respiratory disease that individuals with asthma face.¹³

With this shift to upstream interventions, public health practitioners and lawyers must increasingly engage sectors beyond health — laws in other sectors influence the social determinants of health and the conditions for achieving population health, including the criminal justice systems, urban planning and development, agriculture, housing, and the environment. The Lancet–O’Neill Institute Commission on Global Health and Law discusses these influences as the “legal determinants of health” noting “if not conceived with due consideration for health objectives, laws in these sectors could have powerful adverse

effects on health.”¹⁴ Conversely, laws and interventions that address the true root causes of public health outcomes, and equitably improve the social determinants of health can build healthy and safe outcomes and behaviors.¹⁵

To date, public health departments have utilized upstream interventions to address a variety of public health threats, and some have used their public health authority to adopt climate adaptation plans and measures.¹⁶ However, public perceptions that climate mitigation measures are environmental issues, rather than public health concerns, have left public health departments without a prominent role in developing preventative policies and interventions to mitigate climate change induced health problems before they start.¹⁷ The CDC’s Climate Ready States and Cities initiative has provided some support for such efforts; however, funding is limited and the CDC program has been subject to administrative reassignment within CDC.

B. Primary Prevention As A Tool To Address The Public Health Consequences Of Climate Change.

Absent efforts to pair adaptation with climate change mitigation measures, our public health and health care systems will be left to undertake the hefty burden of managing climate induced diseases and disasters, but may fail to prevent inequitable impacts of climate change. Primary prevention measures for climate change related illness include interventions that reduce carbon emissions and other short-lived climate pollutants, such as methane and hydrofluorocarbons. These primary prevention efforts have exponential public health benefits. For instance, actions that mitigate climate change by reducing air pollution from fine particulate matter emitted from the burning of fossil fuels and automobile exhaust, could also mitigate the approximately 100,000 deaths each year in the United States attributed to fine particulate matter.¹⁸ These upstream prevention interventions can also strive to alleviate health inequities in communities of color that are more often located near sources of air pollution, and are disproportionately impacted by climate change.¹⁹

Using a public health lens to assess climate change mitigation policies can also ensure that those policies do not increase inequities or exacerbate public health problems when implemented. As noted above, The Lancet Commission has emphasized the role of law as a determinant of health and the need to assess the unintended consequences that laws in other sectors have on public health — and many laws and policies have not benefited from a public health lens, leaving poor health and health inequities in their wake.

C. Natural Solutions Used To Mitigate And Adapt To Climate Change Are Effective Public Health Measures. Natural solutions, or nature-based solutions, include measures that manage or restore natural ecosystems to address climate change.²⁰ These solutions are inspired, or supported, by nature; help build resilience; and impart ancillary benefits for human well-being. The carbon capturing capacity of natural solutions are paramount to meeting internationally accepted greenhouse gas reduction levels needed to avert the worst impacts of climate change.²¹ As we have modified nature to accommodate human populations, our built environment has increasingly replaced the natural environment, reducing the earth's capacity to capture carbon dioxide, and substituting man made infrastructure for the natural systems that help alleviate flooding and reduce extreme heat events. Re-engaging nature-based solutions can be cost effective, help mitigate climate change, reduce the impact of extreme weather events, and address health inequities, but may require support from laws and policies.²²

Preventative natural solutions, such as expanding the urban tree canopy (discussed below) can also decrease the burden on human engineered and built climate adaptation measures that are less reliable in the face of other public health crises, such as the current COVID-19 pandemic. Extreme heat and other climate induced disasters will continue to occur as the world grapples with the COVID-19 pandemic, but the built solutions (cooling centers and emergency shelters) primarily used to mitigate public harm during these disasters may not be as dependable due to social distancing measures used to reduce the COVID-19 disease burden and fears of contracting COVID-19 in large group settings. The COVID-19 pandemic has required significant modifications at cooling centers and emergency shelters, such as instituting testing and screening protocols, identifying alternative safe spaces that allow for physical distancing, isolation of sick individuals, and enhanced air exchange systems and cleaning protocols. These necessary modifications illustrate the need for longer-term interventions that can equitably reduce the incidence of and exposure to extreme heat events and climate change fueled natural disasters.

1. TREES CAN MITIGATE HEALTH RISKS POSED BY EXCESSIVE HEAT DAYS

As the climate changes and temperatures rise, natural solutions such as equitable tree cover can help mitigate the health risks from urban heat islands — including respiratory difficulties, heat exhaustion, heat stroke, heart attack, and heat-related mortality — and help prevent excessive heat days in the future.

The shade, increased albedo (reflective capacity of the tree canopy), and evapotranspiration (the transfer of water collected in and on tree leaves into the air as water vapor) provided by urban tree cover provides significant cooling benefits to offset dangerous temperatures.²³ Increased urban tree canopy can also promote community health by removing carbon dioxide from the air, reducing air pollutants that contribute to asthma, lowering fossil fuel usage, and providing natural cooling to ease the high costs of electricity and air conditioning.²⁴ Local policies and ordinances to protect and expand tree cover take many forms — such as treating trees as infrastructure, requiring planting of trees in energy conservation zones, or incentivizing or mandating tree canopy.²⁵

Eliminating the inequitable distribution of trees seen in many urban areas can also help remedy current health inequities resulting from racist laws and policies.²⁶ Historic redlining practices have made many low-income communities and communities of color more susceptible to extreme heat and flooding due to concentrated areas of hot impervious surface and limited tree cover: historically redlined neighborhoods (deemed hazardous for real estate investments in the 1930s based on racial makeup of the neighborhood) are, on average, 5 degrees hotter than neighborhoods with higher percentages of white residents.²⁷ Increasing urban tree cover, particularly in formerly redlined neighborhoods, areas with high asthma rates, and near schools in low-income communities of color, can promote health equity while simultaneously providing climate adaptation and climate mitigation benefits.²⁸ While tree cover may fall within some broad definitions of the built environment, categorizing it as part of the natural environment is more likely to promote an approach grounded in emulating natural solutions.

2. BLUE-GREEN INFRASTRUCTURE CAN HELP MITIGATE IMPACTS FROM FLOODING AND DROUGHT

Other natural solutions, categorized as blue-green infrastructure, utilize the earth's natural systems, such as wetlands and native landscaping, to filter and slow the flow of water and reduce the risk of flooding and its associated negative health outcomes. Blue-green infrastructure initiatives can reduce flooding and water pollution from combined sewer overflows and phosphorus, while reducing greenhouse gases, mitigating the potential for drought, reducing urban heat islands, and reducing energy costs and demands.²⁹

Blue-green infrastructure can also reduce the cost of building stormwater infrastructure and eliminate the potential for disease outbreak from standing water. In many flood prone areas, rebuilding efforts occur with-

out considering the need for blue-green infrastructure to absorb water, restore the natural environment that was wiped-away as the flood plains were developed (and redeveloped), and mitigate future damage.³⁰ The result is an extremely expensive and time-consuming cycle of flooding and rebuilding that could be moderated by more cost effective disaster mitigation efforts. As with the discussion of tree canopy above, approaching green infrastructure as part of the natural environment is most conducive to a comprehensive, systems approach to natural solutions.

D. Tribal Adaptation Actions Rely on Natural Solutions

Tribal climate adaptation and planning activities promote the use of natural solutions that integrate indigenous knowledge, values, culture, and history.³¹ Many Tribal adaptation efforts are grounded in parity between humans and non-human beings, and a foundational understanding that humans are part of the natural world and have been given the responsibility to care for, rather than exert dominance over, non-human beings.³²

Tribal adaptation efforts often begin with traditional and cultural knowledge and are primarily rooted in nature and disavow measures that preserve the Western perspective of dominance over nature that has produced modern ecological and climate crises. A framework for integrating indigenous knowledge, culture, and history into climate adaptation planning in the western Great Lakes Region, Dibaginjigaadeg Anishinaabe Ezhitwaad: A Tribal Climate Adaptation Menu, suggests natural solutions such as pollution source reduction measures; actions to support the natural ecosystem's capacity to filter and cool water by restoring drained wetlands and beaver populations; planting conifers in riparian area to increase stream shading; expanding riparian and floodplain areas to anticipate more extreme floods; and seeking out and utilizing traditional knowledge about natural infrastructure materials and techniques to capture and filter pollutants.

