

FROM SUBPRIME LOANS TO UNWANTED GREENSPACE:
AN URBAN POLITICAL ECOLOGY OF ECONOMIC CRISIS IN CLEVELAND, OHIO

BY

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DISSERTATION

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ABSTRACT

This dissertation examines tension between the ecology and political economy of land vacancy in former industrial hubs of the US Rust Belt. Following the 2007-2009 economic crisis, Rust Belt cities undertook sweeping demolition campaigns and have sought to repurpose the resulting vacant land for ecosystem services. Yet, calls to ‘green the Rust Belt’ through vacant land re-use tend to foreground its biophysical aspects along with superficial nods to sustainability and environmental justice, rarely engaging with how political economy influences the contemporary geography of land vacancy. This dissertation asks: what does it mean to cast the material effects of economic crisis in ecological terms, and how does that move reshape the way urban decline is understood and managed today? Drawing on evidence from Cleveland, Ohio, I investigate how processes of land clearance and re-use have brought together urban ecology, racial inequality, and property markets to direct the pivot from post-crisis land devaluation towards future land revalorization and reinvestment. First, I review of the ecology of shrinking cities literature, which provides intellectual scaffolding for vacant land re-use practices today. I critique the neo-Malthusian overtones of this literature and argue for engaging the ecology in urban political ecology as a remedy. My intervention enacts this engagement by combining remote sensing analysis with a qualitative case study informed by urban political ecology. I demonstrate that race and property, not population, ‘drives’ post-crisis revegetation, particularly where high foreclosure rates fall in and near the historically redlined area. A case study of a contentious vacant land re-use project argues that White desires dominate the way vacant land is enrolled into ecological stewardship within a broader land holding strategy that stakes a land claim in anticipation of future revalorization. Triangulating in the space between the ‘greening of the redlined area’ and the ‘whitening of greened space’, I argue that the same

mechanisms of colorblind neoliberal racism that transformed racial exclusion into predatory inclusion in subprime loans prior to the crisis is, today, exploiting environmental justice rhetoric to transform historical racial exclusion into predatory inclusion in environmental amenities.

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CHAPTER 1: INTRODUCTION

1.1: Field notes from Cleveland

While conducting site visits in the Slavic Village neighborhood of Cleveland, Ohio, I stopped to photograph an overgrown swath of tall grasses and blooming urban-adapted plants on a vacant lot (Figure 1). Immediately after snapping my picture, a resident came out of a nearby home to confront me, expressing dismay at the apparent lack of management on the site and inveighing at the excessive height and general disorderliness of the vegetation. In the course of my fieldwork, which focused on land vacancy in Cleveland following the 2007-2009 economic crisis, it was not unusual for urban vegetation and its management to become politically charged. Questions around standards of care and the distribution of responsibility for vegetation management often took center stage in the politics of everyday life in neighborhoods like Slavic Village with large and increasing densities of vacant land.

Vacant land is not evenly distributed across Cleveland. The majority of vacant land is concentrated on the east side of the Cuyahoga River, in predominantly Black neighborhoods like Slavic Village. City crews and private land managers struggle to control vegetation in the humid summer climate when plants can grow upward of an inch a day. Residents frequently intervene to fill in maintenance shortfalls with their own unpaid labor. As one resident who invests his own time and money into vacant land management put it to me, *“It was a big problem to me because if that continued, it only gets bigger. If you don't cut the grass, something else is going to happen. It grows just like these weeds are growing, into a bigger problem.”* Many residents I met were quite zealous about keeping vacant lots on their streets mowed, not just to assert certain aesthetic preferences or as a nod to notions of civility and social control but rather to address what they saw as pressing public health and safety issues. Tall grass, for example, is thought to

invite an array of unwanted guests—squatting, dumping, and urban wildlife—all “bigger problems” cited by residents I met in my field work.



Figure 1: Contested arthropod survey site where mowing has been withheld to observe effects of biodiversity. This vacant lot is in Slavic Village, a neighborhood of Cleveland, Ohio, considered to be the ‘epicenter’ of the subprime mortgage crisis, with the most foreclosures of any zip code at the height of the crisis in 2008.

What struck me about this vacant lot, however, was not so much the vegetation itself but rather the series of bright yellow cards tied to t-posts carefully arranged along a transect spanning the length of the parcel. Closer inspection revealed these cards to be sticky traps, placards covered with a thick glue designed to catch insects for the purposes of sampling and monitoring, positioned as part of an arthropod survey conducted by a nearby university’s extension office. Each trap had become encrusted with insects and spiders that had ventured too close to its adhesive surface. The arthropod survey took on an experimental design that aimed to test the effect of varying levels of mowing effort on arthropod biodiversity. This particular lot

was in the no-mow group. However, some residents took umbrage at having the exigencies of scientific experimentation imposed on their neighborhood, it seemed, particularly the requirement that some vacant lots would not be mowed. Somewhere in the space between scientific interest in ecology of vacant lots and the environmental politics of everyday life in Cleveland following the Great Recession of 2007-2009, a conflict was growing, one that pitted “social” and “ecological” ways of thinking about land vacancy against one another. That tension is the subject matter of this dissertation.

1.2: A collision of urban ecology and political economy

1.2.1: The ecology of shrinking cities

The arthropod survey described above represents a relatively new way of thinking about urban land vacancy as an *urban ecology*. By that, I mean that, increasingly, vacant land is being reframed not as a social or economic problem, a void space or tax liability, but rather as an ecological feature of the urban landscape, a site to be cultivated for the production of ‘ecosystem services’, or the benefits humans derive from ecological functions (Gómez-Baggethun & Barton, 2013). Although there has been research on the ecology of land vacancy stretching back through the crisis of the 1970s (and even before that, as Davis (2002), Mabey (2010), Gandy (2013), and others have documented), research on land vacancy as an urban ecology has taken off in the years following the 2007-2009 economic crisis (Herrmann, Schwarz, Shuster, Berland, & Chaffin, 2016). Because of the benefits humans are said to derive from ecosystem services, a wide range of interventions, including reductions in vegetation management, are considered justifiable to enhance these ecosystem services, or to produce new knowledge about them. As this ecological lens has been affixed to vacant land, studies like the contested arthropod survey I encountered in my field work have proliferated (Fischer, Lippe, Rillig, & Kowarik, 2013; Frazier

& Bagchi-Sen, 2015; Gardiner, Burkman, & Prajzner, 2013; Riley, Herms, & Gardiner, 2018). The reframing of vacancy as an urban ecology has been particularly prominent in research on Cleveland and other declining former industrial hubs of the US Rust Belt, so-called ‘shrinking’ cities that have undergone multidecadal population loss and host large inventories of vacant land. Indeed, the literature on the ecology of shrinking cities is one of the primary venues in which vacancy has been reframed as ecology (Burkholder, 2012; Kowarik, 2018; Rink, 2009).

Land vacancy is hardly novel in Cleveland, where decades of suburbanization, deindustrialization, and neoliberal economic restructuring have materialized through an ongoing demolition of the built environment (Kerr, 2011; Rosenman & Walker, 2015; Wilson, Margulis, & Ketchum, 1994). What *is* new, however, is the way processes of land clearance in Cleveland and its peer cities have been cast of not just in social but also biophysical terms, as a process of *land cover change* through the transformation of impervious surfaces to vegetation that can be monitored via satellite (Deng & Ma, 2015; Emmanuel, 1997; Hoalst-Pullen, Patterson, & Gatrell, 2011; Ryznar & Wagner, 2001). From this emerging vantage point, demolition does not merely reduce the housing stock but reshapes the landscape in a way that *adds* to urban ecological function. New policy recommendations have emerged to cultivate and enhance these functions. In an influential paper, Schilling and Logan (2008) called for ‘greening the Rust Belt’ by intentionally repurposing vacant land into a greenspace network to be managed for the production of ecosystem services. The paper “propose[s] a new model to effectively right size or stabilize communities and neighborhoods with the greatest levels of abandonment by (a) instituting a green infrastructure program and plan; (b) creating a land bank to manage the right-sizing effort; and (c) building community consensus through collaborative neighborhood planning” (Schilling & Logan, 2008, p. 452). The proposal portrays the re-use of vacant land for

ecosystem services as a ‘triple-bottom line’ sustainability solution that will not only enhance urban ecological function but also boost property values and serve the interests of environmental justice and public health by providing environmental amenities in historically underserved communities (de Leon & Schilling, 2017).

Vacant land re-use has profoundly influenced the way ‘sustainability’ is envisioned and enacted across the US Rust Belt. Today, scholarly research on the ecology of vacancy feeds directly into practice through venues like the ‘Reclaiming Vacant Properties’ conference, an annual event organized by the Center for Community Progress (CCP), which I attended for several years as part of my field work. The principle think tank on urban vacancy, CCP brings together local government and non-profit staff from across the US to advance their mission to repurpose “vacant, abandoned, and deteriorated properties...[for] productive uses that benefit the surrounding community” (Center for Community Progress, 2019). In attending CCP, I observed practitioners propose a wide range of vacant land re-use projects, from pocket parks to rain gardens, urban farms, and detention basins as part of this vision, often leveraging the ecology of vacancy to define what constitutes ‘productive’ use. Typically, these projects are predicated on dramatic shifts in land tenure and land management. Part of Schilling and Logan’s vision involves conferring ownership of vacant land to land banks, quasi-governmental property holders who are to steward vacant properties into ‘productive’ use, while relying on a mix of non-profit and volunteer efforts for management. To justify these new ownership patterns and labor relations, current residents are designated as the primary beneficiaries of re-use within a rubric of environmental justice, as vacant land tends to be concentrated in areas of the city that have historically been deprived of equitable access to environmental amenities. To live in proximity to ecosystem services like pollination is considered a benefit too obvious to call into question,

while concerns such as reduced mowing are often deemed to be misapprehension on the part of residents to be remedied by education and outreach (Burkholder, 2012; Haase et al., 2017; Riley, Perry, Ard, & Gardiner, 2018). As it has traveled from scholarship and into practice, the ecological lens on vacancy has contributed to reshaping patterns of land tenure, land use, and land management. Along the way, however, enthusiasm for ecological processes like pollination seems to have crowded out questions of urban decline, race, property, and capital. Consequently, the concerns cited by the resident who confronted me as I took the photograph in Figure 1 seem to fall to the wayside.

1.2.2: The political economy of foreclosure and land vacancy

The conflict between ecologists and residents over vacant land management described above encapsulates a broader collision between two different ways to think about land vacancy: as an *urban ecology*, on the one hand, and as a product of *political economy*, on the other. It is no accident that concerns regarding the management of vacant urban land, and concomitant interest in the ecology of vacancy, have skyrocketed since the subprime mortgage industry collapsed, precipitating the 2007-2009 economic crisis. In the aftermath of the crisis, Rust Belt cities were saddled with devalued and physically damaged housing stock and undertook sweeping demolition campaigns remove vacant structures (Mallach, 2018).

Critical urban theorists have long understood demolition not as an ecological process of land cover change but rather as a *political economic* process inherent to crises of capitalism. From this vantage point, land vacancy is no accident or found condition but rather plays a central role in managing the tendency towards overaccumulation inherent to capitalism (Harvey, 1989). Periods of crisis temporarily resolve, or at least displace, the problem of overaccumulation by

devaluing—and often physically damaged and ultimately demolished—some portion of the built environment (Smith, 2008/1984). The vacant land that results from these demolition campaigns plays two roles. First, by removing the hindrance to profits, demolition allows accumulation to continue elsewhere in the present moment. Second, demolition prepare the way for producing a rent gap, a difference between actual and potential profitability, that will be available for future land revalorization and, with it, a new round of accumulation (Smith, 2005/1996). Vacant urban land, from this standpoint, is a *spatial fix* that allows capital accumulation to proceed unhindered in the present moment while also forming a reserve of cheap land ripe for future profits (Harvey, 1982). The very processes of demolition and land clearance that give rise to vacant land, the new vehicle for sustainability in the Rust Belt, are essential to producing the conditions under which accumulation can be ‘sustained’.

But neither the subprime mortgages at the center of the 2007-2009 economic crisis, nor the foreclosures, vacant structures, and demolitions that followed, have been distributed randomly across urban landscapes. Rather, *race and racism* have organized the geography of subprime mortgage lending and continues to shape the geography of vacancy today (Brescia, 2009; Hyra & Rugh, 2016). In Cleveland, and across many declining industrial hubs of the US Rust Belt, the subprime mortgage lending industry targeted residents of predominantly Black neighborhoods with an array of risky, high-cost mortgages, many of which were designed in such a way that loan defaults seemed nearly inevitably in hindsight (Dymski, Hernandez, & Mohanty, 2013; Faber, 2013). The crisis hit Cleveland particularly hard. Nearly 60% of subprime and other high-cost loans to Black households in Cleveland resulted in a foreclosure filing (Coulton et al., 2010). The Slavic Village neighborhood, where roughly 3 out of 4 residents are Black, was branded “the epicenter of the Great Recession” with the most

foreclosures of any zip code in the US in 2007 (McGraw, 2015) and a housing vacancy rate of roughly 30% in 2010 (Mallach, 2018). Significantly, Slavic Village intersects the historically redlined area in Cleveland, a zone delineated in the 1930s that has produced a durable spatial pattern of racial residential segregation through the way it systematically denied Black households access to credit (Hernandez, 2012; Nelson, Winling, Marciano, & Connolly, n.d.).

Over 10 years since the subprime mortgage industry began its collapse, the impact of widespread foreclosure continues to reshape urban landscapes, not only in Slavic Village (Ryberg-Webster, 2016) but across the Rust Belt (Endsley, Brown, & Bruch, 2018), most visibly through ongoing demolition of vacant, once-foreclosed property. Every step leading from a subprime loan to a vacant lot, from antecedent racial segregation to the terms of the loan, the valuation of properties following foreclosure, and the level of maintenance provided to the bank-owned properties, has been shaped by not just economic considerations but also racial discrimination, or has had racially discriminatory effects (Coulton et al., 2010; Coulton & Schramm, 2008; Kelly, 2014). In this way, the contemporary geography of vacancy in Cleveland emerged from and, in many ways, has reproduced barriers to Black wealth accumulation rooted in the structural racism of redlining, Urban Renewal, and the triage urbanism that followed (Kerr, 2011).

1.2.3: The political ecology of land vacancy

As the subprime mortgage crisis recedes from memory, the political economic problem of racialized dispossession through subprime lending and foreclosure is increasingly cast as an ecological problem of vacant land re-use. The new ecological lens on land vacancy emerging through the shrinking cities literature stands at the fulcrum of this pivot. Yet, even as this lens attempts to wrest urban ecology apart from political economy on a conceptual level, the two

cannot be separated in practice. Vacant land re-use proposals coming out of this literature have generated a range of political conflicts, ranging from the politics of everyday life, for example, through contested mowing schedules in Slavic Village, to broader struggles around who ought to own, manage, and benefit from vacant land (Safransky, 2016). Tellingly, even if political economy and urban ecology are held separate conceptually in the way we typically ask questions about economic crisis and its aftermath, they become hopelessly entangled in language commonly used to discuss the way crisis comes to ground. For example, CCP affixes metaphors of ‘blight’ (suggestive of agricultural crop damage) and urban ‘decay’ (signifying after-death metabolic processes) to the material effects of devaluation and disinvestment from the housing stock. The subprime mortgage crisis itself has been cast in ecological terms as a sort of pathology of the built environment, an “epidemic” of foreclosures leading to a “cancer” of vacancy (Detroit Blight Removal Task Force Plan, 2014) that “pose[s] new and *virulent* threats to the public health, safety and security in neighborhoods” (Lind 2012, 2, emphasis added). Tropes of disaster also figure prominently in the language of housing stock crisis. Looking out onto the widespread damage to the built environment in Cleveland, David Harvey pronounced the streetscapes to resemble fallout from a “financial Katrina” (Harvey, 2011, p. 2). Community development workers I spoke with during my field work often described the unfolding of the crisis as a “tsunami” of foreclosure and vacancy. Once a demolition has occurred, urban-adapted plants, known as “pioneer” species, move in to “colonize” the space where a foreclosed house once stood (del Tredici, 2010), both metaphors suggestive of an appropriation of space that takes place following crisis.

The slippage in language points towards the central intervention of this dissertation: that economic crisis is never just a ‘social’ problem and that environmental stewardship interventions

in response to crisis are never just ‘ecological’ solutions. There is a materiality to crisis, particularly in the humid climate of the Upper Midwest, where processes of disinvestment, devaluation, and demolition of the build environment are lively, verdant affairs that produce prime conditions for plant growth. Likewise, efforts to respond to economic crisis through ecological interventions—in what follows, I focus on vacant land re-use proposals—are never politically neutral but rather rest on a set of normative commitments which often go unstated, even if they have the effect of enabling certain political projects while disabling others.

This ongoing tension between urban ecology and political economy of land vacancy following the 2007-2009 economic crisis has created a pressing need to understand the conjoined political economic and ecological consequences of economic crises in tandem. This tension forms the point of departure for this dissertation. I position my dissertation within the framework of *urban political ecology*, a branch of critical urban theory concerned with the way ecology, political economy, and urbanization come together to produce uneven urban environments. In urban political ecology, cities are considered socio-natural hybrids, complex assemblages of biophysical processes mingled with human labor, and its attendant social relations under capitalism (Castree & Braun, 2001; Swyngedouw & Heynen, 2003). Vacant land, from this standpoint, is a *produced* nature, bound by both biophysical laws and by property market dynamics at the heart of capital accumulation in cities (Smith, 2008). Produced nature is then enrolled in a complex web of discourses, social constructions—in the Rust Belt, social constructions of race and nature come to the fore, as Safransky (2014), Millington (2010), and Pedroni (2011) have noted—and representational practices that animate the micro-processes driving accumulation forward.

1.3. Dissertation overview

In this dissertation, I put forward an urban political ecology of land vacancy in the aftermath of the 2007-2009 economic crisis in Cleveland, Ohio, focusing on how processes of land clearance and vacant land re-use have brought urban ecology, racial inequality, and property markets together to reshape urban landscapes within a hybrid socio-natural process. At the broadest level, this dissertation asks: what does it mean to cast the material effects of racial dispossession associated with subprime mortgage lending in ecological terms, and how does that move reshape the way urban decline is understood and managed today? The conflict around urban land management I described above sheds light on the two main lines of inquiry I will advance in service of this question. The first is an inquiry about vegetation, crisis, and racism. I offer a critique of the ecology of shrinking cities literature, in which I foreground its tendency to isolate ecology from political economy, particularly as it pertains race and economic crisis. I then combine quantitative analysis of land change with qualitative analysis of vacant land re-use to suggest an alternate frame for how to understand processes of land clearance and vacant land re-use in a way that brings the race and crisis to the fore. The second is an epistemological inquiry into how to enact that integration, how to synthesize political economy with ecology, in other words. Here, I ask questions about how we know, think about, and act with the inter-relations among urban ecology and political economy, and what it means to mix quantitative and qualitative research methods. I lay out my overarching research questions, methods, and analytical approach below.

In Chapter 2, I set up both lines of inquiry through a literature review that critiques the ecology of shrinking cities literature and lays the groundwork for an integrative approach taken in subsequent chapters. In this critique, I offer a two-part diagnosis of the problem with the literature, as I see it: first, that it wrongly identifies population loss as a casual force behind

processes of land clearance and fails to engage meaningfully with the political economy of land vacancy and, second, that this omission reproduces certain fallacies and misrecognitions rooted in the neo-Malthusian logics of cultural ecology and risk-hazards research. I argue that part of why we are seeing a resurgence and urbanization of cultural ecology lies in the increasing divergence of political ecology from other sub-fields that emerged from cultural ecology and risk-hazards research. I propose that one remedy is to bridge this divide by integrate quantitative methods, for example land change science, into an urban political ecology framework. Following Nightingale (2003), I argue that triangulating for divergence offers sound epistemological footing to stage this engagement without placing quantification ‘above’ qualitative analysis. Chapters 3-5 present quantitative, qualitative, and synthetic findings that emerge from this set-up.

In Chapter 3, I focus on processes of land clearance following the 2007-2009 crisis to fill a knowledge gap around economic crisis as productive of urban ecological change. Drawing on the urban land change literature, particularly studies that focus on relationships between urban greenness and social inequality, I used remote sensing techniques to assemble a satellite imagery time series to quantify ‘greening,’ or shifts in vegetation abundance, after the 2007-2009 recession in Cleveland, Ohio, and surrounding suburbs of Cuyahoga County. Against the neo-Malthusian explanations that link population with ecology in the shrinking cities literature, I propose and test an alternate hypothesis that factors related to property and race ‘drive’ land change. I ask: how have urban vegetation dynamics shifted in an exemplar shrinking U.S. city following the Great Recession, and how have property market dynamics and race contributed to this shift? I show that, even on its own positivist terms, there is no linkage between population loss and environmental change. Instead, post-crisis revegetation amounts to a ‘greening’ of the

historically redlined area, in which processes of land clearance and revegetation are driven by the way past and present forms of racism magnify one another through property markets.

In Chapter 4, I draw on urban political ecology to develop a case study to fill a knowledge gap around how vacant land re-use contributes to preparing the ground for a new round of accumulation. Here, I am particularly interested in investigating the way environmental justice rhetoric fuses with certain discursive and representational practices, both in the ecology of shrinking cities literature and in vacant land re-use practice, that produce the conditions for future land revalorization. I selected a project featuring all the best practices identified in Schilling and Logan's (2008) 'greening the Rust Belt' agenda—green infrastructure, land bank ownership, and a community engagement process—that became a site of place-making conflict around purportedly aesthetic concerns. I ask: why do aesthetic concerns become sites of racialized contestation in vacant land re-use and what does this contestation imply for urban greening practices, particularly in spaces of disinvestment? I argue that the conflict turned on what I term the cultural politics of the pastoral, in which upper-middle class White ideologies of nature dominate site designs in a way that authorizes certain land claims, entrenches racial hierarchies, and, by 'whitening' greenspace, prepares the ground for future displacement¹.

In Chapter 5, I synthesize main findings from Chapters 2-4 to address my overarching research question about what it means to cast the material effects of racial dispossession associated with subprime mortgage lending in ecological terms. I bridge the gap between the 'greening of the redlined area' (Chapter 3) and the 'whitening of vacant land' (Chapter 4) by

¹ State practices of land acquisition and disposition are central to preparing for future land revalorization. However, because this dissertation is primarily concerned with how knowledge regarding urban land vacancy is produced, this dissertation does not emphasize questions related to how the state apparatus serves the needs of capital, for example, through fiscal austerity, land banking, or by devolving traditionally public-sector activities to non-profit organizations. For a more complex discussion related to the ways in which the local governments in the Rust Belt deploy specific constructions of land vacancy to serve the needs of capital, see Rosenman and Walker (2016) and Safransky (2016).

extending the concept of predatory inclusion from credit access to greenspace provision, arguing that the former sets up the conditions for the latter, both materially and discursively. I argue that, just as subprime mortgage lending transformed the historical racial exclusion from credit into a predatory inclusion, leading to widespread racialized dispossession through foreclosure, the cultural politics of vacant land re-use is transforming the historic racial exclusion from greenspace into a parallel form of predatory inclusion that is likely preparing the ground for future gentrification through a discursive ‘whitening’ of space. Rather than presenting an ‘objective’ representation of land clearance and revegetation following crisis, land change analysis produces a fundamental indeterminacy around urban vegetation that calls out for triangulation with qualitative field data to understand what vegetation *does*, and how it makes a difference, depends on one’s positionality.

Overall, this dissertation lays out an urban political ecology of crisis, land change, and vacant land re-use that makes two central contributions. First, through a critique of the ecology of shrinking cities, I show that the way this literature, and the practices informed by this literature, tries to pry ecology away from political economy itself produces political effects by casting the process of urban decline as an ecological affair. I argue that, to the extent that this framing actively contributes to the discursive micro-processes that both entrench and obscure the greening of the redlined area and subsequent whitening of ‘greened’ land, rendering the racialized dispossession of subprime lending into an ecological problem is helping to prepare the way for land devaluation to pivot towards land revalorization². Second, I propose ‘critical urban

² By racialized dispossession, I refer to the way in which the dispossessions associated with subprime mortgage lending were organized through a complex entanglement of race and class. Following Omi and Winant (2014), I understand “racialization” to refer to the way social relations and practices become imbued with racial meaning. In the context of Cleveland, subprime mortgages constitute racialized dispossession not only through the way they were primarily targeted towards Black households through a set of conditions that arose from antecedent forms of racial discrimination (systematic denial of credit, residential segregation by race) and reproduced social inequality

remote sensing' as a form of strategic positivism (Wyly, 2009) useful for uncovering how purportedly neutral patterns of urban land change are hitched up to deeply power-laden political economic processes. I call for critical urban geographers to intervene in the resurgence a new, specifically urban permutations of cultural ecology flying under the banner of, for example, urban land change science or sustainability science by appropriating, situating, and showing the limits of quantitative methods.

along racial lines (deepening the racial wealth gap). For general discussion around drawing race and racialization to the center of analysis in urban political ecology, see Brahinsky, Sasser, and Minkoff-Zern (2014) and Heynen (2016). For a more thorough discussion of race and subprime mortgage lending, see Rugh and Massey (2010).

CHAPTER 2: CRITIQUING THE ECOLOGY OF SHRINKING CITIES

2.1: Introduction

In the wake of the 2007-2009 economic crisis, a growing body of research has emerged around the ecology of ‘shrinking cities,’ or cities that have undergone multi-decadal population loss. Within this literature, the increasing inventories of vacant urban land typically found in so-called shrinking cities are framed not as problems of political economy but rather as potential ecological resources (Herrmann et al., 2016) best understood through the lens of ‘ecosystem services,’ or the benefits humans derive from biophysical processes (Haase, 2013; McKinney, Ingo, & Kendal, 2018; Threlfall & Kendal, 2018). As this ecological framing of vacancy travels from research to policy, the notion that vacant urban land holds value as a bundle of ecosystem services has informed a number of concrete proposals to ‘reclaim’ vacant urban land in shrinking cities and manage the land so that certain ecological processes will flourish. Often, vacant land re-use proposals find their justification within the rubric of sustainability and environmental justice: ecological repurposing of vacant land is a ‘triple bottom line’ for sustainability, touted as a way to advance regional economic and environmental priorities while also benefitting local residents by providing environmental amenities in historically underserved communities (Burkholder, 2012).

In this chapter, I critique the literature on shrinking cities ecology. There are two related arguments I will advance in this critique: (1) a diagnosis, in which I argue that the literature fails to engage meaningfully with the political economy of land vacancy to the extent that it falls prey to certain fallacies and misrecognitions that have roots in cultural ecology and risk-hazards research, and (2) a remedy, in which I suggest an alternate approach that integrates quantitative methods within an urban political ecology framework.

First, I argue that the shrinking cities frame seizes upon the longstanding Malthusian narrative that population growth acts as a causal force behind environmental degradation and reworks it through the lens of sustainability and environmental justice: if population growth is said to *cause* environmental degradation, as neo-Malthusians argue, then population decline must also *cause* environmental ‘improvement.’ This improvement—the transformation of impervious surfaces to vegetation, the emergence of novel ecosystems from this transformation, and the flow of services derived from these ecosystems—is then represented as a set of potential environmental amenities presumed to alleviate environmental justice concerns for historically underserved communities. From here, a consensus has formed in the literature that the way to realize the full potential of this environmental amenity, and to enact sustainability in spaces of decline more broadly, lies in ceding ownership of these lands to purportedly neutral third parties, typically land banks or non-profit organizations, while relying primarily on unpaid resident labor for ongoing maintenance within a rubric of community building. Drawing on evidence from the urban political ecology literature on the US Rust Belt, I demonstrate that this inversion and urbanization of neo-Malthusian claim-making through the shrinking cities concept, and the policy prescriptions that arise from it, performs certain erasures of political economy that find analogues in foundational political ecology critiques of cultural ecology.

Second, I argue that the shrinking cities literature, as a permutation of cultural ecology, has emerged, in part, because of the way political ecology has diverged from other fields rooted in cultural ecology and risk-hazards research. Today, a number of these fields aligned with what is now called systems science (for example, land change science, sustainability science, and coupled human-natural systems research more broadly) have fully committed to quantitative methods (but not to an explicitly political theoretical framework) and unproblematically affix

their neo-Malthusian lens onto spaces of urban decline. I argue for intervening in this specifically urban resurgence of cultural ecology—which I conceptualize as the urbanization of systems science—by taking up Walker’s (2005) call to engage the ecology in (urban) political ecology. In other words, I argue for intervening in the urbanization of systems science by taking measurement of biophysical change seriously while also situating it within a rigorous and explicitly political theoretical framework. Drawing on efforts to integrate political ecology and land change science in forestry research, I propose a *situated* and *politicized* approach to urban land change science, grounded in urban political ecology, as a remedy to the urbanization of neo-Malthusian claim-making. Finally, I argue that feminist approaches to mixed-methods triangulation, particularly Nightingale’s (2003) triangulation for divergence, provide sound epistemological footing for this engagement while keeping political economy at the center of analysis.

The chapter is organized as follows. I first provide a brief review of early political ecology interventions around theories of population and environmental degradation and show their relation to debates surrounding ‘the ecology in political ecology’ (Section 2.2). I then explain how these debates have spurred the development of an integrative land change science and political ecology framework in resource management and discuss various problems and opportunities associated with performing this integration through mixed-methods research. Next, I demonstrate how the ecology of shrinking cities literature falls prey to many of the same problems early political ecologists identified with neo-Malthusian modes of explanation (Section 2.3). I argue that, while urban political ecologists avoid falling into the neo-Malthusian trap, their tendency to eschew the quantitative methods hobbles its ability to refute claims emerging from the urbanization of system science in a way that ‘sticks’. Finally, I propose an alternative

framework that centers on engaging the ecology in *urban* political ecology by combining urban land change analysis with qualitative case studies and triangulating for divergence, which will set up the investigations I pursue in subsequent chapters (Section 2.4).

2.2: The ecology in political ecology

2.2.1: Early debates around population, degradation, and biophysical measurement

Population is the dominant lens through which environmental change has been understood. Across a range of scholarly domains, population growth is thought to be the root cause of environmental degradation. The population-centered understanding of human-environment relationships finds its roots in an argument laid out by Thomas Malthus in *Essay of the Principle of Population* (Malthus, 1878). Malthus held that exponential population increase alongside linear increases in food production will inevitably lead to famine, which in turn causes environmental degradation as increasingly marginal lands are enrolled into agricultural production. The policy implications arising from this thesis were straightforward: slow population growth by ending food distribution to the poor while also imposing a moral order on women to control their fertility.

Subsequent neo-Malthusian reworkings of this thesis, for example *The Population Bomb* (Ehrlich, 1968), *The Limits to Growth* (Meadows, Meadows, Randers, & Behrens III, 1972), and others have elaborated on the mechanisms that link population growth with environmental degradation, for example, by introducing mediating factors such as affluence or technology, or by identifying alternative mechanisms to control fertility, for example, through the education of women. Despite these more recent embellishments, the underlying eco-scarcity logic identifying population growth as the principle ‘driver’ of environmental change has remained remarkably

durable. For example, the cultural ecology literature drew on population-based evolutionary concepts such as ‘carrying capacity’ to explain how human societies relate to non-human nature (Orlove, 1980; Rappaport, 1967). The presumption that population ‘drives’ social and environmental change continues to be propagated by a range of sub-fields concerned with environment-society interactions, often making its way from scholarship into policy proposals and popular culture in ways that enable certain remedies while disabling others. For example, *National Geographic* is constantly abuzz with anxiety around how to secure techno-scientific fixes to ‘feed the world’ (Kunzig, 2011), foregrounding increases in food production while obscuring questions of food distribution or the processes mediating food access. Likewise, recent biodiversity conservation proposals, for example *Half Earth*, call for a vast program of land depopulation, proclaiming that “only by committing half of the planet’s surface to nature can we hope to save the immensity of life-forms that compose it” (Wilson, 2016, p. iii). Wilson’s proposal reproduces Malthus’ thesis: only by displacing poor people from the lands they inhabit, only by *producing a nature with no people in it*, can ongoing environmental degradation be arrested.

Foundational political ecology texts assailed the logic of population-based eco-scarcity and instead argued for explicitly political explanations of social and environmental change that are more sensitive to their broader history and social contexts. Watts (1983) explained that cultural ecology and risk-hazards research misapprehend the root causes of famine by failing to engage with political economy, an omission stemming from their reliance on a faulty premise: that there exists an ‘environment’ separate from ‘society’ and that the two ‘interact’. For Watts, bounding the environment as external and non-social, while constructing the social through a cybernetics lens, in which human societies are seen as “a type of self-regulating, self-organizing

living system isomorphic with nature itself” (237), set up the preconditions for an epistemological alignment with positivist approaches that disable questions of political economy by explaining away the structures that constrict household decision-making through tropes of the irrational or maladaptive peasant. In lieu of an environment-society interaction, Watts favored a Marxist political economic approach that foregrounded the roles of labor, the distribution of resources, and the role of colonial legacies in explaining the emergence of famine, factors that shape the social relations of production and cannot be known through biophysical measurement but rather through detailed qualitative data collection. Presenting findings from immersive qualitative fieldwork on drought and famine in the Sahel, Watts argued for locating the emergence of famine in a set of political-economic shifts associated with peasant enrollment in global markets through European colonization, which upset long-standing practices of food storage that historically protected peasants from shortages arising from rainfall variability (Watts, 1984/2013). In this way, Watts showed that explaining famine outside of political economy not only misrecognized its root causes but provided cover for perpetuating them.

While early political ecology texts were consistent in foregrounding how crude positivism obscures political economy, they did not shy away from incorporating measurement of biophysical change into analysis. For example, Watts (1983, p. 233) maintained that the unexamined normative commitments contained within “naïve” empiricism led hazards researchers to misapprehend the root causes of drought vulnerability, yet he still included biophysical data, for example, evidence to subvert claims of ‘desertification,’ where it strengthened his own argument (Lave, 2017). Indeed, one of the primary aims of early political ecology research lay in engaging biophysical measurement to demonstrate the inseparability of social and physical processes in co-producing uneven environmental and social change

(Benjaminsen, Aune, & Sidibé, 2010). Blaikie and Brookfield (1987), for example, drew on direct measurement of soil erosion into a chain of explanation that linked biophysical conditions and household-scale practices with structures at progressively broader scales, such that household land management decisions, biophysical change, and enrollment in capitalist production processes cohere within a single structure-agency dialectic (Rocheleau, 2008). The “constantly shifting dialectic between society and land based resources” (Blaikie & Brookfield, 1987, p. 17) emerging from intervened in the population-degradation narrative by showing how processes of social marginalization both emerge from and produce environmental degradation; as local economies become integrated into global commodity chains, smallholder are compelled to effectively mine the soil to keep up with the treadmill of production. Subsequent political ecologists, for example Rocheleau (1995; 2001), Zimmerer (2003), and Robbins (2007) also drew on mixed-methods analysis, combining spatial analysis with surveys and ethnography to reveal the co-constitutive structures and micro-processes at the core of both uneven power relations and environmental conditions.

2.2.2: (Dis)engaging the ecology in political ecology: The post-structural turn and the rise of resilience theory

Over three decades since these foundational critiques of cultural ecology were published, debate periodically crops up around how, if at all, to synthesize political economy and ecology in geographic thought (Turner, 2015; Turner, 2014; Walker, 2005). To what extent should political ecologists, or critical theorists more generally, engage with positivist epistemologies? How should fields oriented towards positivism, for example land change science, engage with theories of political economy to formulate research questions, assess potential data sources, and interpret the results of analysis? This longstanding epistemic tension around ‘the ecology in political

ecology’, on the one hand, and the unstated normative commitments concealed within positivism, on the other, has been heightened by new frameworks social and biophysical sciences—the post-structural turn in critical theory and the consolidation of ‘new ecology’ of resilience through the rise of systems science—that have deepened the epistemic wedge within geography as a discipline.