Utilizing indigenous knowledge and culture to maintain the first foods that sustain the health of indigenous communities can also mitigate climate impacts. For example, the Swinomish Climate Adaptation Action Plan includes proposals for restoring and enhancing fish and shellfish habitat and "maintaining the traditional livelihood based upon these resources."³³ U.S. government policies of removal and reservation have disrupted "the right of peoples to healthy and culturally appropriate food produced through ecologically sound and sustainable methods, and their right to define their own food and agricul-

ture systems."³⁴ As climate change threatens to further disrupt Tribal food systems by altering the distribution and yield of culturally important food sources, food sovereignty is one element of a holistic response to the inequities facing indigenous communities, which includes disparate climate change impacts.³⁵

E. Primary Prevention Measures in the Natural Environment to Mitigate Outcomes From Future Pandemics: Air Pollution and COVID-19.

Primary prevention efforts to address climate change can also limit potentially devastating, and racially disparate, health impacts from the current COVID-19 pandemic and future pandemics. The same air pollutants that contribute to climate change contribute to the underlying respiratory and cardiovascular health conditions associated with the worst health outcomes from emerging zoonotic diseases such as the 2003 SARS outbreak and the current COVID-19 pandemic.³⁶ Public health measures that reduce these air pollutants could mitigate and prevent these same severe outcomes during future disease outbreaks.

As the earth's climate warms, humans and animal that have relocated to cope with the changing climate may more frequently interact and the range and life-cycle of vectors is anticipated to increase, heightening the potential for infectious disease transmission from animals to humans. With these increased interactions and vector ranges, preventative measures that reduce underlying health vulnerabilities such as asthma, chronic lung disease, or heart conditions that increase the risk of severe illness from novel zoonotic diseases such as COVID-19 become even more essential to combatting the most severe disease outcomes.³⁷ The social distancing measures and closures instituted in response to the COVID-19 pandemic have shown that reductions in fossil fuel emissions can quickly clear the skies of harmful pollution.³⁸ These lower levels of air pollution have resulted in a declining incidence of pollution related deaths: an estimated 12,000 air pollution related deaths were avoided during 35 days of COVID-19 response in China.³⁹

The current efforts to control the COVID-19 pandemic, such as business and school closures, are both necessarily extreme and simultaneously insufficient to reduce the worst health consequences of the disease. Additional air pollution mitigation measures are consistent with long-standing public health primary prevention measures that reduce the disease burden by aiming to reduce the risk of death from novel diseases that cause respiratory illnesses. The COVID-19 pandemic highlights the important public health and equity benefits that investment in policies and legal strategies to successfully shift communities, particu-

larly those most heavily impacted by fossil fuel related air pollution, toward cleaner energy sources could have.

IV. Intersections of Environmental Law with Climate Change and Health

Environmental law is an expansive area of law that, among other things, includes pollution prevention laws aimed at protecting the public health by reducing air and water pollution. Generally, environmental laws create standards that deem a certain level of human health risk from pollution to be acceptable, but do not necessarily consider the disparate risks and burdens to specific communities. This has left some areas of the United States, predominantly low-income communities and communities of color, to bear the highest health burden from air and water pollution, and experience the greatest susceptibility to the public health impacts of climate change. To date, these environmental laws have not sufficiently mitigated the climate change threats, however, a public health law lens could be used to achieve “the highest possible level of physical and mental health in the population, consistent with the values of social justice” and help equitably mitigate the public health impacts of climate change.

A. The Methods, Purpose, and Insights of Environmental Law

Modern U.S. environmental law is a fledgling area of law developed in the face of environmental tragedies — such as the 1969 Cuyahoga River fire — and grounded in a series of statutes designed to reduce threats to the environment and public health and prevent overuse of limited natural resources for the benefit of some individuals or communities, at the expense of others. Historically, pollution control relied on the use of the police power by states, but concerns about the impact of pollution on public health evolved into a regulatory system that also incorporated local and federal laws. The principal tool of environmental law is direct regulation, which aims to prevent pollution from creating an unhealthy natural environment, but does little to recognize, preserve, or enhance the human health benefits provided by nature. The prominent federal pollution control laws, such as the Clean Air Act and Clean Water Act, incorporate the concept of cooperative federalism, which puts willing states at the forefront of enforcement and allows states to tailor federal standards to meet state specific needs. Many modern day legal disputes arise from the tension between state and federal authority and the bounds of the federal government’s statutory duties and authorities to regulate pollution.

The Clean Air Act and Clean Water Act, were enacted to mediate a mismatch of burdens and benefits that had left individuals who neither created, nor benefited from, pollution to bear the most significant health consequences.⁴⁰ In other words, environmental laws shift the economic burden back to the polluter, rather than allowing those costs to be externalized. Environmental law has its roots in common law doctrines, such as public nuisance and the public trust doctrine that establish restrictions on the use of private land and reserve some natural resources for the public good and common welfare. Environmental laws also recognize that other systems of law, such as tort, may fail to protect individuals that are harmed or killed by pollution, and recognize human health and safety on equal footing with economic well-being.⁴¹ Modern environmental laws also recognize that it is much less costly to prevent pollution than to clean it up after it has caused damage to the natural environment or public health. Regulators can utilize environmental laws before significant harm to public health occurs: “significant risks to public health are weighed against the social burden of controlling such substances.”⁴²

While the mission of the U.S. Environmental Protection Agency is to protect human health and the environment, the environmental laws administered by the agency vary in the overtness of their commitment to public health. For example, the federal Clean Water Act regulates the discharge of pollution into the nation’s water with the objective to “restore and maintain the chemical, physical, and biological integrity of the Nation’s waters,” and includes goals such as: eliminating the discharge of pollutants into navigable waters by 1985; achieving an interim goal of water quality that supports fishing and swimming; prohibiting the discharge of toxic amounts of pollutants; and developing technology needed to eliminate the discharge of pollutants.⁴³ The public health goals of the Clean Air Act are more overtly premised on the dangers of air pollution to public health and welfare, with the purpose of protecting air quality for the promotion of public health and welfare.⁴⁴

Environmental laws also protect public health by establishing ambient air and water pollution standards, setting technology standards to reduce pollution from specified industry categories, prohibiting the release of pollutants without a permit, requiring monitoring and compliance with permit limits, and mandating the use of minimum standards for pollution treatment. Critical components of environmental laws require the regulator to estimate and assess the risk to the human population from a particular contaminant or process. This requires assessment of the hazards a pollutant presents to humans, likely expo-

sure levels, and incidence of disease or damage. The result is a determination of the level of acceptable public risk, not the elimination of risk entirely. For example, the Clean Air Act includes several different types of protections, including standards that balance public health risks against the cost to the polluter; standards based on economics and technological feasibility; and standards based on the risk of health outcomes at particular levels of pollution.⁴⁵ And while costs of compliance are considered elsewhere in the Clean Water Act, cost considerations are not relevant

that rely heavily on fish as a staple food source. And it is well documented that communities of color have higher rates of exposure to air pollutants and other contaminants that impact health outcomes.⁴⁹ A public health law lens could help derive more nuanced, equitable, and well-rounded solutions that consider, and ameliorate, disparate health impacts.

Public health practitioners and attorneys who understand these subtleties in environmental law can engage more effectively as advocates for improved public health. Conversely, public health practitioners

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when a state sets the water quality criteria identifying acceptable levels of pollution in lakes or rivers.⁴⁶ These criteria are considered “technology forcing” pollution standards because technology beyond the minimum requirements outlined in the Clean Water Act is generally needed to prevent multiple sources of pollution from causing a lake or river to exceed safe levels.⁴⁷

Many environmental laws are designed to achieve pollution reductions, but lack the nuance necessary to avoid disparate health impacts and health burdens on communities of color and low-income communities. While these laws often aim to reduce aggregate pollution, they are ill-equipped to prevent the unequal distribution of pollution. Among other things, the incorporation of grandfathering clauses and the lack of legally mandated tracking methods to assess community health impacts, impair the ability of these laws to protect the communities most impacted by pollution. As is well recognized in the tenets of environmental justice, the laws can also create opportunities for politically or monetarily well-connected communities to shift the pollution burden elsewhere. For example, nearly four decades after polluted discharges to the nation’s waters were to be eliminated, many of the nation’s lakes and rivers contain pollution in amounts that create hazards for people who wish to use water for recreation, drinking, or as a source of fresh food.⁴⁸ Fish consumption warnings that warn of the dangers of eating too many contaminated fish apply to a lengthy list of waters in many states, but may not be posted at lakes and rivers to warn the individuals who are most susceptible to contamination, including pregnant women and children, or communities

and attorneys who behave as if regulation of the quality and quantity of water, air, and soil are not proper concerns or methods of public health, are likely to miss opportunities to address health-related impacts of climate change.