The post-structural turn in political ecology produced a new wave of critical scholarship that, in some ways, departed from the Marxist tradition of structural critique to grapple with how discourses, social constructions, and ideologies form terrains of power for maintaining both uneven social relations and environmental conditions, with particular concern for resistance movements (Jones, 2008). While continuing to take aim at the construction of ‘nature’ as a fixed, stable other, and the essentialist categories that emerge from this construction, this turn in the literature focused on how knowledge of degradation is produced and what political effects that knowledge generates rather than asking questions about how and why degradation emerges (Peet & Watts, 1996). Regarded all scientific knowledge of ‘the environment’ with a modicum of skepticism, post-structuralists launched strident critiques of how positivism not only covertly advanced domineering political projects within the guise of contrived neutrality and false objectivity but actively participated in shaping access to and control over resources (Escobar, 1998, 2013). As a result, critical theorists, including political ecologists, increasingly targeted their critiques at scientific knowledge production and narratives that deploy this knowledge to make political claims, rendering biophysical change illegible to analysis, little more than an inert field upon which environmental politics play out (Lave, 2017; Mitchell, 2002).

Meanwhile, a range of fields also rooted in cultural ecology but aligned with what is now called systems science were embracing positivism with a fervor. The ‘new ecology’ of resilience

theory centered analysis on the dynamics of self-organized complex systems characterized by thresholds, nonlinear dynamics, path dependency, and heterogeneity, but insisted that these dynamics are only knowable through careful quantitative data analysis and model building for the purposes of generalization across ‘systems’ (Walker, Holling, Carpenter, & Kinzig, 2004). Advancements in satellite imaging technologies progressed alongside these developments in a way that enabled detailed observation and monitoring of the earth’s surface and, with it, new methodologies for biophysical measurement of land change to understand ‘system dynamics’ (Turner, Lambin, & Reenber, 2007). Today, a resurgent form of cultural ecology, now flying under the banner of systems science, dominates the research agenda on ‘environment-society interactions’ through a number of positivist sub-fields, including land change science, sustainability science, and coupled human-natural systems research. In what follows, I pay particular attention to the tension between political ecology and land change science to set up my intervention.

As a result of these divergences, there is an ongoing epistemic tension between political ecology and land change science that turns on certain fundamental questions of how ontology, epistemology, and methodology relate to politics (Massey, 1999): does a methodology carry with it a particular view of how the world is put together? To what extent does the veneer of scientific objectivity prop up certain political projects while disabling others? Different sorts of research questions, scales of inquiry, methodological approaches, and, importantly, normative commitments lie at the heart of this widening, and at times tense, intra-disciplinary gulf (Turner & Robbins, 2008). While there is no single methodological approach within political ecology (Doolittle, 2017), the field has rallied around a set of epistemological commitments to place-based research typically comprising qualitative case studies on the co-production of social and

environmental inequality. Land change science, by contrast, focuses on producing whole-system modeling from measurable patterns observed via satellite, with quantification and statistical inference at the center of analysis (Magliocca et al., 2015). At present, land change science has largely accepted the neo-Malthusian narrative and has imported neoclassical microeconomics behavioral models as premises for analysis while political ecology remains staunchly critical of both, leading to charges of ‘politics without ecology’, on the one hand, and ‘ecology without politics’ on the other (Brannstrom & Vadjunec, 2014). Political ecology has historically been critiqued for appearing to make unwarranted assumptions about system dynamics that lead to what appear as hasty conclusions (Vayda & Walters, 1999), while political ecologists themselves rail against the conflation of pattern and process in land change science, particularly the way proximate causes (what land change scientists call ‘drivers’) are mistaken for root causes (what political ecologists call political economy), and the way socially constructed categories are left unanalyzed by land change scientists. For example, drawing on the techno-scientific gaze of the satellite and uncritically accepting a given set of socially constructed land cover categories (e.g. what is a ‘forest’?) to understand land change may not only fail to engage with political economy but can produce knowledge directly favorable to bureaucratic authority at the expense of local smallholders (Robbins, 2001). Apart from Robbins, Turner, and a handful of other researchers, efforts to bridge this widening gap between land change science and political ecology have been rare.

2.2.3: Reconciling land change science and political ecology

I maintain that the divergence of political ecology and land change science in geography, and of critical theory from systems science more broadly, was not inevitable (Nelson, 2014). The

split emerged from the historically contingent set of developments resulting from how the quantitative revolution of the 1960s sutured positivist epistemology to a set of unstated political commitments aligned with neoclassical economics, making positivist epistemology anathema to Marxist geography and to emancipatory political projects more broadly (Wyly, 2009). The outcome has been the formation a crude “anti-historical positivism” (Smith, 2008, p. 2) organized around a set of received abstractions—Cartesian or ‘absolute’ space, linear time, external nature (Moore, 2015)—that form a convenient basis for producing knowledge that props up existing relations of dominance and subordination. As a result, during the period when political ecology took off, radical political projects saw little potential in drawing on measurement and calculation to make their case and even defined themselves in opposition to positivism.

Periodically, however, geographers have sought out possibilities for synthesis across these epistemic boundaries. For example, efforts to “socialize the pixel” (Liverman, Moran, Rindfuss, & Stern, 1998) by integrating biophysical change detected via remote sensing with social change interpreted from household surveys emerged during the GIS wars of the 1990s. As land change science rose to a position of dominance in global change policy-making, proponents of synthesis made instrumentalist arguments for engaging the ecology in political ecology for the practical purpose of infiltrating policy discussions (Turner, 2003). Wyly (2009, p. 310) argued that “the presumed linkages between epistemology, methodology, and politics were never fundamental or immutable” and calls for a “strategic positivism” to stage theoretically rigorous and empirically robust interventions in policy. More recent attempts at reconciling critical theory with positivism, for example, critical physical geography (Lave, 2017; Tadaki, Brierley, Dickson, Le Heron, & Salmond, 2014; Tenet & Urban, 2018), have sought to re-theorize

environmental change as a co-production of biophysical and social processes that requires “critical attention to relations of social power [combined] with deep knowledge of a particular field of biophysical science or technology in the service of social and environmental transformation” (Lave et al., 2014, p. 1). Despite increasingly rigid disciplinary (and *intradisciplinary*) boundaries, the advent of the Anthropocene (Crutzen, 2002, 2006) has presented new possibilities for a reinvigorated, and explicitly political, explanation of conjoined social and environmental change that draws on and triangulates between ‘thin’ and ‘thick’ description for broader explanatory power. Through these developments, social scientists are re-engaging with the material at a time when physical scientists are ‘discovering’ the social (Elshafei, Sivapalan, Tonts, & Hipsey, 2014; Sivapalan et al., 2014) by engaging with how questions of historical legacy, irreducible indeterminacy, and the particularities of how socio-ecological assemblages come together, all insights which suggest new possibilities for synthesis.

Rapprochement between political ecology and land change science offers a tantalizing means to explore these analytical possibilities, particularly with respect to understanding vegetation change. Proponents of integrative political ecology and land change science emphasize these fields share a single scholarly lineage and a commitment to context and complexity, offering two “complementary but parallel approaches of addressing human-environment dynamics” (Turner & Robbins, 2008, p. 295). The most substantive integration has been in forestry, where a “reconciliation agenda” (Brannstrom & Vadjunec, 2014, xviii) between political ecology and land change science is thought to hold the key to producing theoretically rigorous and empirically rich multi-scalar case studies of how ecology and political economy, together, shape processes of deforestation and reforestation. This emerging mixed-methods approach emphasizes that no single agent—not *only* population, nor capital, nor the state— can

capture how land struggle becomes entangled with land use and land cover change (Aldrich, Walker, Simmons, Caldas, & Perz, 2012) and often leverages Marxist political economy concepts to understand land change within the context of capitalist development (Napoletano, Paneque-Gálvez, & Vieyra, 2015).

However, drawing these two approaches into conversation is far from seamless. The engagement would seem to require certain epistemological compromises. Political ecologists would have to relax their skepticism of ‘violently reductive’ quantitative techniques such as remote sensing and statistical analysis while land change scientists must relax their skepticism of ‘sloppy and subjective’ qualitative methods such as ethnographic and archival data collection. Moreover, land change scientists must suspend their quest for generalization and universality that relies on pre-given categories and re-engage with how institutions and political economic processes structure social relations, access, and control over resources *in particular places*. Mixing satellite imagery analysis with qualitative field data presents additional challenges. First, research must attend to the politics of geospatial representation, recognizing that Cartesian models of space are not politically inert. Geospatial techniques often produce a “cartographic silence” around the social, but integrating political ecology with remote sensing can remedy this problem by foregrounding how *failure* to engage the social can quite literally erase resource-dependent communities from the map (St. Martin & Hall-Arber, 2008, p. 780). Second, research must contend with how patterns observed via satellite relate to processes on the ground in a way that acknowledges the relationality of space. Patterns observed within spatial units often do not arise solely from inherent characteristics of those units but rather relations between them, and across spatial units at varying scales, in ways that are not observable from above (Munroe, McSweeney, Olson, & Mansfield, 2014).

2.2.4: Approaches to mixed-methods triangulation

At the core of this debate over engaging the ecology in political ecology lie enduring questions about how to mix methods rooted in different epistemological traditions and what practices are acceptable for triangulating between different sets of findings. There are several approaches to mixed-methods triangulation (Elwood, 2010). The first is *validation*, drawing on multiple data sets to ensure they are all telling the same story, for example, providing broad-scale tabular data for context and analyzing interview data for nuance. The second is *complementarity*, which is what is typically meant by ‘integration’ or ‘synthesis’, or bringing multiple data sets together to tell different sides of a single story that would not be knowable otherwise. Both approaches are fraught with questions around whether a hybrid epistemology is ontologically coherent: is it possible to "simultaneously hold multiple assumptions about the nature of the social world, our knowledge about it" (Elwood, 2010, p. 4)? For example, does drawing results from geospatial analysis (and, with it, world of linear time and a pre-given cartesian plane of entities) into conversation with findings from participant-observation (a world comprising a messy web of relations) imply a collision between two fundamentally different ways the world is put together? Another problem with appealing to quantification is that it would seem to prop up the hegemony of positivism. By deploying calculation and measurement as impartial and ‘objective’, some approaches to mixed-methods research implicitly endorse a hierarchy of knowledge in which quantification is placed at the top and qualification at the bottom. Mixing methods as a "demonstration of proof simply through appeal to a higher authority" may indeed reproduce a hierarchy rather than deploying positivism strategically as "a provocation, a stimulus to thought" that shows how internally contradictory social relations are expressed materially as land use? cover? change (Massey, 1999, p. 264). Massey argues that the knowledge politics that

emerge from engagements between different ways of knowing depend on "the terms on which the appeal [to positivism] made...[and] the intellectual history of why we do it."

For the purposes of staging an engagement between political ecology and land change science, I call attention to a third approach to mixing methods that has potential to address the dual problems of incoherence and knowledge politics on terms more favorable to keeping political economy at the center of analysis: triangulation for *divergence*. Informed by the feminist geographic tradition, particularly Haraway's (2003) analysis of situated knowledge, and pioneered by Nightingale (2003), this 'non-positivist' approach to positivism engages calculation and measurement not as a path to some 'objective' truth, elevated above qualitative analysis, but rather as a "situated, partial, and political" artifact (Nightingale 2003, 78), akin to how early political ecologists engaged data as 'text' that arises from and reflects historical and geographical contingency (Rocheleau & Ross, 1995). Rejecting efforts to form an internally consistent approach to synthesis, this approach instead foregrounds omissions and contradictions that emerge from different sets of results, aiming to excavate around that negative conceptual space as fodder for generating new knowledge. Rejecting the satellite's detached 'view from nowhere' (Dodge & Perkins, 2009; Shim, 2014) and bringing the techno-scientific gaze down to earth in this way can uncover subjugated knowledge and help provide a more complete explanation of socioecological complexity. For example, by showing how perceptions of climate variability and change diverge from the climate record, Burnham, Ma, and Zhang (2015) advance knowledge on how to communicate climate variability to smallholders while also showing the limits of knowing climate change through measurements of temperature or precipitation.

2.3: Engaging the ecology of urban political ecology: The case of ‘shrinking cities’

Drawing on these ongoing debates around mixed-methods research and synthesis, this chapter argues for *urbanizing* the engagement between political ecology and land change science. There are several reasons to extend the engagement of land change science and political ecology to urban areas. First, there is no reason to believe the ecology in political ecology only matters in studying resource-dependent communities. Indeed, failing to approach the ecological dimensions of urbanization tacitly inscribes the same nature-culture binary that Watts identified at the core of Malthusian narrative, upholding the presumption that ecology need only be engaged ‘out there’ in spaces of primary production but not ‘in here’ in urban spaces of consumption. There is nothing *a priori* unnatural about the urban. Cities, after all, are simply human-dominated ecologies built from natural resources, sustained by vast material flows ultimately derived from and intimately connected to landscapes of primary production (Heynen, Kaika, & Swyngedouw, 2006), as natural as “the colonies of prairie dogs or the beds of oysters” as Jacobs (1993/1961, p.444) put it.

Another reason to urbanize the engagement between land change and political ecology is to intervene in what I conceptualize as the urbanization of systems science, or the way system sciences concepts and methodologies have been affixed to the urban and have traveled to from scholarship to shape public policy (Alberti et al., 2003). Nowhere is the disconnect between systems science and political ecology more prominent than in the shrinking cities literature. Below, I show that the shrinking cities frame rests on the same neo-Malthusian fallacy that Watts and other early political ecologists critiqued. The way to intervene in this resurgent, and specifically urban permutation of cultural ecology, I argue, is to engage the ecology of *urban* political ecology. While the urbanization of systems science has proceeded alongside the urbanization of political ecology, the two literatures remain largely disconnected, owing to the

epistemic divergence described above (Section 2.2.2). I make the case that combining remote sensing with a qualitative case studies and triangulating for divergence offers an effective means to destabilize the urbanization of systems science and critique its constitutive features, including neo-Malthusian narrative and the nature/culture binary, while also showing the limits of positivism for understanding urban change.

2.3.1: The urbanization of systems science in the ‘shrinking cities’ literature

The urbanization of systems science is at the forefront of how urban decline is understood today. Since the mid-2000s, researchers in a range of disciplines aligned with systems science, including sustainability science, land change science, and urban ecology, as well as practitioner-oriented disciplines such as urban planning and landscape architecture, have reconceptualized urban decline through the lens of shrinking cities, or urban areas with sustained, multi-decadal population loss. Emerging through new, ‘sustainable’ approaches to triage urbanism in declining industrial hubs in former East Germany and the Upper Midwest of the United States, much of this literature aims to produce practitioner-centered knowledge on concrete material problems associated with managing urban decline (Blanco et al., 2009). In the United States, early planning documents from Youngstown, Ohio, put forward a widely-acclaimed vision of ‘smart’ decline that centered on ‘right-sizing’ or urban spatial restructuring, essentially depopulating high-vacancy neighborhoods and moving households into high-density hubs while repurposing the resulting depopulated land as greenspace (Aepfel, 2007; Rhodes & Russo, 2013). In Cleveland, a somewhat different landscape-scale vision emerged that rejected ‘right-sizing’ and instead integrated vacant land re-use for ecosystem services into existing neighborhoods, minus the forced migration (Cleveland Urban Design Collaborative, 2008). The urban ecological

imaginary affixed to vacant land through these proposals has been enthusiastically taken up in urban systems science research (Frazier & Bagchi-Sen, 2015; Gardiner et al., 2013; Riley, Herms, et al., 2018; Riley, Perry, et al., 2018). Many of the constitutive features and epistemological commitments associated with systems science—prioritizing pattern over process, alignment with the new ecology of resilience theory, a preference for whole-systems quantitative modeling, and neo-Malthusian rationality—inform the way this literature engages urban ecology and deploys it in policy recommendations.

The idea that cities ‘shrink’ was introduced to destigmatize urban decline in the interests of generating innovative ways to think about planning and managing decline rather than merely attempting to avert it (Hollander, Pallagst, Schwarz, & Popper, 2009). Yet, the way urban decline is understood as a problem of population, and particularly the way population loss is linked to an ‘opportunity’ to enact sustainability through vacant land re-use, has itself proved to be value-laden. Oda et al. (2018, p. 1), for example, begin their research by framing land vacancy as “land *freed up* by decreasing population pressure” that presents “a *window of opportunity* for administration and residents alike to revisit and rethink visions, strategies and planning priorities” (emphasis mine). Here, a set of unstated normative commitments animate the framing. Here, land is not just vacant but ‘free’ from human settlement and this emancipation presents an ‘opportunity’ to assert more preferable land uses (the researchers advocate for urban agriculture). Importantly, the way key findings from this literature have traveled quite fluidly from scholarship to policy are directly shaping the way urban ecologies are enrolled in broader political projects, with implications for land tenure arrangements, land use patterns, and land management practices, as I explain below.

By their very definition, shrinking cities are understood primarily through a *pattern* of population loss rather than the specific set of *processes* that have population loss as their outcome (Blanco et al., 2009; Hollander, 2013). Shrinking cities are said to emerge through various processes, including economic restructuring, political upheaval, war, disease, and natural hazards. According to this literature, while the processes leading to population loss may be varied, the problems and opportunities created through urban depopulation are similar. For example, urban decline in the American and German Rust Belts may have unfolded through neoliberal economic restructuring as it has interwoven with different sets of processes (the former influenced by and the spatialization of anti-Black racism, the latter by geopolitical shifts, specifically the fall of the Iron Curtain) but they share similar problems, including increasing land and building vacancy, infrastructure over-capacity, the accumulation of deferred maintenance, loss of human capital, and the withering away of tax base. The analytical move to prioritize pattern over process removes these cities from their historical context, producing a false equivalence across a diverse set of circumstances. Shrinking cities are presented as instances of a timeless category whose dynamics differ from growing cities *in the same way* such that planning proposals can unproblematically travel from one locale to another, independent of place or history. For example, planning documents for Detroit, Michigan, directly reference urban greening projects from Germany for justification (Detroit Future City, 2013).

Ecologists have historically framed cities as abiotic dead zones, reflecting a history of anti-urban bias animated by nature/culture binaries at the heart of ecological thought (Alberti et al., 2003). As the new ecology framework grips the urban ecological research agenda, however, shrinking cities have been recast as biodiversity hotspots with potential for “serious ecosystem services” (Kowarik, 2011; Shuster et al., 2011). Urban decline has been reconceptualized as a

population-driven process of abandonment and demolition that gives rise to a hyper-patchy, edge-rich mosaic of impervious and vegetated surfaces, spaces teeming with non-human life. A flurry of urban ecological research has emerged around, for example, land vacancy as a ‘driver’ of urban biodiversity. Brownfield and vacant lots have been reframed as novel ecosystems that provide endangered species habitat (Fischer et al., 2013; Gardiner et al., 2013; C. M. Walker, Colton Flynn, Ovando-Montejo, Ellis, & Frazier, 2017) and a range of ecosystem services, including urban heat island mitigation, carbon sequestration, shade provision, air pollution abatement, soil building, pollination, and stormwater management (Haase, 2013).

Quantitative modeling has become a powerful tool to analyze patterns of land change associated with urban decline. Geospatial technologies, particularly remote sensing, are increasingly used to measure the expansion of vegetated surfaces through land vacancy (Deng & Ma, 2015; Emmanuel, 1997; Maimaitijiang, Ghulam, & Sandoval, 2015) and to integrate this ‘greenspace’ into planning (Frazier & Bagchi-Sen, 2015; Oda et al., 2018). The transformation from impervious to vegetated surfaces associated with demolition of the built environment is interpreted through an implicitly value-laden framework: demolition is framed as ‘improvement,’ greener is always ‘better’. Because shrinking cities ecology papers argue that ecosystem services, including cultural services, are necessarily associated with greening (Robinson & Lundholm, 2012), the literature is quick to assume increases in vegetated surfaces not only improves ecological processes but also contributes directly to human well-being (Kim, 2016). Apart from a few notable exceptions (Hoalst-Pullen et al., 2011; Ryznar & Wagner, 2001; Schwarz, Berland, & Herrmann, 2018), the possibility that greening constitutes anything other than a benefit, an ecosystem *disservice* in this nomenclature, is either ignored or is treated as a

‘trade-off’ with competing ecological priorities (Rega-Brodsky, Nilon, & Warren, 2018; Riley, Perry, et al., 2018).

Researchers are quick to draw on a rehashed cybernetics (see Section 2.2.1) to explain urban decline as a ‘natural’ phase within an imagined ahistorical ‘cycle’ of urban development, in which decline leads inevitably to revitalization, analogous to the cycling of nitrogen or carbon (Tredici, 2010). Haase (2013) and Hoalst-Pullen et al. (2011) both feature models of various a-historical ‘stages’ of urban development and their associated biophysical characteristics to advance their arguments. Some shrinking cities ecologists have envisioned urban decline as a process that enrolls nature itself in capitalist processes of creative destruction, for example, by portraying novel ecosystems as innovations imagined to enact a sort of recombinant, more-than-human “laissez faire” (Rink, 2009, p. 282). As with cybernetics more broadly, this framing rests on an assumption that social and ecological systems are, in essence, similar in the way they are structured and how they change (Cote & Nightingale, 2012).

In sum, shrinking cities ecological research positions population loss as the causal force behind urban decline, with vacant land as its primary effect. This formulation—that population loss causes land vacancy, and that land vacancy constitutes environmental improvement—inverts the longstanding neo-Malthusian narrative that population growth causes environmental degradation. It also relies on and reproduces a false commensurability: not only is decline a generalizable process, uniform across space and time, but all forms of ‘greening’ associated with vacancy are deemed homogenous and universally beneficial. Most salient for the present critique is the way an emerging consensus has formed around the idea that the key to the shrinking cities problematic lies in leveraging ecological improvement by ‘reclaiming’ vacant property for urban greening projects in service of sustainability and environmental justice. Shrinking cities, we are

told, can be “role models” not “relics” (Burkholder, 2012, p. 1169) by enlisting this surge of ecological activity as a green design element in within a broader urban sustainability transition. Urban planners call for repurposing vacant land for community gardens or green infrastructure (Hollander & Németh, 2011), or even for de-urbanizing vast tracts of vacant land as a way to ‘right-size’ infrastructure to current population (Schilling & Logan, 2008; Németh & Hollander, 2016). Right-sizing proposals cohere with other neo-Malthusian proposals that ‘fix’ environmental problems by displacing the poor and producing a nature with no people in it—*Half Earth* at the urban scale (see Section 2.2.1).

2.3.2: Urban political ecology of the US Rust Belt

While urban systems science understands urban decline through the lens of ecological opportunity, urban political ecologists draw on Marxist urban political economy to make sense of decline as a co-constitutive process of the urbanization of capital and nature (Heynen, Kaika, et al., 2006). Within this literature, land vacancy is understood in the context of the way capital generates and absorbs surplus through the built environment. The durability and rigidity of the built environment (as fixed capital) is both the necessary precondition and result of capital accumulation but contains its own internal contradiction that can only be staved off through periodic devaluation and crisis. Real estate investment conveys a complex of use values and exchange values that must be financed up-front but can only be realized gradually. Initially, these investments are highly profitable because they absorb surplus and increase labor productivity, boosting the accumulation of relative surplus value. Over time, however, the dead labor contained in the depreciated fixed capital interferes with continued extraction of surplus from living labor. Because fixed capital at first augments but then hinders accumulation, it must be

devalued through crisis to allow for unfettered extraction of relative surplus values elsewhere—this is the ‘spatial fix’ (Harvey, 1982). As a result, “whole areas of the built environment” must be destroyed through demolition to prepare the ground for a new round of accumulation elsewhere (Smith, 2008, p. 170). Thus, crises of capital have not only deindustrialized the Rust Belt, resulting in urban population loss, but also require that portions of the built environment be devalued and destroyed to support ongoing accumulation elsewhere, giving rise to vacant land, which is then available for future revalorization. The state apparatus often facilitates the needs of capital by enacting demolition campaigns that aim to ‘stabilize’ property markets with an eye towards future reinvestment (Hackworth, 2014, 2015; Rosenman & Walker, 2015). From this standpoint, population decline does not *cause* land vacancy. Instead, patterns of population decline and increasing land vacancy are both effects of a single underlying process of uneven development expressed through property markets.

Political ecologists have seized upon the ecology of vacancy to show that the urbanization of nature in spaces of prolonged disinvestment does not necessarily constitute an ecological ‘improvement’ that serves the interests of environmental justice. Material effects of this process often bring vulnerable residents into contact with unwanted ecologies associated with neglect, such as increasing pest presence (D. Biehler, 2013; D. D. Biehler, 2009) ‘ecologies of fear’ associated with ongoing neglect of vegetation (Brownlow, 2006), and the ‘ordinary environmental injustices’ of chronic exposure to disinvestment from the built environment (Whitehead, 2009). Efforts to bring uneven development into conversation with remote sensing argue that “greening may mask underlying and persistent socio-economic problems” (Hoalst-Pullen 2011, p. 431) and that the linkage between greening and environmental justice should be treated as a question, not a premise (Ryznar & Wagner, 2001; Schwarz et al., 2018).

Not only is the assumption that depopulation causes greening, and that greening indicates ‘improvement’, unwarranted from an urban political ecology standpoint, but this misrecognition may itself generate its own political effects. It participates in and reproduces various discourses and representations that erase residents from the landscape and construct land as empty and claimable. Representational practices associated with mapping vacant land reinforce this blank-slate discourse, tending to isolate the shrinking city in Cartesian space, disconnected from its regional context, particularly the context of White suburbanization, wrongly suggesting the processes driving land vacancy are internal to the city rather than relational within and across entire metropolitan areas (Safransky, 2014). In the case of Rust Belt cities, this blank-slatting effect produces a colonizing gaze, positioning predominantly Black neighborhoods in cities like Detroit and Cleveland as new ‘frontiers’ for White homesteaders to colonize (Millington, 2010). Urban political ecology research argues that this return-to-nature construct fundamentally misreads the landscape, not only by obscuring the political economic roots of land vacancy but also by using narratives of depopulation as a way to erase evidence of ongoing human presence, thereby ‘producing’ a wilderness to be claimed (Draus, Roddy, & McDuffie, 2014; Pedroni, 2011). The inverted Malthusian discourse applied to shrinking cities has erased political economic origins of land vacancy, creating a critical need to examine the power dynamics behind the ways knowledge for reclaiming of vacant land to produce ecosystem services is produced.

2.3.3: Examples of strategic positivism in urban political ecology

Just as foundational texts in political ecology turned the population-degradation narrative into a set of questions, I argue that the linkage between land vacancy, ecological improvement,

and environmental justice must also be made into a question to be demonstrated with evidence rather than taken as a premise. Moreover, I argue that mixed-methods research offers a potent vehicle for staging this intervention in a way that shows how ecological processes *make a difference* in how these contradictions are worked out on the ground. Such an approach may also contribute to making results more legible to planners, ecologists, and landscape architects. While it is true that techno-scientific rationality associated with satellite imagery analysis often produces knowledge responsive to political agendas that are in turn amenable to reproducing status quo domination, there is no need to eschew calculation and measurement in critiquing positivists. Below, I draw attention to several examples in which critical theorists deploy what Wyly (2009) called strategic positivism to deepen explanatory power in urban political ecology of the US Rust Belt.

Hackworth (2017) provides a compelling example for drawing on quantitative methods to support critical projects. In a statistical analysis of US Rust Belt land abandonment, he tests three dominant, largely a-political theories of urban decline against a fourth, explicitly political theory that combines racism and capital accumulation in explaining the emergence of land vacancy. Results demonstrate that the data on the emergence of ‘extreme land abandonment’ across Rust Belt cities are inconsistent with dominant theories. He locates the origins of urban decline in not only the urbanization of capital but also White reaction to the Great Migration and subsequent racial containment strategies that involved systematic discrimination and, ultimately, White flight from the cities. Hackworth’s study suggests a need for further attention to how race shapes the political economy of land vacancy in the Rust Belt.

A series of papers on the urbanization of nature in Rust Belt cities demonstrate the irreducible indeterminacy of vegetation in spaces of disinvestment while also showing how

integration of remote sensing with qualitative data improves explanatory power. An initial paper, set in Indianapolis, analyzes aerial imagery within a political economy framework, expecting to observe a positive correlation between decreasing income and decreasing tree cover, as impoverishment is anticipated to be related to reduced access to environmental amenities like the urban tree canopy (Heynen, 2006). Yet, the statistical analysis found these variables to be *inversely* related—as areas became poorer or more predominantly Black, they also became ‘greener’. A follow-up paper, set in Milwaukee, identifies the same pattern but includes qualitative data analysis (Heynen, Perkins, & Roy, 2006). By triangulating these results with interviews with residents and local arborists, the paper argues that a ‘fenceline forest’ of unmanaged vegetation accounts for a large share of the urban tree canopy in some neighborhoods. By presenting qualitative evidence that these trees are nuisances or hazards rather than amenities to residents, the paper concludes that some forms of greening are outcomes of structural disinvestment, particularly from Black neighborhoods, embedded within a neoliberal processes of shifting the burden of maintenance from the state onto private citizens. Importantly, using aerial imagery, the fenceline forest cannot be distinguished from amenity trees; qualitative evidence is required to distinguish between them.

Combining insights from both sets of studies, it is apparent that ‘greening’ through demolition and land vacancy cannot be studied only through a techno-scientific gaze from above. Failing to ground quantitative analysis in a rigorous theoretical framework, or failing to triangulate results, for example, by pairing statistical analysis with interviews, poses significant limitations in terms of explanatory power. The fenceline forest and the race-based process of land abandonment in the Rust Belt more broadly are the main impetuses for this dissertation research. However, I argue that both sets of studies missed an opportunity to show both the

strength and limitations of integrating quantitative techniques into critical inquiry. At no point did either paper question whether the quantitative data used for analysis were partial or situated, nor was there any analysis of the positionality of the researcher using these techniques. In doing so, the papers quietly uphold quantitative techniques as a more authoritative way to understand the environment, with interviews used only to support or complement statistics.

2.4: Triangulating around the greening of shrinking cities

2.4.1: Triangulating for divergence

Apart from a handful of studies, many of the insights gleaned from integrative land change science and political ecology approaches to resource management (Section 2.2.3) have not been explored in an urban context. In what follows, I contribute to filling this gap by urbanizing the engagement between land change science and political ecology. One of the main findings coming out of forestry research is that the processes identified by political ecology can help recuperate the tendencies towards naïve empiricism of land change science, particularly to understand what constitutes degradation (or ‘improvement’, in this case), while land change science can offer a robust data-driven grounding for political ecology theory-testing. I propose to perform an analogous recuperation of the shrinking cities literature.³

The above review, particularly findings from Harding and Heynen, suggests a particular need for mixed-methods research to critically appraise the patterns and processes of urban ‘greening’ in relation to race, property devaluation, and processes of demolition. I argue that a mixed-methods approach that brings urban land change within an urban political ecology

³ My approach is informed by and builds upon previous studies that have investigated the state practices that enact vacant land re-use in service of capital. For more on the growth coalition that underpins vacant land re-use governance in Cleveland, see Walker (2018).

framework can render the spatial patterns of land vacancy visible in a way that is empirically robust while also making legible the underlying processes of uneven development driving both reduced population densities and land vacancy in so-called shrinking cities. Relying on Nightingale's method of triangulation for dissonance (Section 2.2.4), I aim to *situate* and *politicize* urban land change, deploying remote sensing strategically as a way to empirically ground certain knowledge claims regarding urban decline and socio-environmental change, while also demonstrating its epistemological limits, pointing towards a need for qualitative case studies. This approach not only contributes to clarifying the linkages between urban land change, revegetation, and environmental justice in the context of urban decline but may also underscore how remotely sensed imagery, in itself, cannot reliably reveal social or spatial relations, and in fact often reifies them.

2.4.2: Conclusion

Taken together, I have argued in this chapter that, much like predecessors in cultural ecology, the ecology of shrinking cities research positions population loss as the *causal force* behind purported ecological resurgence in Rust Belt cities. Moreover, by linking this improvement to what I will show is a reductive interpretation of environmental justice, the shrinking cities narrative renders land claimable while framing that land seizure as a benefit to residents. Malthusian discourse, in turn, depoliticizes land vacancy by obscuring political economy, enabling an ecological modernization agenda that calls for 'reclaiming' vacant land to be repurposed for production of ecosystem services. Urban political ecology research on declining Rust Belt cities has demonstrated that the environmental justice content of 'greening' through demolition is tenuous at best. However, because this literature centers on environmental

politics, largely eschewing quantitative methods, it fails to engage seriously with ecological dimensions of land vacancy. Only by engaging with the ecology of urban political ecology, taking quantitative measurement of urban environmental change in the aftermath of economic crisis seriously while drawing on critical social theory to ask the right research questions and interpret results, can this Malthusian narrative be critiqued and destabilized in a way that ‘sticks’.

More broadly, *situating* and *politicizing* urban land change science may offer lessons for engaging with other systems science sub-fields with roots in cultural ecology, for example resilience ecology and sustainability science. In the next two chapters, I develop an urban land change analysis and a qualitative case study of vacant land re-use to support this engagement.

CHAPTER 3: GREENING THE REDLINED AREA: FORECLOSURE AND REVEGETATION IN CLEVELAND, OHIO

3.1: Introduction

Economic crisis can drive ecological change in urban areas. Urban vegetation patterns may shift when economic crisis leads to changes in land tenure and land values that, in turn, affect landscape management practices (Minn et al., 2015; Ripplinger, Collins, York, & Franklin, 2017). Land use may also change vegetation abundance as municipalities implement demolition programs in an effort to stabilize property values (Endsley, 2018). Shifts in vegetation following economic crisis may be particularly acute in shrinking cities, or cities with multi-decadal population decline that tend to already have large inventories of vacant land.

Nowhere has the process linking economic crisis, property market dynamics, and the expansion of vegetated surfaces been more pronounced than in urban neighborhoods with high foreclosure rates associated with the 2007-2009 economic crisis (the “Great Recession” hereafter). The ‘shrinking’ city of Cleveland, Ohio, for example, faced some of the highest foreclosure rates in the U.S. (Coulton et al., 2010) and undertook an aggressive demolition program that has added to the city’s considerable stocks of vacant urban land (Rosenman & Walker, 2015), although local economic recovery has remained spatially uneven and has failed to ameliorate property market conditions in ‘distressed’ neighborhoods where foreclosures and demolitions were concentrated (Ford, 2016; Griswold, Calnin, Schramm, Anseli, & Boehnlein, 2013). Yet, the connections among the Great Recession, property market dynamics (particularly foreclosures and vacancy), and urban environmental change have rarely been quantified. This knowledge gap has led many urban ecologists and planners to frame increasing stocks of vacant urban land in shrinking cities as an outcome of gradual population loss and post-industrial economic restructuring, without acknowledging the way periods of economic crisis accelerate

processes of land clearance and reshape the spatial patterning of vegetation through property markets (Haase et al., 2014; Riley et al., 2018).

This chapter seeks to fill this gap by asking: how have urban vegetation dynamics shifted in an exemplar shrinking U.S. city following the Great Recession, and how have property market dynamics contributed to this shift? Drawing on U.S. Census data, tax assessor records, and twenty years of satellite imagery, the paper analyzes how relationships among urban vegetation abundance, population, socioeconomic status, racial composition, and property markets have changed in Cleveland, Ohio, from 1998 to 2017. It uncovers a spatially uneven pattern of increasing vegetation abundance following the Great Recession that is statistically linked to foreclosures in the historically redlined area, an administrative boundary delineated in the 1930s that has contributed to persistent racial segregation in U.S. cities and a wealth gap between different racial groups.

The chapter is structured as follows. I begin with a review of literature on remote sensing approaches to detecting, monitoring, and explaining urban vegetation change, particularly in shrinking cities, and identify knowledge gaps around the role of economic crisis, property markets, and race in shaping these dynamics, which motivate the present study (Section 3.2). I then explain the data sources and methods used in this analysis (Section 3.3), describe spatial and temporal patterns of post-crisis greening, and presents results from a linear mixed-effects regression model that foreground the relationships among redlining, race, foreclosure, and property market characteristics in explaining post-crisis greening (Section 3.4). Following a discussion of the implications of these results for urban land change science, I concludes with a call for further research on redlining as a driver of environmental change in U.S. cities (Section 3.5).