B. Access to Water, an Example of How Regional Environmental Laws Can Protect Public Health In the Face of Changing Precipitation Patterns Resulting from Climate Change

The public health threats of climate change may not have been the underlying focus of many modern environmental laws. However, some of these laws create structures and opportunities to protect public health in the face of a changing climate. Water quantity regulations provide a pertinent illustration. As the climate changes, precipitation patterns are also changing, leaving some areas of the United States susceptible to drought and disputes over water — who has it, who needs it, who gets it. Public health tensions and risks—such as lack of access to clean drinking water, food insecurity, poor air quality, water-borne diseases, mental health concerns, wildfire, and poor sanitation—will arise in drought-ridden areas that lack a regional source of water sufficient to meet population needs.⁵⁰ Evidence of these public health implications can be seen in the data collected on drought conditions. In the drought-burdened San Joaquin Valley, over 1500 domestic wells failed in 2017, excess rates of heat-related-illness occurred from 2005-2011, and a significant increase in the number of cases of Valley Fever was recorded between 2000-2011.⁵¹ The mental health implications of drought cannot be underesti-

mated; evidence shows a significant increase in suicide rates among farmers during the Midwest drought in the 1980s.⁵²

Drier regions of the United States are struggling to find equitable solutions to water availability under the prior appropriation water rights allocation scheme, where older water rights are prioritized over newer rights, regardless of the health implications during drought conditions.⁵³ At the same time, lawmakers in traditionally water-rich regions have developed policies to protect the quantity and quality of natural water sources in these regions by limiting out of basin diversions.

In the face of increasing water uncertainty, the Great Lake Compact (“Compact”) anticipates the need to preserve and protect the “continued sustainable, accessible and adequate water supplies for the people and economy of the [Great Lakes] Basin,” which holds approximately 20% of the Earth’s freshwater.⁵⁴

The Compact, which recognizes that “future diversions and consumptive uses of basin water resources have the potential to significantly impact the environmental, economy and welfare of the Great Lakes — St. Lawrence River region,” prohibits new or increased bulk water diversions of water out of the Basin. While the Compact directly prohibits removal of water from the Basin in containers greater than 5.7 gallons, the Compact leaves it up to the signatory states to choose whether to ban diversions in smaller containers - this controversial provision is sometimes referred to as the bottled water loophole.⁵⁵ Public health exceptions to the ban on diversions allow withdrawals for firefighting; humanitarian and emergency response aid; and to provide drinking water for nearby communities that lack adequate water supplies.⁵⁶ Such exceptions have been invoked to allow for Lake Michigan water to be diverted for use by a nearby community that was facing radium contamination in its overdrawn drinking water supply; and for water to be used by Fox-Conn, a private company planning a new electronics manufacturing facility in a community partly within the Basin.⁵⁷ As drier parts of the country contemplate diminishing access to clean water, and industry eyes the need for Great Lakes water, there may be a need to assess the strength of the Compact in protecting water quality and quantity in the Region.

Some companies, like Water Train,⁵⁸ have proposed tapping into groundwater sources in water-rich states in the Midwest and Great Lakes Region and shipping that water to western states dealing with water shortages and droughts.⁵⁹ These water-rich areas are adopting policies that include mitigation measures to prevent mass diversions of groundwater. A law protecting the Mt. Hinkley Aquifer for local drinking water uses

in the Twin Cities in Minnesota recently halted a proposal to ship 500 million gallons per year of groundwater via rail to drier parts of the country.⁶⁰ Resolving tensions between federal, Tribal, regional, state, and local authority and health needs in the face of limited resources are classic concerns of public health law and ethics. Recent public health efforts to engage on issues of drought recognize that the natural environment is well within the realm of public health, and public health input is essential to developing equitable and durable solutions.⁶¹

C. Climate Change and Laws to Protect Water Quality

Many U.S. residents take access to a clean water supply for granted, without considering the source, or safety, of their drinking water. However, the distinct differences in how our laws do, or do not, protect us from drinking water contamination, will become increasingly important as the climate warms and increased flooding and drought conditions threaten U.S. drinking water supplies. While the Safe Drinking Water Act generally protects individuals that rely on a public water supply for tap water from exposure to unsafe levels of regulated contaminants, there is no similar protection for the approximately 45 million U.S. residents who rely on private wells for water.⁶² When contamination is found to be fouling private well water, the burden of obtaining a clean source of household water often falls on the well user, regardless of the source of contamination.⁶³ Even if a homeowner can readily afford the substantial investment in a new well, if the source of contamination is not controlled, contamination remains a threat that the homeowner cannot control. Thus, preventative measures to eliminate the sources of pollution in drinking water are all the more necessary to alleviate the disparities in exposure to well water contamination.

More extreme precipitation events will sweep additional pollutants into fresh water and global temperature rise is predicted to promote the growth of pathogens and toxic algae blooms, like the August 2014 Lake Erie bloom that left 400,000 residents of the City of Toledo without clean tap water for 2 days.⁶⁴ Warmer temperatures create conditions that allow these toxic algae blooms to flourish and increase the likelihood that the blooms develop toxins that cause liver, neurological, digestive, and skin diseases. Unfortunately, state and federal environmental laws such as the Safe Drinking Water Act and Clean Water Act are not particularly useful in preventing or correcting contamination from diffuse sources such as agricultural practices that cause phosphorus, nitrate, and fecal bacteria contamination. These diffuse sources are likely to cause increased contamination during

climate change fueled extreme weather events, and an alarming number of private rural wells in susceptible areas are already contaminated by excess levels of nitrate from fertilizers (both synthetic and manure based).⁶⁵

While local health departments may assist homeowners with drinking water quality testing, many local governments lack policies needed to reduce the sources of drinking water contamination, which is a source of concern for public health organizations.⁶⁶ Some local communities have adopted local ordinances that address sources of contamination, such as concentrated animal feeding operations or other agricultural practices.⁶⁷ Without the population focus of these health interventions, individual families are left to protect themselves by finding a new source of water. Reliance on public health tenets could protect human health and should ensure equity in protections, which can only be realized by reducing the source of contaminants.

D. Environmental Laws and Public Health: A Combined Approach to Mitigate Climate Change-Fueled Public Health Threats from Drought and Flooding in the United States

Changing precipitation patterns, coupled with rising air and water temperatures, are likely to increase human susceptibility to waterborne illness and water insecurity, as climate change contributes to a cycle of heavy precipitation and drought events. Natural solutions, such as blue-green infrastructure, can help mitigate contamination from these climate-change-fueled storm events and during drought conditions.

Many public water suppliers treat water with disinfection products to eliminate pathogens and toxins in the source water before it is distributed to homes. However, upstream interventions that reduce the sources of this contamination can more effectively improve public health by mitigating exposure to the harmful contaminants created when disinfectants such as trihalomethanes, which have been linked to threats including an increased risk of cancer, are used to treat drinking water.⁶⁸ Without increased prevention efforts, rising temperatures will contribute to the prevalence of these so-called disinfection byproducts, and their associated public health risks.

Water quality concerns also arise in drought situations as pollutants become more concentrated in drinking water and recreational water, and drinking water becomes scarcer.⁶⁹ Pollution limits for discharges of water from industrial and municipal facilities may also not be protective of human health during drought conditions, when water levels are too low to dilute pollution to levels that are safe for recreation

and drinking. Preventative blue-green infrastructure solutions can stave off drought conditions that are anticipated to accompany the increase in extreme precipitation events — with these heavy rain events, come longer periods without rain — a pattern that will likely reduce the capacity of aquifers to recharge.