3.2. Literature review

3.2.1. Urbanization, vegetation, and public health

Processes of urbanization drive environmental change as human settlement activities rework landscape-scale patterns. As global population increasingly congregates in cities, satellite imagery has proved crucial to mapping and monitoring how urbanization is expressed on the earth's surface through patterns of land cover change (Weng, Quattrochi, & Gamba, 2018). State-sponsored earth observation programs such as Landsat have accumulated decades of satellite imagery (Yang & Lo, 2002; Zhu, 2017), enabling the use of multitemporal and time series remote sensing methods to not only map and monitor urban land cover change but also to identify drivers (Gamba & Dell'Acqua, 2016; Luck et al., 2009). Urbanization typically manifests as the expansion of the built environment, expressed as a pattern of transformation from vegetation to impervious surfaces (Sun et al., 2011), with implications for an array of biophysical processes, from stormwater management to urban heat island effects. As a consequence, the bulk of multi-temporal urban remote sensing literature focuses on mapping and monitoring patterns of impervious surface expansion as well as identifying drivers of these patterns to assist urban planning and urban ecological research (Rashed & Jürgens, 2010).

The transformation of vegetation to impervious surfaces affects public health and human well-being. Access to managed urban greenspace improves environmental quality, physical and psychological well-being, and quality of life (Lang et al., 2018). Cross-sectional remote sensing studies show urban vegetation abundance tends to be positively correlated with measures of higher socioeconomic status in U.S. cities (Mennis, 2006; Schwarz et al., 2015). Because of the public health benefits typically associated with access to managed urban greenspace, a dearth of vegetation in areas of concentrated poverty or in communities of color is thought to constitute an

environmental justice issue (Wolch, Byrne, & Newell, 2014). Within such areas, some evidence suggests relatively higher concentrations of greenspace may have a palliative effect, all else held constant. For example, areas with more expansive tree cover were associated with reduced crime within predominantly low-income Black neighborhoods of Chicago, Illinois (Kuo & Sullivan, 2001) .

3.2.2: Effects of vacancy and demolition on vegetation dynamics in shrinking cities

When remotely sensed vegetation detection supports environmental justice claims about disparities in urban vegetation, these claims tend to rest on a generic ‘urban green’ that is presumed to convey an array of ecosystem services that support human well-being (Lang et al., 2018). However, not all urban vegetation conveys the sort of public health benefits associated with managed greenspace. Unmanaged or under-managed vegetation associated with neglect or disinvestment complicates the relationship between urban vegetation abundance, socioeconomic status, and public health described above, although distinguishing between management regimes in cross-sectional analysis proves difficult without ground data. For example, Heynen et al. (2006, p. 16) combined aerial imagery analysis with interviews to reveal a “fence line forest” of unmanaged trees in Milwaukee, Wisconsin that was produced not through increasing well-being but rather through a shift in the burden of street tree care from the public sector to individual property owners that redistributed environmental amenities along lines of race and class.

An emerging body of urban land change research on shrinking cities further complicates this linkage between vegetation, socioeconomic status, and public health. As demolition converts the built environment to vegetated surfaces, the correlation between socioeconomic status and urban vegetation abundance has been shown to weaken, become spatially variable, or even

reverse (Maimaitijiang et al., 2015; Pearsall & Christman, 2012). In the shrinking city of Detroit, Michigan, for example, vegetation has increased in areas of concentrated poverty since 1975, a result of ongoing demolition of the built environment (Emmanuel, 1997; Hoalst-Pullen et al., 2011; Ryznar & Wagner, 2001). In Toledo, Ohio, another shrinking U.S. city, the linkage between measures of social vulnerability and urban vegetation abundance has shifted from negative to statistically insignificant (Schwartz et al. 2018). Although not considered a shrinking city, tree cover was found to increase in areas that experienced declining income between 1962 and 1993 in Indianapolis, Indiana (Heynen, 2006).

Shrinking cities with increasing stocks of vacant land may struggle to keep pace with mowing and other management needs. The public health benefits of unmanaged or under-managed greenspace are, at best, ambiguous (Gulachenski, Ghersi, Lesen, & Blum, 2016; Katz, Connor Barrie, & Carey, 2014). Indeed, high concentrations of unmanaged urban vegetation may constitute an environmental injustice in their own right (Lewis et al., 2017; Nassauer & Raskin, 2014). While some studies have investigated the potential for heightened vegetation presence to enhance urban ecosystem service provision for human benefit (Burkholder, 2012; Gardiner et al., 2013), environmental social scientists have cautioned against ignoring urban ecosystem *disservices*, as some services may be perceived as nuisances rather than benefits (Lyytimäki et al., 2008). Unmanaged vacant lots do not convey cultural ecosystem services because they lack “physical evidence of social capital” associated with gardens, parks, and other forms of managed greenspace (Nassauer & Raskin, 2014, p. 246).

3.2.3: Property markets, economic crisis, and shifting vegetation dynamics

Housing market activity may be an under-recognized driver of urban vegetation change through its effect on housing vacancies and demolitions, particularly during times of crisis. Economic crises such as the Great Recession may operate in a way similar to a disturbance event across the urban landscape, with the direction and magnitude of this change shaped by climate (Grimm, Pickett, Hale, & Cadenasso, 2017). During a crisis, some properties may be abandoned or neglected, leading to changes in vegetation productivity through land management, and may ultimately be demolished. Thus, economic crisis may precede significant shifts in land cover (increasing or decreasing vegetation, depending on climate) resulting from way crisis leads to shifts in land tenure that reshapes land use through demolition and land management through vacancy. Areas with lower property values and higher foreclosures were linked to increasing vegetation in Detroit between 1990 and 2010, for example (Endsley et al., 2018). In the arid climate of Phoenix, Arizona, mortgage foreclosure was associated with declining vegetation abundance because home vacancy left private urban greenspace unirrigated (Minn et al., 2015). Evidence for crisis-induced land management shifts are also evident in recent biodiversity studies in Phoenix, where a pattern of homogenization in species diversity was evident owing to ‘weed’ species colonization following land management shifts (Ripplinger et al., 2017; Ripplinger, Franklin, & Collins, 2016).

3.2.4: Redlining, subprime mortgage lending, and the study area of Cleveland, Ohio

This paper advances knowledge in urban landscape studies by further investigating how property markets mediate the way the Great Recession has affected urban vegetation patterns in the shrinking U.S. city of Cleveland, Ohio, and surrounding suburbs of Cuyahoga County. The primary contribution lies in demonstrating how the historically redlined area has magnified the

linkage between foreclosure and post-crisis greening by (1) organizing the spatial pattern of subprime or other high-cost loans, many of which were subject to foreclosure and (2) increasing the likelihood that those foreclosed properties would ultimately be neglected or demolished, thereby affecting vegetation.

Scholarly research has situated subprime mortgage lending within a history of racial, ethnic, and class-based inequalities in access to safe, affordable housing in US cities that have been shaped, in part, by the practice of redlining (Hernandez, 2012). Redlining describes the historical practice of delineating certain areas within U.S. cities as unworthy of investment or otherwise excluded from access to amenities, typically based on racial demographics. A state-led racially discriminatory practice enacted in the 1930s, itself a time of economic crisis, redlining emerged from a neighborhood typology intended to guide future investment as depicted in “residential security maps” produced by the Home Owner Loan Corporation (HOLC) (Figure 2). HOLC maps marked predominantly white areas in green and deemed them ‘desirable’ for investment, while designating predominantly Black and some racially diverse areas as ‘hazardous’ and unsuitable for investment. These latter areas were marked in red, often accompanied by detailed area descriptions that characterized neighborhood change in starkly racist terminology. For example, a redlined area around Cedar Avenue on the east side of Cleveland was described as “a continuation of the negro belt” that “has experienced...the detrimental change of ownership occupancy from white to colored” (Nelson, Winling, Marciano, & Connolly, 2019). In subsequent decades, this area was deemed to be a “crime-ridden slum” by city officials and was subjected to ongoing disinvestment and demolition campaigns on that basis (Kerr, 2011, p. 119). As HOLC maps were taken up by banks to guide credit-worthiness, redlining had the effect of systematically denying communities of color, particularly Black

households, access to home loans throughout much of the 20th century, reinforcing racially segregated neighborhoods and producing dramatic gaps between Black and white households in terms of life chances and opportunities for accumulating and transferring wealth across generations (Mendenhall, 2010).

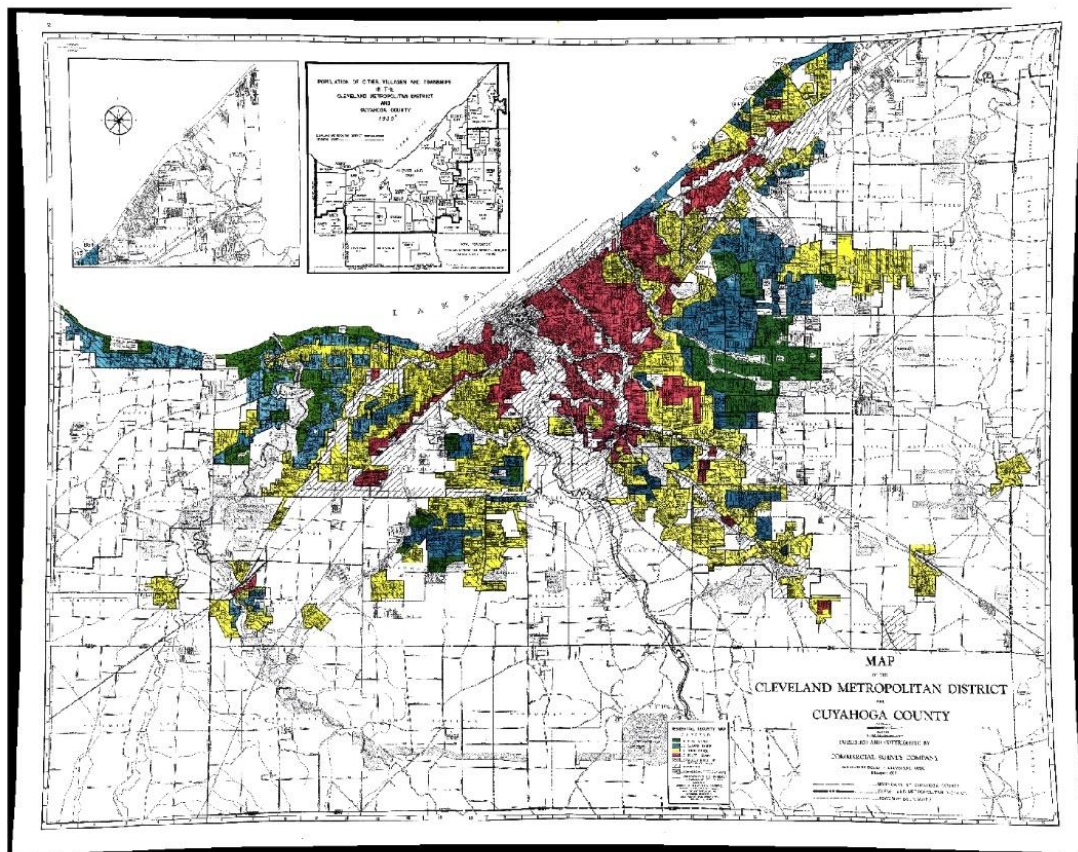


Figure 2: Residential security map of Greater Cleveland produced by Home Owners' Loan Corporation (HOLC) in 1940. HOLC graded urban neighborhoods on potential credit-worthiness on a scale from “desirable” (A, in green) to “hazardous” (D, in red) for investment. Predominantly Black neighborhoods or neighborhoods with increasing Black population were designated as “hazardous” and marked in red. The practice of redlining through HOLC maps has contributed to present-day racial composition, foreclosure rates, and property values in Cuyahoga County. Source: Mapping Inequality (Nelson et al., 2019)

Innovations in the financialization of risk in the late 1980s underwrote a process by which the history of racial exclusion from credit was transformed into a predatory inclusion through high-cost or “subprime” loans (Ashton, 2012), a process that has become known as

‘reverse’ redlining, in which borrowers designated as ‘risky’ received loans at higher interest rates or with higher fees (Brescia, 2009). A considerable body of evidence demonstrates that Black and Latinx households were more likely to be targeted for subprime loans, even after adjusting for household income and credit rating, in the lead-up to the Great Recession (Dymski et al., 2013; Faber, 2013; Rugh & Massey, 2010). In Cleveland, subprime lending comprised nearly half of all home loans in 2004, with the bulk of these loans targeting Black borrowers on the east side of City of Cleveland and adjacent suburbs. Class status did not protect Black borrowers from risky subprime credit in Cleveland. Higher-income Black households were, in fact, the most likely demographic group to receive high-cost loans and thus faced a higher risk of foreclosure, with over 60% of subprime and other high-cost loans to Black households resulted in a foreclosure filing (Coulton et al., 2010). Owing to the way redlining spatially organized racial segregation of many U.S. cities, the practice of targeting certain racial or ethnic groups for high-cost loans, which often resulted in mortgage foreclosure, had the effect of spatially concentrating foreclosures in *de facto* segregated communities of color (Hyra & Rugh, 2016). In Cleveland, 35% of mortgage foreclosures were filed for properties on the east side of the city. Of these, 63% (n=41,405) were found in the historically redlined area (Table 1).

Following foreclosure, devaluation of foreclosed properties was most severe in Cleveland’s majority Black neighborhoods. Banks that took ownership of foreclosed properties tended to provide less routine maintenance, such as lawn mowing and window boarding, to vacant, foreclosed properties in majority Black neighborhoods (Kelly, 2014). Between 2005 and 2008, roughly 75% of bank-owned properties on the predominantly Black east side, compared to just over 30% on the whiter and more affluent west side of Cleveland, sold for less than \$10,000 (Coulton & Schramm, 2008). This disparity in property values has continued over ten years after

the crisis, contributing to a pronounced, though spatially uneven, rise in vacancy rates, property tax delinquency, and tax foreclosure. While Cuyahoga County housing market as a whole appears to have recovered in terms of sale prices, property markets on Cleveland's east side are still considered "distressed" (Ford, 2018).

The state apparatus in Cleveland and in surrounding suburbs in Cuyahoga County have undertaken an aggressive program to demolish vacant properties in an effort to stabilize property markets and tax revenues (Griswold et al., 2013; Rosenman & Walker, 2015), providing reason to hypothesize that vacant urban land (and, given the humid climate, increasing vegetation abundance) may follow foreclosure. Therefore, material effects of subprime mortgage lending and ensuing crisis may remain inscribed on the urban landscape through the way lower home values and higher vacancy rates in communities of color have led to observable shifts in vegetation patterns.

3.3. Data and methods

The literature review presented above leads to the overarching hypothesis that property market dynamics drive increasing vegetation abundance in parts of Cuyahoga County, Ohio through the way redlining has shaped the distribution of foreclosures as well as the pathway linking foreclosure with land cover change following the Great Recession. I operationalized this overarching hypothesis as follows:

H1: Foreclosure rates are more strongly associated with patterns of increasing vegetation in census tracts that intersect the historically redlined area.

To test this hypothesis, I assembled and analyzed twenty years of satellite imagery, demographic and socioeconomic data, and tax assessor records in a linear mixed-effects regression model. I

tested various specifications of the model to see whether including an interaction term for foreclosure and redlining explains more variance in the data.

3.3.1: Vegetation data

Vegetation abundance was calculated using the Normalized Difference Vegetation Index (NDVI) from multispectral imagery available through Landsat Analysis Ready Data (ARD), a recently-introduced product from U.S. Geological Survey (USGS). Landsat ARD has undergone geometric and radiometric correction procedures such that scenes are directly comparable over time and thus appropriate inputs to time series analysis, reducing computational requirements and sources of error introduced through ad hoc decisions made during pre-processing (U.S. Geological Survey, 2017; Young et al., 2017).

3.3.1.1: Imagery selection

Surface reflectance data were acquired through the USGS EarthExplorer interface (<https://earthexplorer.usgs.gov/>). Imagery from 579 dates from Landsat 5, 7, and 8 were acquired between 1998 and 2017. This temporal extent was selected to establish a ten-year baseline pattern of land change prior to the Great Recession (2007-2009) and to capture post-crisis effects. The spatial extent comprised all of Cuyahoga County to match the spatial extent of property market data (Section 3.2). Because the area of interest covered a relatively small area but straddles two scenes (H=24 and 25, V=7 in the ARD tiling system), it was possible to access scenes with partial coverage (all but the westernmost edge of Cuyahoga County) every *other* 16 days. All scenes with at least some clear land in the area of interest were downloaded, including images with significant cloud cover as well as post-2003 Landsat 7 data with scan-line correction (SLC) error.

Table 1 Summary statistics of demographic, socioeconomic, and property market characteristics by region.

	Region				
	Cleveland (east)	Cleveland (west)	Inner ring suburb (east)	Inner ring suburb (west)	Outer ring suburb
Population change (1990-2010)	-25.8%	-13.7%	-15.4%	-7.8%	15.7%
% Black (2010)	83.3%	20.1%	56.7%	4.9%	7.8%
% Vacant (2010)	23.8%	14.5%	13.9%	7.2%	6.2%
Poverty rate (2010)	38.7%	31.2%	18.6%	11.5%	5.5%
Median home value (2010)	\$73,162	\$90,728	\$123,890	\$130,616	\$208,143
Total number of residential tax parcels	81,853	60,548	93,064	73,746	134,143
Residential tax parcels with at least one mortgage foreclosure (% of total mortgage foreclosures)	28,727 (35.1%)	17,590 (29.1%)	33,214 (35.7%)	12,932 (17.5%)	15,365 (11.5%)
Residential tax parcels with at least one tax foreclosure (% of total tax foreclosures)	22,157 (27.1%)	4,925 (8.1%)	7,234 (7.8%)	882 (1.2%)	1,255 (0.9%)
Total number of residential tax parcels in redlined area (% of total parcels)	41,405 (50.6%)	8,460 (14.0%)	1,606 (1.7%)	520 (0.7%)	412 (0.3%)
% redlined parcels with at least one foreclosure	63.2%	36.3%	57.5%	34.4%	40.5%

3.3.1.2: Image processing

Image pre-processing comprised a four-step workflow, with raw Landsat scenes as the input and a time series of tract-level residential NDVI trend estimates as the output. NDVI offers an index of vegetation abundance that makes use of the fact that vegetation reflects light in the near infrared range but absorbs it in the red range of the electromagnetic spectrum. The calculation for NDVI in pixel i is as follows:

$$NDVI_i = \frac{NIR_i + RED_i}{NIR_i - RED_i}$$

where NIR and RED refer to Landsat surface reflectance values in the near-infrared and red range of the electromagnetic spectrum, respectively. I opted to use NDVI for a readily interpreted measure that captures changes in both vegetation extent associated with changes in land use (demolition) and increases in vegetation abundance associated with land management (vacancy). While other methods of vegetation detection, such as linear spectral unmixing or land cover classification, can capture change in the spatial extent of vegetation, they cannot detect shifts in vegetation abundance or density resulting from management shifts and so were rejected. All pre-processing was conducted in R Statistical Software version 3.4.0 (2017-04-21).

Following a mosaic-clip-reproject process conducted with the `gdalutils` package (Greenberg & Mattiuzzi, 2018), I identified atmospheric and land cover conditions in each pixel using the Landsat ARD band “PIXELQA” for masking purposes (U.S. Geological Survey, 2017). Only pixels classified as clear terrain were accepted. Pixels containing snow, ice, water, haze, or clouds were masked. Masking and NDVI calculation were conducted within a single process that relied on the `RStoolbox` package (Leutner, Horning, Schwalb-Willmann, & Hijmans, 2019).

Fewer than 10% of images downloaded had over 90% clear terrain. To address this problem, I developed a process of down-sampling NDVI to the scale of an individual tax parcel, producing a monthly NDVI time series at that scale, and aggregating a monthly residential NDVI time series to the census tract level. This approach allowed me to sidestep the need for cloud-free imagery in a way that made best use of clear terrain available in each scene while also decreasing the time step between NDVI estimates (see Section 5.3 for discussion of these methods). First, I used all dates with clear terrain over a given parcel developed an irregular time series of area-weighted NDVI estimates for that parcel. This process rested on georeferencing NDVI pixels to residential parcels to determine the percentage of parcel's area covered by each pixel. Using this georeferencing information, I calculated an area-weighted mean NDVI for each parcel on each date in which clear imagery was available for the associated pixels. If any pixel intersecting a parcel contained no data for some date, the parcel was also assigned no data for that date. This process yielded a 20-year irregular time series of NDVI estimates for each residential parcel, with a mean of 10.8 NDVI estimates per year.

A process of outlier identification and interpolation to a regular monthly time series was then implemented on each residential parcel time series to smooth the time series and reduce noise (Cai, Jönsson, Jin, & Eklundh, 2017). Outlier identification and interpolation were conducted using time series analysis methods available through the forecast package in R (Hyndman et al., 2018). An example smoothed, monthly parcel-scale NDVI time series, contrasted with its associated irregular time series, is provided in Figure 3. Following interpolation, residential NDVI estimates were then aggregated to the census tract level, with one mean residential NDVI estimate per tract per month, 1998-2017. I validated the result by comparing tract-level NDVI estimates produced through the downscaling and reaggregation

methods described above to a straightforward tract-scale mean NDVI calculated on eight cloud-free days. The latter method tended to produce slightly lower NDVI estimates, with the largest deviations found in tracts where industrial land uses are dominant. For primarily residential census tracts, NDVI estimates tracked closely over time, tending to be 0.05 higher through downscaling and reaggregation compared to whole-tract measures on cloud-free days, which makes sense as whole-tract measures include roadways and other non-residential land uses.

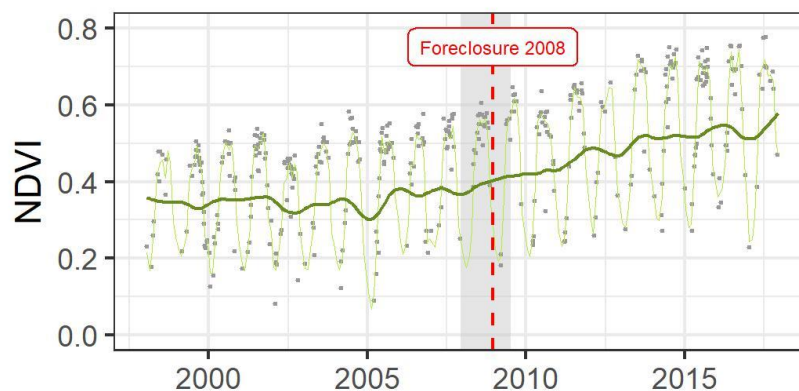


Figure 3: Example residential parcel NDVI time series. Raw NDVI estimates are represented as grey points. The interpolated monthly time series is overlaid in light green. A trend line in dark green shows increasing vegetation abundance over time. In the case of this parcel, a foreclosure filing was recorded in 2008. The parcel was confirmed to be vacant lot in a 2015 property condition survey.

3.3.2: Socioeconomic change and property market data

3.3.2.1 Socioeconomic change

Data on demographics, socioeconomic status, and some housing stock measures were derived from the Brown Longitudinal Tract Database (LTDB), which provides five decades of U.S. Census data for select variables aggregated to 2010 census tract boundaries (<https://s4.ad.brown.edu/projects/diversity/Researcher/Bridging.htm>). Census tract boundaries may change over decades as tracts are split, consolidated, or redrawn to reflect population change in a way that makes decade-over-decade comparisons difficult because data are

aggregated to different areal units. Because LTDB have been aggregated to a common spatial unit (2010 census boundaries) using crosswalk tables, these data are appropriate for analyzing neighborhood characteristics across decades (Logan et al. 2014). Candidate explanatory variables drawn or calculated from LTDB included 20-year population change, racial composition (% Black), poverty rate, vacancy rate, median household income, and median home value. Data provided in US dollar units were rescaled to z-scores.

3.3.2.2: Foreclosure data

Foreclosure data (2005-2017) were acquired through the Northeast Ohio Community and Neighborhood Data for Organizing (NEOCANDO, see <http://neocando.case.edu/>), a database of foreclosure records, property transactions, and an array of community well-being metrics drawn from Cuyahoga County's tax assessor and maintained by Case Western Reserve University Center on Urban Poverty and Community Development. A parcel boundaries shapefile was also acquired by contacting NEOCANDO staff. I used Cuyahoga County Tax Assessor land use class (LUC) codes provided with the parcel data to identify residential parcels. Any LUC code containing the terms "dwelling", "apartment", "housing", or "residential" was included. Mixed-use developments, mobile home parks, and properties owned by public agencies (including land banks) were included. Group quarters (nursing homes, dormitories, hotels) were excluded. The parcels shapefile contained a total of 484,591 features. Of these, 442,340 were identified as residential properties. A total of 99,930 residential parcels in Cuyahoga County were subject to at least one foreclosure filing over that interval (22.5% of all parcels). I created a tract-level summary of cumulative mortgage and tax foreclosures. Census tracts where residential parcels were sparse (< 50 parcels) were excluded (n=8). NEOCANDO data included a regional categorization variable that became meaningful for analysis as each of these regions have

exhibited a distinct development trajectory over time: Cleveland-East, Cleveland-West, Inner Ring-East, Inner Ring-West, and Outer Ring (Figure 4).

3.3.2.3: Redlining data

To map Cleveland’s historically redlined area, I obtained a shapefile of Home Owner’s Loan Corporation (HOLC) delineated as part of the Mapping Inequality project (Nelson et al., 2019) housed at Virginia Tech, which maintains a database of shapefiles for HOLC areal designations (<https://dsl.richmond.edu/panorama/redlining/#loc=5/36.721/-96.943&opacity=0.8>). A spatial join was used to identify parcels with HOLC codes. A code of ‘D’ indicated presence in the historically redlined area. I developed a tract-scale measure of redlining by calculating the percentage of residential parcels within the historically redlined area by tract.

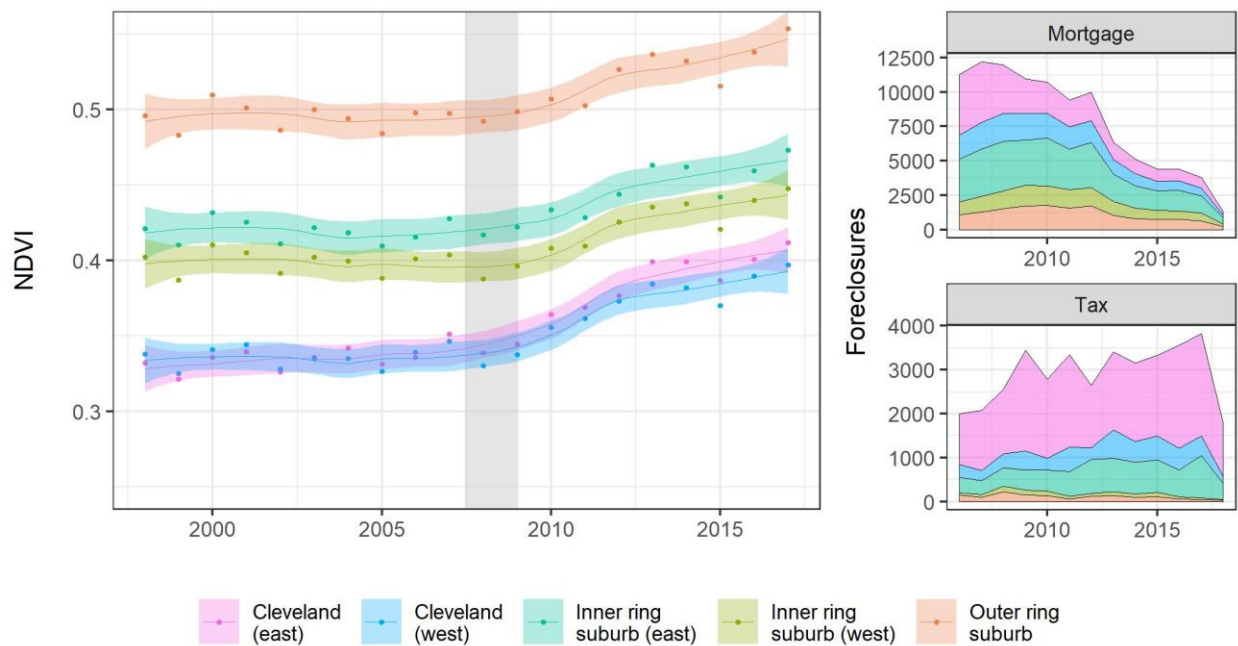


Figure 4: Trends in mean monthly tract-scale Normalized Difference Vegetation Index (NDVI, left) and rates of mortgage and tax foreclosure (right) by region in Cuyahoga County, Ohio. Foreclosure rates were particularly high in Cleveland’s east side. Following the Great Recession, NDVI has risen faster in this region compared to surrounding areas.

3.3.3: Weather data

To control for climate influence vegetation cover, I obtained monthly temperature (minimum, mean, and maximum) and monthly precipitation depth estimates for all of Cuyahoga County from the PRISM (Parameter-elevation Relationships on Independent Slopes Model) Climate Group [Oregon State University, 2019; see also <http://www.prism.oregonstate.edu/explorer/>].

3.3.4: Statistical modeling

A series of linear mixed-effects regression models were developed to evaluate whether hypothesized interactions involving foreclosure rates and the redlined area contribute to explaining vegetation abundance following the Great Recession. Mixed effects regression was selected to test these hypotheses as it offers an effective means to analyze repeat-measure data by harnessing its inherently hierarchical data structure of within-group correlation and between-group variation. The approach can be thought of as partially pooled linear regression (Gelman & Hill, 2007) falling in between specifying a single pooled model for the entire study area or developed separate, unrelated models for each spatial unit. Here, some parameters are constant across the entire study area (fixed effects) while others vary by tract (random effects), where those parameters are drawn from a probability distribution common to all groups (Snijders & Bosker, 2012). Mixed-effects modeling has been useful in explaining variability in repeat-measure vegetation data, particularly with respect to separating climactic and anthropogenic effects (Breyer, Zipper, & Qiu, 2018; Donato, Fontaine, Robinson, Kauffman, & Law, 2009; Knutson et al., 2014; Omuto, Vargas, Alim, & Paron, 2010). Models were developed to explain NDVI in ten-year intervals: 1998-2007 (pre-Recession) and 2008-2017 (post-Recession). Each model comprises two 'levels': time-varying data that change by month (Level 1: NDVI and

weather) and time-invariant census tract characteristics (Level 2: demographics, socioeconomics, and property markets).

3.3.4.1: Time series decomposition

Because NDVI and temperature exhibit pronounced, regular patterns of seasonal variation, leading to serial autocorrelation, time series decomposition procedures were implemented to isolate long-term trends in these data. Time series decomposition separates a univariate time series into a long-term trend, seasonal variation (regular, periodic oscillation), and residual components. For each census tract, the NDVI time series was decomposed using seasonal decomposition of time series by loess (Cleveland, Cleveland, McRae, & Terpenning, 1990). The seasonal component was removed while trend and residual were added together to form the dependent variable. The same process of deseasonalization was used to isolate trends in temperature data. To capture change in NDVI over the study period, a ‘time’ variable was created that gives number of months from the start date.

3.3.4.2: Model development

I first developed a pre-Recession model of NDVI using 1998-2007 data. An iterative process of forwards and backwards selection was used to fit Level 1 (monthly weather) and Level 2 variables (demographic, socioeconomic, and property market characteristics). Once developed, the model was applied to post-Recession (2008-2017) data, replacing 2000 Census variables with comparable values from 2010 (or the 2012 ACS for income, median home values, and poverty). Next, I tested HI by adding possible interactions involving foreclosure rates and the historically redlined area. Finally, I applied the model separately to City of Cleveland and suburban areas to compare parameter estimates vary within the study area. Mixed-effects models were fit with the lme4 package (Bates, 2010) with likelihood ratio testing was used to compare goodness of fit between models. Significance of fixed effects was assessed using Satterthwaite’s

degrees of freedom method for approximating p-values as generated through the lmerTest package (Kuznetsova, Brockhoff, & Christensen, 2019) as this approach is unlikely to overstate significance for the purposes of hypothesis testing (Luke, 2017). Likelihood profiling was used to fit confidence intervals around random effects to assess whether these estimates were different from zero. Model residuals were evaluated for diagnostic criteria including normality, homogeneity, and statistical independence. Effect sizes for plausible interaction terms were visualized using the effects package (Fox, 2003).

From the literature review in Section 3.2, I generally expect urban vegetation to be positively associated with measures of affluence (property values or income, for example) and negatively associated with measures of social deprivation (poverty or vacancy rates, for example). If urban vegetation dynamics follow patterns observed in nearby shrinking cities (Detroit and Toledo), I expect models to show decreasing associations between property values as areas devalued through crisis are ‘greened’ over time. If the data are consistent with H1, I expect a positive, statistically significant interaction term involving foreclosure and redlining that significantly improves goodness of fit.

3.4: Results

Tract-scale NDVI rose across much of the study area following the Great Recession (Figure 5). While some of this increase is likely attributable to particularly wet springs and summers between 2008 and 2017 (Figure 6), the rate of change in mean NDVI varied across regions within the study area, with the largest increases found on the east side of Cleveland, where foreclosures were most concentrated (Table 1). By 2017, 25.6% (n=26,088) of all mortgage foreclosures and 60.4% (n=22,911) of all tax foreclosures fell on the east side of

Cleveland. Foreclosure rates were also high in the east side inner ring suburbs (30.7% of mortgage foreclosures and 19.8% of tax foreclosures) but the rate of change in mean NDVI was not different from the rest of the study area. By 2017, the difference in mean NDVI between the east side of Cleveland and adjacent suburbs had narrowed relative to pre-recession patterns.

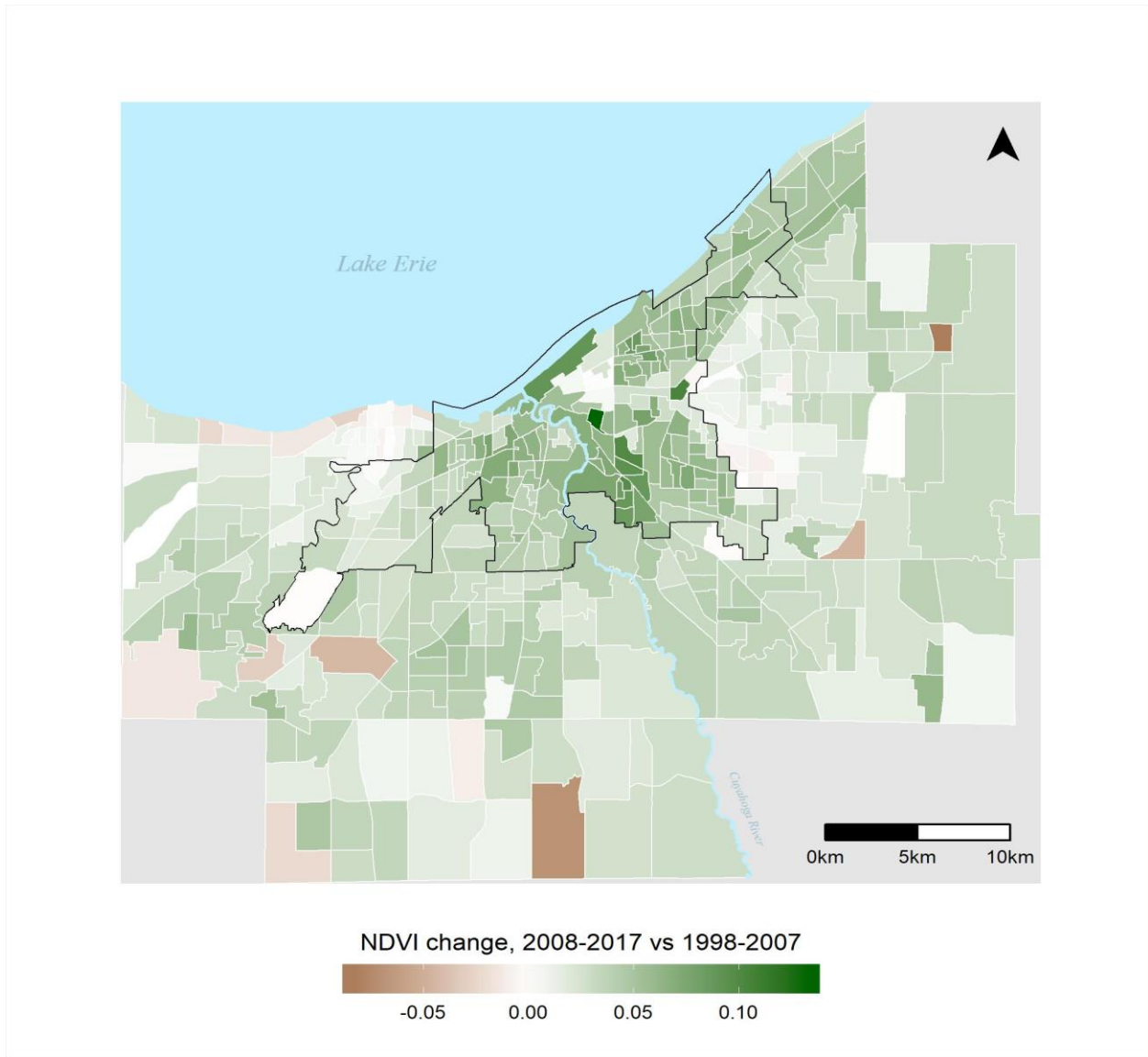


Figure 5: Change in annual maximum Normalized Difference Vegetation Index (NDVI) before (1998-2007) and after (2008-2017) the Great Recession by tract. The City of Cleveland municipal boundary is shown as an overlay. Increasing vegetation abundance is most prominent on the east side of Cleveland.