E. Case Study of a Local Government Use of Blue-Green Infrastructure to Reduce Water Pollution, Stave Off Drought Conditions, and Mitigate Climate Change

Milwaukee, Wisconsin, a city sitting on the shores of Lake Michigan, faced increased flooding as a result of development and intense rain storms. The city's early efforts to prevent flooding — by channelizing creeks and building a deep tunnel to store rainwater and prevent the discharge of untreated sewage to areas lakes and rivers during heavy rain events — provided temporary relief from flooding and sewage releases.⁷⁰ However, as precipitation events continued to intensify, state and federal environmental regulators sought to require Milwaukee's wastewater treatment facility to implement costly upgrades as a condition of its Clean Water Act permit, known as a National Pollutant Discharge Elimination System, or NPDES, permit. Instead, Milwaukee instituted a less expensive and more sustainable natural alternative — the inclusion of green infrastructure requirements in its NPDES permit that mandate natural solutions capable of storing millions of gallons of water during rain events.⁷¹ The Milwaukee Metropolitan Sewerage District's 2019 Clean Water Act permit requires enough green infrastructure capacity to retain 50 million gallons of stormwater using natural solutions.⁷² These natural stormwater solutions, such as wetlands, green roofs, and stormwater trees, serve double duty by also helping mitigate climate change; reducing urban heat islands and air pollution; and preventing drought by capturing and storing water in the soil and aquifers, rather than funneling the water off the land and leaving the soils dry and aquifers depleted.⁷³ As noted above, green infrastructure could reasonably be classified as part of either the built or natural environment; there is no reasonable debate, however, that by seeking natural solutions, the city achieved multiple environmental, economic, and public health co-benefits.

V. Intersections of Agricultural Law with Climate Change and Health

As with environmental law, agricultural law is intimately concerned with the natural environment, and with human interactions with the natural environment. Agricultural land makes up about 40 percent of the landmass of the United States, and the Farm Bill, the nation's recurring multi-year omnibus agri-

cultural law, currently has an annual budget of about \$85 billion per year. No sector of the economy is more dependent upon the weather than agriculture. Many of the same changing climate patterns which threaten human health threaten agricultural production. Agricultural law and policy offer opportunities for potential collaboration and innovation to reduce and reverse the health impacts of climate change, if public health and public health law are open to those opportunities.

A. The Methods, Purpose, and Insights of Agricultural Law

While public health law has undergone a period of rapid development and expansion of its scope, and environmental law has largely emerged over the last 50 years, agricultural law has experienced its own evolution. Agricultural law was long dominated by “agricultural exceptionalism,” rooted in the fact that food

surprising extent upon the power to alter the socio-economic environment, rather than upon the direct regulation utilized in environmental law.

In 2009, Susan Schneider, agricultural law professor and director of the L.L.M. program in agricultural and food law at the University of Arkansas, called for a “reconsideration” of agricultural law and policy in order to “address the unique aspects of agricultural production, the fragility of the environment, and the fundamental need for healthy food.”⁷⁵ Schneider argued that “Agricultural law’ should be recast as the law of food, farming, and sustainability, with the sustainable production and delivery of healthy food to consumers as its central goal.” Her article, which has since grown into two editions of a textbook and a website dedicated to the law of food, farming, and sustainability, was well-timed. Interest in healthy, local, organic foods had been piqued by influences

Like clean air and clean water, healthy soil is a public good, and public health law as a legal discipline is well suited to collaborate with thought leaders in environmental and agricultural law to develop and encourage adoption of the most effective natural solutions.

and farming play a unique role in the economy, history, and culture of the United States. Influenced by notions of farming as a way of life and a cornerstone of rural communities, the prevailing view among lawmakers has been that agriculture should be subject to its own laws and exempt from many legal requirements applicable to other businesses and industries. These exemptions to generally applicable environmental and labor laws, which continue to be endorsed by many lawmakers and agricultural lawyers, tend to be less protective of public health.

Unlike public health law, which is most importantly state and local law, agricultural law is dominated by federal law, especially the Farm Bill. The Farm Bill is renewed every 4 to 6 years. The current Farm Bill was enacted in 2018 and is scheduled to be in effect until 2023.⁷⁴ One title, and about 75% of the spending, of the Farm Bill is dedicated to nutrition programs. Other titles are concerned with supporting production of commodities (largely corn, soybeans, wheat, rice, and cotton), crop insurance, conservation programs, agricultural credit and loan programs, trade, research, rural development, energy, horticulture, and forestry. In its focus upon addressing hunger, malnutrition, and food insecurity as well as upon providing a safety net for farmers, agricultural law rests to a perhaps

as disparate as publication of Michael Pollan’s *Omnivore’s Dilemma*, celebrity chef Jamie Oliver’s efforts to improve school lunches in the United Kingdom, a major commitment by the Robert Wood Johnson Foundation to tackle childhood obesity, and support for policy, systems, and environmental change to support healthy eating and active living through the Community Transformation Grants under the American Recovery and Reinvestment Act of 2009.

Equity has emerged as a concern in agricultural law as well. A landmark class action lawsuit brought by African-American farmers against the U.S. Department of Agriculture and settled in 1999, began to address decades of governmental discrimination.⁷⁶ Similar class action lawsuits were brought by Native American, female, and Latinx farmers, all of whom experienced governmental discrimination which accelerated the loss of farmland and contributed to the rise in larger, more industrialized, farms. A major factor in Black land loss has been a higher rate of farm owners who die intestate, sometimes leaving title to the farm unclear or highly fractionated, and creating obstacles to participation in USDA programs for agricultural credit, disaster recovery, and conservation. Together with adoption of a model law, the Uniform Partition of Heirs Property Act, in a growing number

of states, highly technical but important provisions of the 2018 Farm Bill provided a pathway for more affected heirs to participate in USDA programs.⁷⁷ Concern about the aging of the farming population and data demonstrating that fewer families were “passing on the farm” prompted interest in laws and policies to support beginning farmers, including farmers who had immigrated to the United States.⁷⁸

Rather than focusing solely on agricultural production, there has been a growing appreciation of the importance of food systems, including production, transportation, processing, distribution, access, sale, preparation, consumption, and disposal of food waste, among agricultural lawyers and others.⁷⁹ Consumer preferences for local and regional foods, sustainably produced, have begun to influence the Farm Bill at the margins, though shifting the fundamental logic and design of such a massive piece of legislation will require persistence, leverage, and broad political will.⁸⁰ Indeed, food law and policy has emerged as a distinct academic field.⁸¹ Agricultural practice and law are beginning to address climate change more directly, through USDA’s regional climate hubs, through the Farm Bill and other laws, and through legal scholarship.⁸² Like environmental law, agricultural law is a resource for potential tools, expertise, and capacity to create the conditions for people to be healthy, in this instance, largely by employing economic incentives which influence the land use decisions of individual farmers as well as broader food systems. One conceptual thread linking environmental law and agricultural law, and arguably public health law, is the need to address the natural environment in order to shape outcomes.

B. Carbon Sequestration and Healthy Soils

Anyone who has tried to launch a community garden or similar urban agriculture effort, only to be halted by lead-contaminated soil, has first-hand experience with the importance of healthy soil to nutrition and public health, but the connections are more substantial than that.⁸³ Healthy soil has the capacity to absorb water, reduce erosion, slow down storm-water runoff and provide protection against drought. By sustaining trees, grasses, crops, and other plants, healthy soil supports the removal of carbon dioxide from the atmosphere and its storage in plants, including decomposing plants. This process is known as carbon sequestration, and it can mitigate climate change and contribute to more stable weather patterns.

The 2018 Farm Bill included an unprecedented number of provisions to improve soil health, such as a pilot Soil Health and Income Protection Program and provisions to facilitate the use of data to promote

soil health.⁸⁴ The conservation title, in particular, contained provisions to provide technical assistance, cost-share assistance, and direct payments to encourage farmers to implement farming practices (such as rotating crops and planting cover crops to prevent soil erosion and restore nutrients; changing or reducing tillage to prevent exposing bare soil; and management intensive grazing to maintain pasture quality) that benefit both their own bottom line and the common good. A growing number of states have adopted laws to support healthy soils.⁸⁵ Related laws which encourage or require composting food waste are another pathway to mimic natural solutions, seeking both to reduce emissions from landfills and incinerators and to capture the benefits of healthy soils.

As alluded to in the reference to community gardens and lead-contaminated soils, public health is already concerned with healthy soils. Certainly agricultural lawyers begin with a greater baseline of knowledge and experience regarding the Farm Bill and healthy soils, but public health and public health lawyers could be powerful allies and supporters. Environmental lawyers, with their focus upon direct regulation to secure clean water and clean air, may have less experience with healthy soils, though laws focused upon Superfund cleanup and brownfields remediation may provide insight. Like clean air and clean water, healthy soil is a public good, and public health law as a legal discipline is well suited to collaborate with thought leaders in environmental and agricultural law to develop and encourage adoption of the most effective natural solutions.