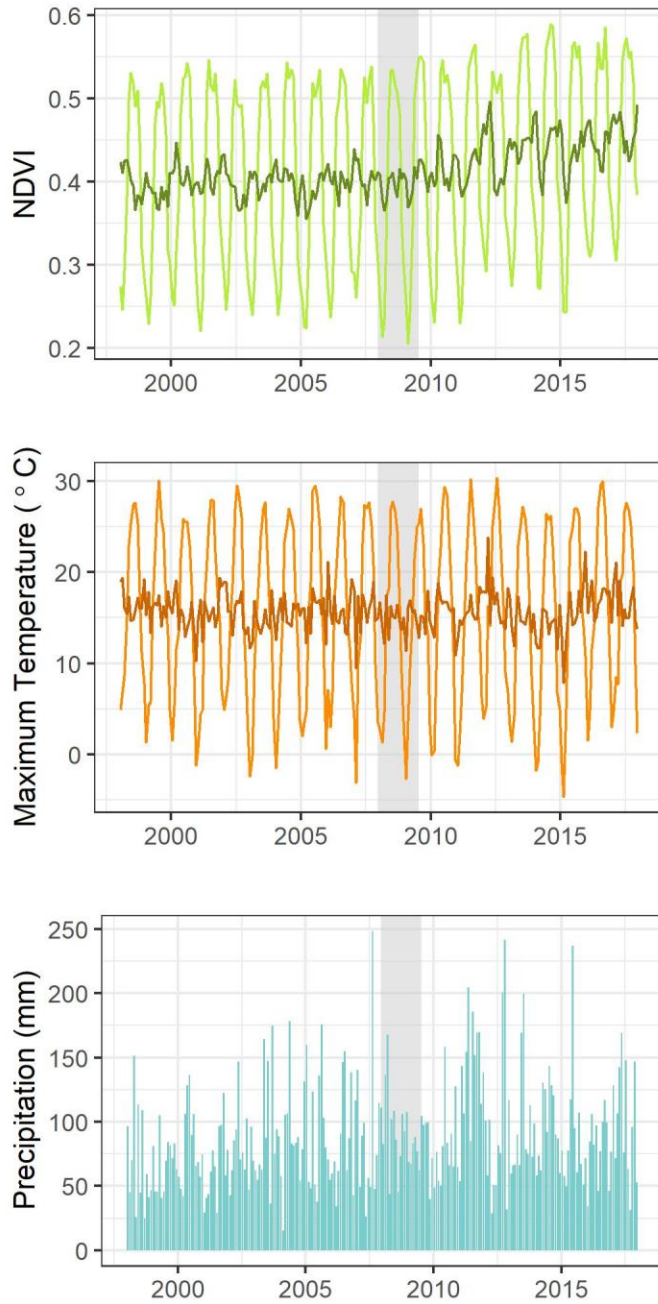


Figure 6: Mean monthly Normalized Difference Vegetation Index (NDVI) in Cuyahoga County, Ohio (top) with mean maximum monthly air temperature (middle) and precipitation depth (bottom). Trend lines obtained through time series decomposition are overlaid on the NDVI and temperature time series.

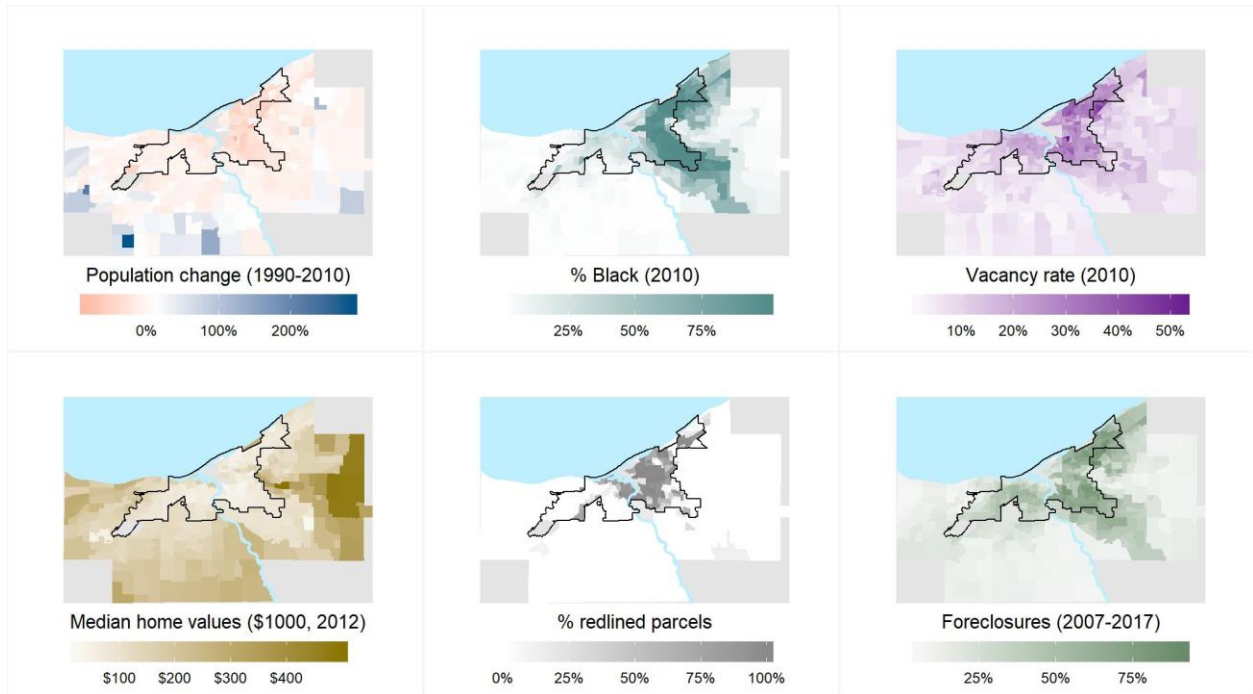


Figure 7: Spatial distributions of explanatory variables.

A series of five mixed effects regression models were fit to explain monthly tract-scale NDVI following the Great Recession (Table 2). Model 1 is a random intercept model fit with pre-crisis (1998-2007) data for Cuyahoga County. Results indicated that, prior to the crisis, NDVI was positively associated with temperature, precipitation, racial composition (% Black), and median home values, including spatially lagged values. NDVI was negatively associated with vacancy rates and presence in the historically redlined area. While measures of socioeconomic status were significantly related to NDVI, a model with both median income and property values, or a model with both poverty and vacancy rates, suffered from multicollinearity. Models that included property market characteristics improved goodness of fit over those with measures of socioeconomic status. Although it was not statistically significant prior to the crisis, I included percent change in 20-year population for comparison with Model 2. Model 2 applies the Model 1 specification to data for the crisis and its aftermath (2008-2017). Following the

recession, the direction of these relationships held at the county scale, except for precipitation, which took a negative sign. The positive relationship between NDVI with population increase became statistically significant while the relationship with the historically redlined area as a fixed effect became insignificant. Relationships with property values and vacancy rates weakened in magnitude while the positive relationship with % Black strengthened. Maps of Level 2 explanatory variables are provided in Figure 7.

Model 3 adds three-way interaction effects involving foreclosures, redlining, and time to the Model 2 specification. Separate interaction effects for mortgage and tax foreclosure were identified, with mortgage foreclosure tending to have the larger effect on NDVI. Consistent with H1, both terms are positive and highly significant; likelihood ratio tests indicated that including these interaction effects explained significantly more variance in the county-scale post-Recession model or a model that replaced these interaction effects with the poverty rate ($p < 0.0001$). Effects plots in Figure 8 demonstrate how the effect of foreclosure on NDVI is magnified within the redlined area. While tracts in the redlined area tend to have lower NDVI in 2008 (lower y-intercepts), the rate of change in NDVI with respect to time is largest for tracts with higher foreclosure rates that also intersect or are completely within the redlined area (steeper slopes).

To understand how these relationships vary geographically within the study area, Model 4 applies the Model 3 specification to City of Cleveland data, excluding suburban areas and Model 5 applies those specification to suburban areas, excluding City of Cleveland. For Model 5, the interaction term is modified to exclude redlining as redlined areas are almost entirely absent outside Cleveland. Within Cleveland, the interaction terms further increase in magnitude compared to Model 3 while, in suburban areas, the interaction of mortgage foreclosure and time was relatively small, although it remained positive and significant. Tax foreclosure was not

Table 2: Associations of weather, demographics, and property markets on monthly vegetation abundance in Cuyahoga County, Ohio. Standardized coefficient estimates are presented to allow for comparison across fixed effects. Model 1 represents pre-Recession data, 1998-2007, at the county scale. Models 2-X represent post-Recession data, 2008-2017, at the county scale. Model X applies Model X to City of Cleveland, excluding suburban areas. Model X applies Model X to suburban areas, excluding Cleveland.

	Model 1	Model 2	Model 3	Model 4	Model 5
Spatial extent	Cuyahoga County	Cuyahoga County	Cuyahoga County	City of Cleveland	Cuyahoga suburbs
Temporal extent	1998-2007	2008-2017	2008-2017	2008-2017	2008-2017
Max. temperature (trend)	0.024 *** (0.001)	0.081 *** (0.002)	0.073 *** (0.002)	0.095 *** (0.004)	0.088 *** (0.003)
Monthly precipitation depth	0.008 *** (0.001)	-0.011 *** (0.002)	-0.011 *** (0.002)	0.011 *** (0.004)	-0.026 *** (0.003)
20-year population change	0.047 (0.026)	0.066 * (0.027)	0.065 * (0.027)	-0.072 (0.051)	0.105 ** (0.04)
% Black	0.206 *** (0.032)	0.22 *** (0.034)	0.194 *** (0.033)	0.303 *** (0.054)	0.187 *** (0.049)
Median home value	0.314 *** (0.046)	0.332 *** (0.048)	0.335 *** (0.048)	0.03 (0.062)	0.339 *** (0.06)
Median home value (spatial lag)	0.403 *** (0.048)	0.349 *** (0.05)	0.347 *** (0.05)	0.121 (0.067)	0.307 *** (0.061)
Vacancy rate	-0.254 *** (0.038)	-0.209 *** (0.04)	-0.181 *** (0.039)	-0.125 (0.067)	-0.222 *** (0.046)
% in historically redlined area	-0.068 * (0.034)	-0.039 (0.035)	-0.229 *** (0.035)	-0.443 *** (0.061)	
Interaction: Mortgage foreclosure, time, redlining			0.143 *** (0.007)	0.279 *** (0.015)	
Interaction: Tax foreclosure, time, redlining			0.095 *** (0.007)	0.225 *** (0.016)	
Interaction: Mortgage foreclosure, time					0.082 *** (0.005)
Residual variance	0.025	0.034	0.032	0.030	0.034
Intercept variance	0.041	0.042	0.042	0.031	0.044

*p < 0.05; ** p < 0.01; ***p < 0.001

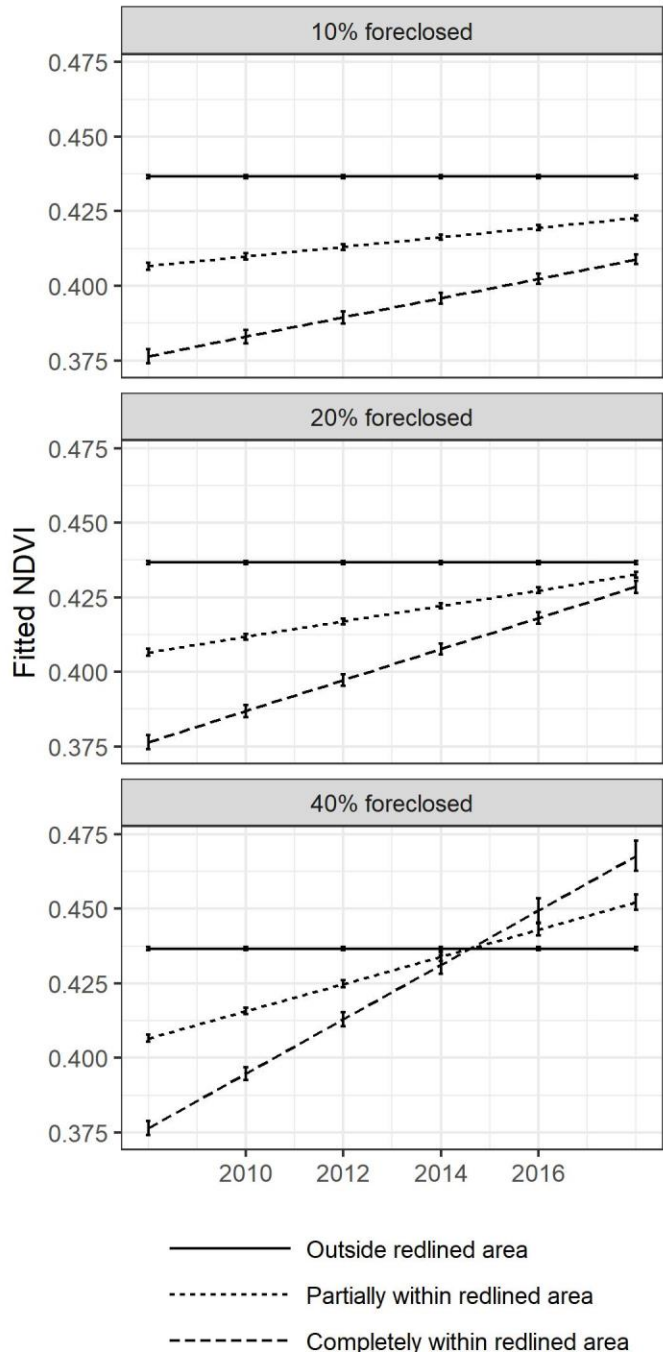


Figure 8: Interaction effect of mortgage foreclosure, redlining, and time on monthly tract-scale vegetation.

significant as a fixed effect or interaction term for suburban tracts, which made sense as the bulk of tax foreclosures are found within Cleveland proper (Table 1). Within Cleveland, the coefficient estimate for population became negative and statistically insignificant while the

estimate for % Black became larger and more significant. By contrast, for suburban areas, population change increased and % Black decreased in magnitude and significance, relative to Model 3. Coefficient estimates for property values and vacancy rates became smaller and statistically insignificant within Cleveland. Population change and property values remained statistically insignificant in models that excluded interaction effects.

3.5: Discussion

3.5.1: Summary of main findings

Results were consistent with the hypothesis that state practices of redlining have helped to shape the process linking economic crisis with land cover change. While weather patterns likely contributed to increasing NDVI across Cuyahoga County following the Great Recession, rates of increase varied spatially, with tracts on the east side of Cleveland ‘greening’ faster than surrounding areas, an outcome that cannot be solely attributable to weather (Figure 5). Foreclosure rates were associated with vegetation change but the effect was spatially uneven. Tracts with high foreclosure rates that intersected the redlined area were more likely to lead to increases in vegetation abundance compared to tracts with high foreclosure rates located in suburban areas. Including a three-way interaction term for foreclosure rates, intersection with the historically redlined area, and time significantly improved goodness of fit (Figure 8), far more than any measure of socioeconomic status or demographic change. While the relationship between foreclosure and greening was particularly strong within Cleveland, tracts with higher rates of mortgage foreclosure tended to green faster than those with lower rates across Cuyahoga County, all else held constant.

The relationship between vegetation and property market characteristics varied with the scale of analysis, consistent with previous studies (Endsley et al., 2018). Although tightly coupled with vegetation at the county scale, median property values and vacancy rates showed no statistically significant relationship to vegetation within City of Cleveland. However, this does not indicate that the underlying process by which property markets are related to vegetation no longer contributed to explaining land cover change. To the contrary, it suggests that the monotonic increase of vegetation and socioeconomic status typically found in cross-sectional analysis (Section 3.2.1) became more complex when examining vegetation change during a period of crisis because areas with lower property values are ‘greened’ through demolition. In this case, those properties are disproportionately located in or near the historically redlined area.

Previous studies that used bitemporal change detection to detect vegetation change have identified population loss and relatively low socioeconomic status as potential covariates with increasing vegetation abundance in shrinking cities (Emmanuel, 1997; Ryznar & Wagner, 2001). By increasing the number of time steps between images from two to many, this analysis showed gradual demographic change (out-migration and population loss), while not unimportant, formed a relatively weak predictor for vegetation change at the county scale and could not explain observed patterns of vegetation increase in Cleveland. Indeed, many tracts that lost considerable population in Cuyahoga County did not green substantially. Similarly, socioeconomic status was a statistically significant predictor of vegetation at the county scale, but its predictive power was relatively weak compared to property market characteristics. Likelihood ratio tests indicated that models with poverty rates or household income in place of vacancy rate of property values reduced goodness of fit. For example, replacing the redlining variable with the poverty rate also

yielded a positive, statistically significant interaction term but did not improve goodness of fit compared to Model 3 (Table 2).