VI. Embracing the Power to Change the Natural Environment as Part of the Public Health and Public Health Law Toolbox

Public health practice and public health law are constantly evolving. As public health continues to respond to the health impacts of climate change, the power to change the natural environment should be considered one tool in the public health law toolbox. Naming the natural environment as an object of public health law does not pre-determine how public health law will approach the natural environment, or whether litigation, regulation, or providing incentives will prove the most effective means. Rather, it means that the natural environment is one of the conditions that influences the ability of people to be healthy. By assessing (whether informally or through a formal environmental impact statement or health impact assessment) how the natural environment is currently affecting human health and projecting likely future effects, public health practitioners gain insight and information regarding public health threats and opportunities.

Public health practitioners may be able to incorporate improving the natural environment into their existing work, or they may be able to incorporate it into long-term public health planning, or they may engage in planning specifically concerned with the natural environment and climate change.⁸⁶

Public health lawyers may consider the natural environment as an object of public health law in at least two ways. By taking a Health in All Policies approach, and monitoring developments in environmental and agricultural law, they may become aware of opportunities to advance a public health perspective before environmental and agricultural policy-makers, and to suggest modifications to legal solutions being considered that may either increase health benefits or decrease health harms. In addition, by maintaining awareness of developments in environmental and agricultural law, public health lawyers may be exposed to innovative legal approaches to address the environment as a social determinant of health in order to advance public health goals related to climate change identified by a wider range of stakeholders.

In practice, embracing the power to change the natural environment as reasonably within the purview of public health law is simply a manifestation of broader trends in public health, such as Health in All Policies and Public Health 3.0. To some extent, the particular ways in which the power to change the natural environment in order to reduce the health impacts of climate change will take shape remain to be seen.⁸⁷ Broadly speaking, however, a focus upon the natural environment appears to lend itself to primary prevention strategies, with an emphasis on natural solutions and blue-green infrastructure.

Practitioners, advocates, decision-makers, and attorneys need to see the natural environment as a resource in order to unleash its full potential to support population health. As has been noted above, a similar evolution has taken place in the public health (law) approach to the built environment.⁸⁸ Frontline communities, environmentalists, and public health practitioners are not waiting for developments in legal doctrine in order to act, but when developments in legal doctrine catch up, they may help spread practical innovation. An excellent guide to support local health departments seeking to address climate change, health, and equity is already available to provide guidance.⁸⁹ Certain types of interventions, such as natural solutions and green infrastructure, are beginning to develop a track record of reduced costs, reduced environmental harms, reduced human health harms, and, frequently, affirmative benefits. Robust Health Impact Assessments help potentially affected individuals and

communities to make informed decisions about proposed projects.⁹⁰

The U.S. Climate and Health Alliance has garnered support from public health associations and health care systems for a Policy Action Agenda that aims to ameliorate the harmful health impacts of climate change.⁹¹ Among the top ten priorities of the Policy Action Agenda are “[p]romote healthy, sustainable and resilient farms and food systems, forests, and natural lands,” and “[e]nsure that everyone in the U.S. has access to safe and affordable drinking water and a sustainable water supply.” Public health practitioners, health care providers, and public health lawyers likely need not become experts on the intricacies of their property as it relates to eligibility to participate in USDA programs. However, to most effectively educate their constituents and advance their public health goals, they may be well served to gain sufficient basic knowledge of the Farm Bill to enable them to make an informed comparison of Farm Bill proposals that may appear to be similar in their broad outlines, but may differ in their details and yield dissimilar health and economic outcomes.⁹²

As this article was being reviewed and finalized in the summer of 2020, the United States enacted the Great American Outdoors Act.⁹³ At first blush, one could forgive a public health lawyer for dismissing this law as wholly concerned with natural resource management at the national parks, perhaps with job creation as a minor adjunct. However, by authorizing long-delayed improvements to amenities, the Act may have a long-term, positive impact on the economy near regions with a national park. The Great American Outdoors Act is not limited to national parks, but also provides some competitive funding for state and local parks. Equitable access to green space, such as that afforded by public parks, is a key aspect of centering the natural environment from a health perspective.⁹⁴ Green space can provide relief from the urban heat island effect, reduce stormwater runoff, provide a venue for physical activity and stress relief, and improve mental health. Public health practitioners and lawyers should take heed — the Great American Outdoors Act is focused upon the natural environment and it is squarely within their scope of interest.

Green schoolyards are the sort of cross-sector collaboration that can produce multiple co-benefits by restoring and re-creating a more natural environment, from reduced flooding, to enhanced carbon sequestration, and increased stress management for kids.⁹⁵ One powerful example is Space to Grow Chicago, a collaboration of Chicago Public Schools, the Chicago Department of Water Management, Metropolitan Water

Reclamation District of Greater Chicago, with support from the Healthy Schools Campaign and Openlands.⁹⁶ Prioritizing flood-prone, under-served schools and communities, Space to Grow Chicago brings together the financial and technical resources of the water utilities with the land base and educational expertise of the schools to create green schoolyards which lower stress levels in kids and, at the same time, replace asphalt with soil, grasses, plants, and trees with a greater capacity to capture carbon and absorb storm-water runoff. Outdoor learning initiatives are also garnering attention in the summer of 2020 for their potential to support physical distancing and slow the spread of COVID-19.⁹⁷

Explicitly naming the power to change the natural environment as a tool of public health law will strengthen the ability of public health law to address the health impacts of climate change, particularly among those most severely affected. Public health law can provide a counter-balance to the tendency of environmental law to limit itself to an overall reduction in pollution, rather than a more affirmative and inclusive goal of improved health for all, beginning with the most vulnerable. Similarly, public health law can counter-balance the tendency of agricultural law to prioritize the economic well-being of individual farmers and the food production and distribution industries as a whole, to the neglect of protecting the natural environment and disrupting discrimination and disparities. If the public health field is to assume a greater leadership role in addressing the health impacts of climate change, it must embrace the power to change the natural environment, in collaboration with thought leaders in environmental and agricultural law.

VII. Conclusion

It is their goal of using law and policy in order to create the conditions for people to be healthy that marks the efforts of public health lawyers and practitioners as grounded in public health and public health law. The natural environment affects health outcomes, and thus, the natural environment is a proper object of public health law. Environmental law and agricultural law each have long histories of engagement with the natural environment, and they both have much to offer public health practitioners and lawyers who seek to mitigate the effects of and adapt to the health impacts of climate change.

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References

1. L.O. Gostin and L.F. Wiley, *Public Health Law: Power, Duty, Restraint* (Oakland, CA: University of California Press, 2016): at 28–33.
2. *Id.*, at 4.
3. *Id.*, at 28–33.
4. *Id.*, at 28 (citing J.P. Koplan and D.W. Fleming, “Current and Future Public Health Challenges,” *Journal of the American Medical Association* 284, no. 13–33 (2000): 1696–1698).
5. L. O. Gostin and L.F. Wiley, *supra* note 1, at 216–219.
6. *Id.*, at 405–406, 536–538.
7. M. Berman, “Defining the Field of Public Health Law,” *DePaul Journal of Health Care Law* 45, no. 15 (2013): 85–86 (discussing T.S. Aagaard, “Environmental Law as a Legal Field: An Inquiry in Legal Taxonomy,” *Cornell Law Review* 221 (2010): 242).
8. J. Gundlach and J. Klein, “The Built Environment,” in M. Burger and J. Gundlach eds., *Climate Change, Public Health and the Law* (Cambridge University Press Publishers Press, 2018): 122–167, 122–123, citing M. Younger et al., “The Built Environment, Climate Change, and Health: Opportunities for Co-Benefits,” *American Journal of Preventative Medicine* 35, no. 5 (2008): 517–526.
9. Centers for Disease Control and Prevention, “Elimination of Malaria in the United States (1947 – 1951),” *available at* <https://www.cdc.gov/malaria/about/history/elimination_us.html> (last visited August 10, 2020).
10. L. Rudolph et al., “Health in All Policies: Improving Health Through Intersectoral Collaboration,” Discussion Paper, National Academy of Medicine, Washington, DC (2013): at 1.
11. Centers for Disease Control and Prevention, *Prevention, available at* <https://www.cdc.gov/pictureofamerica/pdfs/Picture_of_America_Prevention.pdf> (last visited August 10, 2020).
12. *Id.*
13. When addressing climate change, such measures are necessarily more likely to focus on pollution reduction measures and changes in the natural environment, unlike secondary and tertiary measures that focus on increasing access to treatment and information via screening and disease management tools that are implemented after a disease or hazard is already present. See for example, Wis. Stat. § 254.22(2), requiring the Wisconsin Department of Health Services to, among other things, “assist local health departments in the adoption of regulations that establish standards for indoor air quality in public buildings to protect the occupants from adverse health effects due to exposure to chemical or biological contaminants.”
14. L.O. Gostin et al., “The Legal Determinants of Health: Harnessing the Power of Law for Global Health and Sustainable Development,” *The Lancet Commissions* 393, No. 10183 (2019): 1857–1910, at 1833.
15. *Id.*
16. J. Krueger and C. Healy Boufides, “The Public Health Sector’s Challenges and Responses,” in M. Burger and J. Gundlach eds., *Climate Change, Public Health and the Law* (Cambridge University Press Publishers Press, 2018): 34–72.
17. K. Syrett, “Doing ‘Upstream’ Priority-Setting for Global Health with Justice: Moving from Vision to Practice?” *Public Health Ethics* 11, no. 3 (2018): 265–274.
18. C. Tessum et al., “Inequity in Consumption of Goods and Services Adds to Racial-Ethnic Disparities in Air Pollution Exposure,” *Proceedings of the National Academy of Sciences* 116, no. 13 (2019), 6001–6006.
19. L. Rudolph et al., “Climate Change, Health, and Equity: A Guide for Local Health Departments (Public Health Institute and American Public Health Association: Oakland, CA and Washington, D.C. 2018) (citing S. Gould and L. Rudolph, “Why We Need Climate, Health, and Equity in All Policies,”

- Commentary, National Academy of Medicine, 2014, available at <<https://doi.org/10.31478/201412e>> (last visited September 29, 2020).
20. N. Kabish et al., eds., *Nature-based Solutions to Climate Change Adaptation in Urban Areas: Linkages Between Science, Policy and Practice* (Springer Nature: Cham, Switzerland, 2017).
 21. World Wildlife Fund International, *Climate Nature, and our 1.5° future: A Synthesis of IPCC and IPBES Reports* (2019), available at <https://wwf.awsassets.panda.org/downloads/wwf_climate_nature_and_our_1_5c_future_report.pdf> (last visited August 10, 2020).
 22. H. Luedke, "Fact Sheet: Nature as Resilient Infrastructure: An Overview of Nature-Based Solutions," Environmental and Energy Study Institute (2019), available at <<https://www.eesi.org/papers/view/fact-sheet-nature-as-resilient-infrastructure-an-overview-of-nature-based-solutions>> (last visited August 10, 2020).
 23. South Carolina Forestry Commission, "Benefits of Urban Trees," available at <<https://www.state.sc.us/forest/urbben.htm>> (last visited August 10, 2020); United States Environmental Protection Agency, "Climate Change and Heat Islands," March 1, 2019, available at <<https://www.epa.gov/heat-islands/climate-change-and-heat-islands>> (last visited August 10, 2020); United States Environmental Protection Agency, "Using Trees and Vegetation to Reduce Heat Islands," Dec. 16, 2019, available at <<https://www.epa.gov/heat-islands/using-trees-and-vegetation-reduce-heat-islands>> (last visited August 10, 2020).
 24. J. Bastin, et al., "The Global Tree Restoration Potential," *Science* 365 (2019): 76-79.
 25. In Miami-Dade County, landscape ordinances establish minimum tree standards and require the planting of trees in energy conservation zones. See Miami-Dade County, Florida, Landscape Code § 18A-1. Cities like Bozeman, Montana and Los Angeles, California have developed Urban forestry management plans that incentivize tree canopy, prescribe tree maintenance and care protocols, or prioritize the use of government funds to more equitably distribute street trees and other trees planted on government properties. Bozeman, Montana, *Urban Forestry Project*, available at <<https://www.bozeman.net/home/showdocument?id=3621>> (last visited August 10, 2020). Where funding becomes a barrier to meeting tree planting goals, some communities, such as Austin, Texas are piloting carbon credit programs that utilize carbon credits paid for by the private sector to fund tree planting and maintenance. M. Dolan, "Carbon Offsets for Urban Trees Are on the Horizon: Austin, Texas and King County, Washington, are testing carbon credits for planting and protecting trees," Bloomberg CityLab (Aug. 28, 2018), available at <<https://www.bloomberg.com/news/articles/2018-08-28/why-cities-are-piloting-carbon-credits-for-urban-trees>> (last visited August 10, 2020).
 26. M.C. Kondo et al., "Health Impact Assessment of Philadelphia's 2025 Tree Canopy Cover Goals," *Lancet Planet Health* 4 (2020): e149-157.
 27. M. Anderson, N. Eckert, and S. McMinn, "Trees Are Key to Fighting Urban Heat — But Cities Keep Losing Them," available at <<https://www.npr.org/2019/09/04/755349748/trees-are-key-to-fighting-urban-heat-but-cities-keep-losing-them>> (last visited Aug. 10, 2020); M. Anderson, "Racist Housing Practices from the 1930s Linked to Hotter Neighborhoods Today," National Public Radio (Jan. 14, 2020) available at <<https://www.npr.org/2020/01/14/795961381/racist-housing-practices-from-the-1930s-linked-to-hotter-neighborhoods-today>> (last visited Aug. 10, 2020).
 28. M. Painter and P. Gandhi, "How Communities are Promoting Health and Responding to Climate Change," Culture of Health Blog, September 30, 2019, available at <<https://www.rwjf.org/en/blog/2019/09/how-communities-are-promoting-health-and-responding-to-climate-change.html>> (last visited August 10, 2020).
 29. United States Environmental Protection Agency, Green Infrastructure for Climate Resiliency, September 1, 2016, available at <<https://www.epa.gov/green-infrastructure/green-infrastructure-climate-resiliency>> (last visited August 10, 2010).
 30. C.L. Anderson, "Climate Change and Infrastructure," *Houston Journal of Health Law and Policy* 18 (2018): 1-28.
 31. See for example: Tribal Adaptation Menu Team, 2019, *Dibaginjigaadeg Anishinaabe Ezhitwaad: A Tribal Climate Adaptation Menu* (Great Lakes Indian Fish and Wildlife Commission, Odanah, Wisconsin).
 32. *Id.*
 33. Swinomish Indian Tribal Community, Office of Planning and Community Development, *Swinomish Climate Change Initiative, Climate Adaptation Action Plan* (October 2010): at 50-51.
 34. J. S. Hipp and C. D. Duren, *Regaining Our Future, An Assessment of Risk and Opportunities for Native Communities in the 2018 Farm Bill* (June 2017); USDA Climate Hubs, Department of Agriculture, "Tribal Food Sovereignty and climate Change Preparedness of Tribal Agriculture," available at <<https://www.climatehubs.usda.gov/hubs/southwest/news/tribal-food-sovereignty-and-climate-change-preparedness-tribal-agriculture>> (last visited August 10, 2020).
 35. Northern Arizona University, "Traditional Knowledge, First Foods and Climate Change," available at <https://www7.nau.edu/itep/main/tcc/Tribes/tdk_foods> (last visited August 10, 2020).
 36. X. Wu et al., "Exposure to Air Pollution and COVID-19 Mortality in the United States: A Nationwide Cross-Sectional Study," medRxiv (2020), available at <<https://www.medrxiv.org/content/10.1101/2020.04.05.20054502v2.full.pdf>> (last visited Septmeber 30, 2020); Y. Cui et al., "Air Pollution and Case Fatality of SARS in the People's Republic of China: An Ecologic Study," *Environmental Health* 2 (2003): 15.
 37. Harvard T.H. Chan School of Public Health Center for Climate, Health, and the Global Environment, "Coronavirus, Climate Change, and the Environment, A Conversation on COVID-19 with Dr. Aaron Bernstein, Director of Harvard," available at <<https://www.hsph.harvard.edu/c-change/subtopics/coronavirus-and-climate-change/>> (last visited August 10, 2020); Centers for Disease Control and Prevention, "Coronavirus Disease 2019 (COVID-19): People with Certain Medical Conditions," available at <<https://www.cdc.gov/coronavirus/2019-ncov/need-extra-precautions/people-with-medical-conditions.html>> (last visited August 10, 2020).
 38. C. Le Quéré et al., "Temporary Reduction in Daily Global CO₂ Emissions During the COVID-19 Forced Confinement," *Nature Climate Change* 10 (2020): 647-653.
 39. K. Chen et al., "Air Pollution Reduction and Mortality Benefit During the COVID-19 Outbreak in China," *Lancet Planet Health* 4, no. 6 (2020): e210-e212.
 40. S. Ferrey, *Environmental Law, Examples and Explanations, Second Edition* (New York, NY: Aspen Publishers, 2001); D.A. Farber, *Environmental Law in a Nutshell: Tenth Edition, Tenth Edition* (St. Paul, MN: West Academic Publishing, 2019); D.A. Farber, A.E. Carlson, and W. Boyd, *Cases and Materials on Environmental Law, Tenth Edition* (St. Paul, MN: West Academic Publishing, 2019); G. Hardin, "The Tragedy of the Commons," *Science* 162, no. 3859 (1968): 1243-48, at 1244-45.
 41. S. Ferrey, *supra* note 40.
 42. S. Ferrey, *supra* note 40.
 43. 33 U.S.C. § 1251.
 44. 42 U.S.C. § 7401. See also *Massachusetts v. EPA*, 549 U.S. 497, 532-535 (2007).
 45. J. Gundlach, "How Existing Environmental Laws Respond to Climate Change and Its Mitigation," in M. Burger and J. Gundlach eds., *Climate Change, Public Health and the Law* (Cambridge University Press Publishers Press, 2018): 373-379, 386.
 46. 33 U.S.C. § 1302.

47. However, there are opportunities for older facilities to phase in this new technology when the costs are too high.
48. United States Environmental Protection Agency, Office of Water, *Fact Sheet: 303(d) Listed Impaired Waters State, Watershed and National Geospatial Datasets*, January 2010, available at <https://www.epa.gov/sites/production/files/2015-09/documents/2010_1_28_tmdl_results_303d_impaired_waters_gis.pdf> (last visited Aug. 10, 2020).
49. Editorial, "Environmental Racism: Time to Tackle Social Injustice," *The Lancet Planetary Health* 2, no. 11 (2018): e462.
50. T. Liu et al., "Critical Analysis of the Value of Drought Information and Impacts on Land Management and Public Health," *Water* 12, no. 4 (2020): 1064-1080; Centers for Disease Control and Prevention, U.S. Environmental Protection Agency, National Oceanic and Atmospheric Agency, and American Water Works Association, *When Every Drop Counts: Protecting Public Health During Drought Conditions — a Guide for Public Health Professionals* (2010); Centers for Disease Control and Prevention, National Center for Environmental Health, *Preparing for the Health Effects of Drought, A Resource Guide for Public Health Professionals* (Feb 2018).
51. C. Ganesh and J. Smith, "Climate Change, Public Health, and Policy: A California Case Study," *American Journal of Public Health* 108, no. S2 (2018): S114-S119
52. *Id.*
53. R.K. Craig, "Drought and Public Necessity: Can A Common-Law "Stick" Increase Flexibility In Western Water Law?" *Texas A & M Law Review* 6, no. 77 (2018).
54. Great Lakes-St. Lawrence River Basin Water Resources Compact, §1.3.1.d-e, Pub. L. No. 110-342, 122 Stat. 3739 (2008).
55. M.K. Scanlan, J.H. Sinykin, J. Korhelski, "Realizing the Promise of the Great Lakes Compact: A Policy Analysis for State Implementation," *Vermont Journal of Environmental Law* 8, no. 1 (2006): 39-99; R. Ross, "Opening the Floodgates and Draining the Great Lakes One Bottle at a Time: How Privatizing Water Resources Threatens the Great Lakes," *University of Denver Water Law Review* (2012): 97
56. Great Lakes-St. Lawrence River Basin Water Resources Compact, *supra* note 66.
57. J. Casey, "Note: Irrigating Industry: Is the Great Lakes Compact Being Drowned for Industrial Gain?" *University of Illinois Law Review* (2020): 307-340.
58. See more information about Water Train at Water Train, "The Pending Water Crisis," available at <<https://www.watertrain.us/sample-page/getting-ready-for-the-pending-water-crisis/>> (last visited August 10, 2020).
59. See E. Adler, "Railway Proposes Shipping 500 Million Gallons of Minnesota Water a Year to the Southwest," *Star Tribune*, October 31, 2019, available at <<https://www.startribune.com/lakeville-company-proposes-drilling-wells-and-shipping-500-million-gallons-of-water-by-rail-to-the-southwest/564167942/>> (last visited August 10, 2020); K. Marohn, "Shipping Minnesota Water to Sate a Thirsty World: Could it Happen?" Minnesota Public Radio, November 5, 2019, available at <<https://www.mprnews.org/story/2019/11/05/shipping-minnesota-water-to-sate-a-thirsty-world-could-it-happen>> (last visited August 10, 2020).
60. Minn. Stat. § 103G.271, Subd. 4a
61. National Integrated Drought Information System, NDIS Summit Connects Drought and Public Health (January 27, 2019), available at <<https://www.drought.gov/drought/news/ndis-summit-connects-drought-and-public-health>> (last visited August 10, 2020); CDC, *supra* note 50.
62. United States Environmental Protection Agency, How EPA Regulates Drinking Water Contaminants, available at <<https://www.epa.gov/sdwa/how-epa-regulates-drinking-water-contaminants#requirements>> (last visited August 10, 2020).
63. United States Environmental Protection Agency, *Protect Your Private Well*, February 2018, available at <<https://www.epa.gov/sites/production/files/2018-02/documents/epa-ogwdw-private-wells-v4.pdf>> (last visited August 10, 2020); M.H. Ward et al., "Drinking Water Nitrate and Human Health: An Updated Review," *International Journal of Environmental Research and Public Health* 15, no. 7 (2018): 1557-1587; Minnesota Department of Agriculture, Fertilizer as a Source of Groundwater," available at <<https://www.mda.state.mn.us/fertilizer-source-nitrate-groundwater>> (last visited August 10, 2020); National Association of Local Boards of Health, *Understanding Concentrated Animal Feeding Operations and Their Impact on Communities*, 2010, available at <https://www.cdc.gov/nceh/ehs/docs/understanding_cafos_nalboh.pdf> (last visited August 10, 2020).
64. United States Environmental Protection Agency, *Toxic Algae Starts Upstream*, available at <<https://www.epa.gov/sites/production/files/styles/large/public/2014-05/toxicalgae.jpg>> (last visited August 10, 2020); I. Delpla et al., "Impacts of Climate Change on Surface Water Quality in Relation to Drinking Water Production," *Environment International* 35, no. 8 (2009): 1225-1233; M. Steffen et al., "Ecophysiological Examination of the Lake Erie Microcystis Bloom in 2014: Linkages between Biology and the Water Supply Shutdown of Toledo, OH," *Environmental Science & Technology* 51, no. 12 (2017): 6745-6755; Wilhelm; Wisconsin Harmful Algal Blooms Program, Bureau of Environmental and Occupational Health, *Harmful Algal Blooms Toolkit, A Planning Guide for Public Health and Emergency Response Professionals*, May 2019, available at <<https://www.dhs.wisconsin.gov/publications/p0/p00853.pdf>> (last visited August 10, 2020); Wilhelm; Wisconsin Harmful Algal Blooms Program, Bureau of Environmental and Occupational Health, *Harmful Algal Blooms Toolkit, A Planning Guide for Public Health and Emergency Response Professionals*, available at <<https://www.dhs.wisconsin.gov/publications/p0/p00853.pdf>> (last visited September 30, 2020).
65. University of Wisconsin-Madison Extension Iowa County, Southwest Wisconsin Groundwater and Geology Study, 2019, available at <<https://iowa.extension.wisc.edu/natural-resources/swigg/>> (last visited August 10, 2020); M.H. Ward, et al., *supra* note 63.
66. National Association of County and City Health Officials, *Statement of Policy, Concentrated Animal Feeding Operations*, June 2018, available at <<https://www.naccho.org/uploads/downloadable-resources/18-06-Concentrated-Animal-Feeding-Operations.pdf>> (last visited August 10, 2020).
67. Winona County, Minnesota Zoning Ordinance, Chapter 8 (2019); Town of Saratoga Livestock Operation Ordinance, Ordinance 11-30-16.
68. E. Hood, "Tap Water and Trihalomethanes: Flow of Concerns Continues," *Environmental Health Perspectives* 113, no. 7 (2005): A474.
69. CDC, *supra* note 50.
70. The PEW Charitable Trusts, "Milwaukee Uses Regulations to Support Nature-Based Solutions to Reduce Flooding," November 19, 2019, available at <<https://www.pewtrusts.org/en/research-and-analysis/issue-briefs/2019/11/milwaukee-uses-regulations-to-support-nature-based-solutions-to-reduce-flooding>> (last visited August 10, 2020).
71. D. Behm, "New Wastewater Discharge Permit Requires 'Green Infrastructure,'" *Milwaukee Journal Sentinel*, July 22, 2012, available at <<http://archive.jsonline.com/news/milwaukee/new-permit-requires-rooftop-plantings-other-green-infrastructure-0m65c7j-163354726.html>> (last visited August 10, 2020). Milwaukee's work to reverse a trend of past sewage overflows also included adoption of an ordinance requiring new development and redevelopment over one acre to utilize enough green infrastructure practices to reduce the amount of rainfall that will directly enter into the city's combined sewer system. Milwaukee, Wisconsin, Code of Ordinances, Ch. 120.
72. State of Wisconsin Department of Natural Resources, *Permit to Discharge Under the Wisconsin Pollutant Discharge Elimination System, Milwaukee Metropolitan Sewage District Combined*, April 1, 2019, available at <<https://www.mmsd.com/>>

- application/files/7615/5412/5872/MMSD_Permit_FINAL_signed.pdf> (last visited August 10, 2020).
73. *Id.*; Georgetown Climate Center, Green Infrastructure Toolkit, available at <<https://www.georgetownclimate.org/adaptation/toolkits/green-infrastructure-toolkit/introduction.html?full>> (last visited August 10, 2020).
 74. Agriculture Improvement Act of 2018, Pub. L. # 115-334 (Dec. 20, 2018).
 75. S.A. Schneider, "A Reconsideration of Agricultural Law: A Call for the Law of Food, Farming, and Sustainability," *William & Mary Environmental Law and Policy Review* 34, no. 3 (2010): 935-963.
 76. S. Carpenter, "An Overview of USDA Discrimination Cases: Pigford, In re Black Farmers, Keepseagle, Garcia, and Love," *Drake Journal of Agricultural Law* 17 (2012): 1-35.
 77. N.D. Hamilton, "America's New Agrarians: Policy Opportunities and Legal Innovations to Support New Farmers," *Fordham Environmental Law Review* 22, no. 3 (2011): 523-562.
 78. T.W. Mitchell, "Historic Partition Law Reform: A Game Changer for Heirs' Property Owners," Texas A&M University School of Law Legal Studies Research Paper No. 19-27 (2019).
 79. J.E. Krueger, K.R. Krub, and L.A. Hayes, *Planting the Seeds for Public Health: How the Farm Bill Can Help Farmers to Produce and Distribute Healthy Foods*, Farmers' Legal Action Group, Inc., 2010; R.A. Neff, K. Merrigan, and D. Wallinga, "A Food Systems Approach to Healthy Food and Agriculture Policy," *Health Affairs* 34, no. 11 (2015): 1908-1915.
 80. C. Dimitri and A. Effland, "From Farming to Food Systems: The Evolution of US Agricultural Production and Policy into the 21st Century," *Renewable Agriculture and Food Systems* (2018): 1-16.
 81. E.M. Broad Leib and B.J. Linnekin, "Food Law & Policy: An Essential Part of Today's Legal Academy," *Journal of Food Law and Policy* 13 (2018): 228-271.
 82. L. Ristino, "Surviving Climate Change in America: Toward a Rural Resilience Framework," *Western New England Law Review* 41, no. 3 (2019): 521-542; T. Edwards and M. Russell, "Earth Friendly Agriculture for Soil, Water, and Climate: A Multijurisdictional Cooperative Approach," *Drake Journal of Agricultural Law* 21, no. 3 (2016): 325-360; National Sustainable Agriculture Coalition, *Agriculture and Climate Change: Policy Imperatives and Opportunities to Help Producers Meet the Challenge* (Washington, DC, 2019).
 83. J.J. Steffan et al., "The Effect of Soil on Human Health: An Overview," *European Journal of Soil Science* 69, no. 1 (2018): 159-171.
 84. K. Harrigan and A. Charney, *Impact of 2018 Farm Bill Provisions on Soil Health*, Soil Health Institute and National Sustainable Agriculture Coalition, 2019, available at <<https://www.nyuelj.org/2018/02/soil-conservation-in-california-an-analysis-of-the-healthy-soils-initiative/>> (last visited August 10, 2020).
 85. D. Desai, "Soil Conservation in California: An Analysis of the Healthy Soils Initiative," *New York University Environmental Law Journal Environmental Law Review Syndicate*, February 2, 2018, available at <<https://www.nyuelj.org/2018/02/soil-conservation-in-california-an-analysis-of-the-healthy-soils-initiative/>> (last visited August 10, 2020). See also <<https://calclimateag.org/healthy-soils-program-sees-record-demand-despite-pandemic-22-million-in-incentives-grants-announced/>> (last visited September 30, 2020).
 86. J. Krueger and C. Healy Boufides, "The Public Health Sector's Challenges and Responses," in M. Burger and J. Gundlach eds., *Climate Change, Public Health and the Law* (Cambridge University Press Publishers Press, 2018): 52-53.
 87. There are many options. See M. B. Gerrard and J. C. Dernbach, eds., *Legal Pathways to Deep Decarbonization in the United States*, Environmental Law Institute (2018).
 88. S. Burris, M. Berman, M. Penn, and T. Ramanathan Holiday, *The New Public Health: A Transdisciplinary Approach to Practice and Advocacy* (New York: Oxford University Press, 2018) at 84-85.
 89. L. Rudolph et al., *Climate Change, Health, and Equity: A Guide for Local Health Departments* (Public Health Institute and American Public Health Association: Oakland, CA and Washington, DC, 2018).
 90. A.L. Dannenberg, B. Rogerson, L. Rudolph, "Optimizing the Health Benefits of Climate Change Policies Using Health Impact Assessments," *Journal of Public Health Policy* 41 (2019): 139-154.
 91. U.S. Call to Action on Climate, Health, and Equity: A Policy Action Agenda (2020), available at <climatehealthaction.org> (last visited November 9, 2020).
 92. Compare the Agriculture Resilience Act (House Bill 5861) with the Growing Climate Solutions Act (House Bill 7393).
 93. Great American Outdoors Act, Pub. L. # 116-152 (August 4, 2020).
 94. V. Jennings, L. Larson, and J. Yun, "Advancing Sustainability through Urban Green Space: Cultural Ecosystem Services, Equity, and Social Determinants of Health," *International Journal of Environmental Research and Public Health* 13, no. 2 (2016): 196-210.
 95. Healthy Schools Campaign, Openlands, *Green Schoolyards: A Growing Movement Supporting Health, Education, and Connection with Nature*, 2016, available at <<https://healthyschoolscampaign.org/wp-content/uploads/2016/03/GreenSchoolyards.pdf>> (last visited August 10, 2020). Green Schoolyards America, National COVID-19 Outdoor Learning Initiative, available at <<https://www.greenschoolyards.org/covid-learn-outside>> (last visited October 1, 2020) and at <<https://healthyschoolscampaign.org/wp-content/uploads/2016/03/GreenSchoolyards.pdf>> (last visited October 1, 2020).
 96. Space to Grow Chicago, available at <<https://www.spaceto-growchicago.org/>> (last visited October 1, 2020).
 97. Healthy Schools Campaign, Openlands, *Green Schoolyards: A Growing Movement Supporting Health, Education, and Connection with Nature*, 2016, available at <<https://healthyschoolscampaign.org/wp-content/uploads/2016/03/GreenSchoolyards.pdf>> (last visited August 10, 2020); Green Schoolyards America, National COVID-19 Outdoor Learning Initiative, available at <<https://www.greenschoolyards.org/covid-learn-outside>> (last visited October 1, 2020).