3.5.2: Environmental justice implications of post-crisis greening

The findings presented here are broadly consistent with a growing body of urban remote sensing literature that demonstrates a complex, shifting relationship between vegetation and measures of well-being in shrinking cities (Section 3.2.2). Not all greening takes the form of managed greenspace and thus does not necessarily indicate improvements to public health. Schwartz et al. (2018) argue that using vegetation as an environmental justice indicator may mask more than it reveals as the process of ‘greening’ shrinking cities through land vacancy likely fails to provide residents with the public health benefits associated with managed greenspace. The present study extends these findings by highlighting the salience of race and the durable effects of antecedent racist housing policies in shaping contemporary patterns of urban vegetation change. One of the most consistently strong and positive associations found in this study was between vegetation and racial composition (% Black), likely a consequence of previous round of demolition yielding considerable stocks of ‘green’ vacant land in predominantly Black neighborhoods (Kerr, 2011). Moreover, no statistically significant interaction term was found involving racial composition and metrics that might be associated with class status, for example, property values or income, suggesting that race does not proxy for class status but operates as a distinct ‘driver’ of post-crisis greening.

Greening can be an expression of economic crisis rather than well-being. For example, the largest increases in vegetation post-crisis were found in Cleveland’s Slavic Village neighborhood, deemed (perhaps unfairly) to be the “epicenter of the Great Recession” as more

foreclosures were recorded in Slavic Village than any other zip code in the US in 2007 (Kotlowitz, 2009). Increasing vegetation in Slavic Village reflects efforts by the community development corporation in Slavic Village to demolish properties rendered vacant and damaged in the wake of the crisis (McGraw, 2015). If anything, the greening in Slavic Village and surrounding areas reflects community efforts to mitigate negative externalities of subprime mortgage lending, not the provision of environmental amenities. To the extent that redlining is associated with the spatial distribution of foreclosures and the transformation of foreclosures into demolitions, similar patterns of racialized urban environmental change may be observable in growing cities as well.

3.5.3. Advancing urban land change science with Landsat ARD

Along with highlighting the relevance of state practices of redlining in shaping contemporary urban environmental change, this paper also makes methodological contributions to urban land change science. Urban remote sensing has historically faced a series of scalar trade-offs involving spatial, spectral, and temporal extent and resolution. The methods used in this study attempt to sidestep these trade-offs by leveraging the fine temporal resolution of Landsat ARD in conjunction with two constitutive features of urban areas that have historically been conceived of as limiting factors: the relatively small scale of analysis (the individual tax parcel) and the mingling of vegetated with impervious surfaces.

Because of computational difficulties in pre-processing to make images comparable, most urban land cover change detection analyses have been confined to a small number of time periods. Data collection entailed finding two cloud-free scenes in the same season (ideally the same month) of different years and conducting whole-scene image differencing. However, when

the number of time periods increases from two to hundreds, patches or swaths of ‘no data’ pixels resulting from clouds, the Landsat 7 SLC error, or missing data resulting from ARD pre-processing (the missing western edge of Cuyahoga County on some dates) become less problematic. The objective changes from finding two comparable scenes with complete data to developing the most complete time series for each parcel. Any clear terrain is useful. Even with 80-90% cloud cover, some terrain ‘peeks out’ through the clouds and can be added to the time series for those parcels. Thus, the small size of parcels becomes an asset, enabling a more efficient use of data and, through that, a clearer view of vegetation change over the seasons—and over decades—to emerge.

Most urban Landsat pixels are ‘mixed’ pixels, combining impervious and vegetated surfaces. Because of the mixed pixel problem, calculating NDVI or some other pixel-scale measure land cover is generally thought to be inappropriate for assessing urban vegetation in any meaningful way at the parcel level, although tract-level vegetation estimates have been attempted. Instead, a host of algorithms have emerged geared towards extracting subpixel land cover composition through spectral unmixing or land cover classification procedures. The output is the percentage of the pixel covered by each land cover type. However, when the number of time periods increases from two to hundreds, the very durability of impervious surfaces in the built environment can become an asset rather than a liability. A pixel may contain a mix of impervious and vegetated surfaces, but because those impervious surfaces are immobilized and invariant in the landscape, especially at a time step between scenes is 2-4 weeks, sudden shifts in vegetation (for example, from demolition) are more readily apparent. Thus, the characteristics specific to urban areas—a small spatial scale of analysis with two land covers, one that changes

quickly and one that changes slowly or not at all—opens up the possibility for detecting relative changes in urban vegetation dynamics through Landsat ARD.

3.6: Conclusion

This chapter asked: how have urban vegetation dynamics shifted in an exemplar ‘shrinking’ U.S. city following the Great Recession, and what are the main drivers of this shift? Results provide evidence for increasing vegetation abundance following the crisis. Subprime lending was positively associated with post-crisis greening, with this pattern magnified through the way foreclosures were more likely to become demolitions in the historically redlined area. While population loss and socioeconomic status were related to greening, these variables did not explain additional variation that was not already captured by property market dynamics. Population loss and increasing vegetation abundance tend to coincide in shrinking cities, the evidence presented here does not support the view that one necessarily causes the other, particularly during periods of economic crisis.

Findings contribute to urban landscape studies by demonstrating the durable legacy of redlining in shaping not racial composition and property markets but also contemporary processes of urban environmental change. However, increasing vegetation abundance should be interpreted with caution as not all urban vegetation takes the form of managed greenspace and may not deliver commensurate public health benefits. The paper also makes methodological contributions to urban remote sensing by exploring novel approaches to urban vegetation change detection with Landsat Analysis Ready Data, a new data product that is readily amenable to time series remote sensing (Section 3.3, Section 3.5.3). Future research may integrate Landsat ARD to

further examine how the legacy of redlining continues to organize processes of urban environmental change today.

CHAPTER 4: WHITENING GREENSPACE: CULTURAL POLITICS OF VACANT LAND RE-USE

4.1: Introduction

On Shale Street in Cleveland, Ohio, sits an abandoned urban greening project. Initiated by a local environmental non-profit organization, the project aimed to ‘reclaim’ a set of vacant lots and transform them into an environmental amenity, purportedly for community benefit. Located in the Woodhill neighborhood, a predominantly Black, working class area on the east side of Cleveland, where environmental amenities like parks and gardens are few and far between, the project employed what are considered some of the best practices in vacant land re-use, combining ecosystem services (a rain garden for stormwater management) with a ‘natural’ play area, built from found materials in the neighborhood—a ‘play log’ made from a fallen tree and a ‘play bench’ made of recycled tires, both intended for recreation (Figure 9). The site design was (purportedly) guided by a community engagement process and much of the planning documentation drew on environmental justice rhetoric for justification, claiming the project would remedy the dearth of greenspace in the neighborhood. Yet, after engaging in the planning process, residents were deeply dissatisfied with the outcome. Residents took particular umbrage at the implication that children were to play on what they considered to be waste materials, which they received as a racist insult, and went to great lengths to make their displeasure known, including disrupting the site’s ribbon-cutting ceremony and, eventually, excavating to remove the installation altogether with their own labor. A shallow basin scattered with pebble mulch sits where the rain garden was installed. Several divots mark the former locations of the play area. All that remains today is some uneven terrain.



Figure 9: The Shale Street ‘natural’ play area with tire bench and play log, with derelict shed on adjacent parcel in background. Photo by author.

Why would residents of an underserved neighborhood resist the provision of an environmental amenity? Several frameworks have been proposed in the urban greening literature to explain conflicts around the provision of greenspace, and environmental amenities more broadly. The first is the ‘knowledge deficit model’ (Yearley, 2003). When the purported benefits of these greening are not well-received by residents, it is not uncommon for opposition to be explained as a problem of ignorance. For example, when numerous Detroit residents turned down opportunities to participate in a street tree planting program, citing concerns about unequal decision-making power and “maintaining *an appearance of care* in their neighborhood” (emphasis added), the environmental non-profit organization administering the program presumed (wrongly) that residents misunderstood the benefits of street trees and required education (Carmichael & McDonough, 2019, p. 9). This conflict fell along the lines of race; in that case, a predominantly White organization misread resistance to urban greening as a problem of Black ignorance. In fact, interview evidence demonstrated that resistance stemmed from

repeat experiences with procedural injustice on project conception, design and implementation, as well as legacies of state-led disinvestment from predominantly Black communities (ibid).

More recently, a ‘green’ gentrification model has been proposed by urban political ecologists, in which resistance to greenspace arises from fears that the provision of such amenities will spur gentrification, leading to resident displacement (Anguelovski, 2015; Dooling, 2009). However, across Cleveland, green gentrification concerns stemming from vacant land re-use have not materialized to date. Much to the surprise (and dismay) of local community development staff (personal communication, September 2017), demolition and vacant land re-use have not bid up land values or increased gentrification pressure in low-income, predominantly Black neighborhoods, at least according to spatial econometric studies (Griswold et al., 2013; Mallach, Steif, & Graziani, 2016). Indeed, conversations with residents on Shale Street indicated that they were neither ignorant of the purported benefits associated with the project nor did they fear displacement.

Neither the knowledge deficit nor the green gentrification models account for why the Shale Street project became so hotly contested. Instead, resistance to the Shale Street project stemmed from charges of anti-Black racism and procedural injustices against the predominantly White environmentalists that spearheaded the Shale Street project, with conflict centering on the site design and aesthetics. Existing urban greening frameworks are ill-equipped to understand how race forms a basis of contestation over environmental amenities in a way that is not reducible to class struggle, nor can these frameworks explain why what appear as aesthetic concerns (for example, the particular features of a “natural play area”) become politically charged in such conflicts. There is a knowledge gap around the reasons why projects like Shale Street fail, given that interest in vacant land re-use skyrockets in former industrial hubs of the US

Rust Belt. Vacant land re-use projects are typically implemented by predominantly White organizations, for example, environmental non-profits (Gibson-Wood & Wakefield, 2013; Taylor, 2014), while increasing stocks of vacant land are particularly common in predominantly Black and Brown neighborhoods, owing to a long history of racial segregation and state-led disinvestment that is particularly acute within former industrial hubs like Cleveland. Rarely, however, do urban greening projects engage directly with how questions of race and racism are brought to bear on these installations, apart from vague gestures at social equity or oblique references to environmental justice. This silence around race has implications for how conflicts around provision of environmental amenities are understood and addressed.

Responding to calls to engage race and racialization in geography, and particularly in urban political ecology (Brahinsky, Sasser, & Minkoff-Zern, 2014; Heynen, 2015; Bonds and Inwood 2016), this paper intervenes to address this lacunae around race and racialized conflict in vacant land re-use, and in conflict over the provision of environmental amenities more broadly. In this paper, I ask: *why do “aesthetic concerns” become sites of racialized contestation in vacant land re-use and what does this contestation imply for urban greening practices, particularly in spaces of disinvestment?* Drawing on evidence from Cleveland, Ohio, I argue that a cultural politics (the ways in which cultural formations become sites of struggle) surrounds vacant land re-use that has drawn together neoliberal colorblind racism with environmental justice claim-making in a way that enables practitioners to, intentionally or not, impose a set of upper-middle class White cultural practices—what I call ‘the pastoral’—onto the Shale Street project. I argue that deploying pastoral tropes both stakes a White claim to vacant land while also evading any engagement with how anti-Black racism lies at the center of the historical causes of disinvestment and land vacancy. Once the pastoral is used to underwrite White land claims in

low-income communities of color, seemingly ‘minor’ aesthetic quibbles around aesthetics can be understood to articulate with struggles around a broader process of White urban recolonization.

4.2: Literature review

4.2.1: The rise of vacant land re-use

Vacant land re-use is located at the confluence of ongoing urban crisis in Rust Belt cities under neoliberal austerity (Hackworth & Nowakowski, 2015; Peck, 2015) and the rescaling of sustainability as a specifically urban problem (Andonova & Mitchell, 2010). The need to find a ‘sustainable’ solution to the problem of vacant land was heightened by the 2007-2009 economic crisis, which precipitated a vast process of devaluation, disinvestment, and land clearance that has swept across US cities, particularly in former industrial hubs with weak property markets. In these post-industrial Rust Belt cities, demolition of the built environment has yielded large and growing stocks of vacant urban land, particularly in communities of color targeted by subprime lenders (Chapter 3). Cleveland had over 3,000 acres of vacant land in the city in 2008 (Cleveland Urban Design Collaborative, 2008). The wave of demolitions that followed the 2007-2009

As demolition continues to perforate the urban fabric, a frenzy of energy has emerged around the ecological dimensions of these newly vacant lands. No longer strictly understood as void spaces and tax base liabilities, vacant urban lands have been reframed as opportunities, sites to be ‘reclaimed’ within a broader project of urban ecological improvement. Vacant lands are said to produce an array of environmental benefits or ‘ecosystem services.’ For example, they can be managed to reduce urban heat island effects (Kim, 2016), provide pollination services and urban biodiversity (Anderson & Minor, 2017; Gardiner et al., 2013), help manage stormwater (Shuster, Dadio, Drohan, Losco, & Shaffer, 2014), and even serve as sites for leisure and

recreation (Burkholder, 2012). A multitude of novel greening proposals have emerged to secure these benefits on newly vacant lands. While some of these proposals focus on customary forms of urban greenspace such as parks, gardens, and street trees, considerable energy and interest has been devoted to ‘reclaiming’ vacant urban land for traditionally rural land uses, for example, agriculture, meadow, drainage space, and even ‘urban prairie’ or ‘urban wilderness’ (Desimini, 2014; Rink & Herbst, 2011).

Vacant land re-use has gained considerable purchase in so-called ‘shrinking cities’ such as Cleveland, Ohio, Detroit, Michigan, and other American Rust Belt cities that have lost population for decades and have undergone waves of demolition and tax base erosion (Hollander et al., 2009). Proposals to ‘green the Rust Belt’ (Schilling & Logan, 2008) by managing newly vacant lands for the production of ecosystem services have circulated widely in community development policy networks as ‘neighborhood stabilization’ strategies that address several distinct problems concurrently. First, vacant land re-use is thought to boost land values by reducing the supply of marketable land while bidding up land values through the provision of desirable ecological amenities (Bolitzer & Netusil, 2000; Heckert & Mennis, 2012). Second, vacant land re-use is thought to ameliorate rising infrastructure costs, particularly around stormwater management (Shuster et al., 2014). Most Rust Belt cities are equipped with combined sewer systems that become inundated beyond capacity following heavy rains, leading to untreated sewage discharge into public waterways. Rust Belt planners have contemplated managing some portion of urban runoff through vacant land. In some cases, planners call for ‘right-sizing’ the city by de-urbanizing the most devalued swaths of urban land, to be repurposed as stormwater retention ponds along with other ecosystem services, for instance, ‘carbon’ forests to sequester carbon dioxide (Detroit Future City, 2013; Kirkpatrick, 2015).

While vacant land re-use primarily addresses economic and environmental problems that operate at regional or even coarser scales, the practice finds its justification as an amenity whose benefits accrue at household or neighborhood scales, often drawing on environmental justice rhetoric to make its case. A range of social benefits are said to arise from the greening of vacant land, principally crime deterrence (Branas et al., 2011; Kuo & Sullivan, 2001; Wachter, 2005) and mental health improvements (Fuller, Irvine, Devine-Wright, Warren, & Gaston, 2007; South, Hohl, Kondo, MacDonlad, & Branas, 2018), but also broader, more diffuse benefits, for example, " social cohesion, individual responsibility, social justice, and other less tangible but no less significant outcomes" (Draus et al., 2014, p. 2524). Plans for 'creative' vacant land re-use featuring polyfunctional rain gardens with play spaces have been met with accolade—the vacant land re-use project *Reimagining A More Sustainable Cleveland* serves as a pioneering example (Cleveland Urban Design Collaborative, 2008). A foundational and highly-cited document credited with spearheading and popularizing vacant land re-use, *Reimagining* presents the landscape architect's take on the ecology of shrinking cities, and lay the groundwork for subsequent vacant land re-use projects across the Rust Belt. The Shale Street project that forms the basis of this case study is one of many examples.

4.2.2: The knowledge deficit model

Like many urban greening initiatives, vacant land re-use draws on the a-political rhetoric of sustainability to entice local investment amid heightened interurban competition, while also attempting to short-circuit political contestation by advancing projects through a language of urban nature represented as universally beneficial, a catch-all solution to urban problems (Desimini, 2015; Haase, 2008; Lacroix, 2011). Because it romanticizes urban nature and places it

beyond political dispute, the literature tends to draw on the knowledge deficit model to trivialize resident opposition—opposition to vacant land re-use is represented as a problem of ignorance. Moreover, such treatments rarely engage with questions of race or class, nor do they dwell on why vacant land in Rust Belt cities is disproportionately concentrated in communities of color. Instead, much of the practitioner-focused literature portrays vacant land re-use as the logical and inevitable best use of devalued land, such that troublesome issues of deferred maintenance, safety, and disputes involving sense of place are diminished and dismissed as “aesthetic and administrative concerns” (Burkholder, 2012, p. 1155). Vacant land re-use practitioners aim to secure ‘resident acceptance’, often accompanied by the enrollment of residents in unpaid maintenance labor in service of community building.

Relying on the premise that resistance to urban nature only arises from ignorance, this ‘knowledge deficit’ approach has a number of shortcomings, particularly in spaces of disinvestment. Most importantly for this case study, it fails to account for the ways urban nature may produce an array of annoyances, nuisances, and hazards—in short, ecosystem *disservices* (Lyytimäki & Sipilä, 2009)—or may conjure up long histories of state-led disinvestment (Battaglia, Buckley, & Galvin, 2016; Carmichael & McDonough, 2019) for people living nearby. If residents contest a re-use project, the thinking goes, the problem must lie with perceptions of the residents themselves (Rink, 2009), not with the structural conditions from which vacancy and vacant land re-use arise. This chapter seeks to add depth and complexity by showing how the knowledge deficit model fails and by exploring what other models of greenspace contestation might better account for resident opposition.

4.2.3: ‘Green’ gentrification

Another explanation for conflict around vacant land re-use arises from a paradox in ‘first generation’ environmental justice scholarship and advocacy: green gentrification. Urban political ecologists have demonstrated that urban greening poses a dilemma for securing environmental justice in historically underserved communities. Providing environmental amenities like parks, gardens, and other forms of urban greenspace addresses longstanding concerns regarding uneven environmental quality that lie at the heart of environmental justice research and activism. Yet, the very act of providing new environmental amenities may fail to ameliorate these distributive inequities if these sites become bound up in a broader process of land revalorization, leading to ‘ecological’ or ‘green’ gentrification and the displacement of intended beneficiaries. Using vacant land for ecosystem services may risk producing value at the expense of residents by boosting market values by making land more scarce (Walker, 2015), potentially driving ‘ecological’ gentrification by bidding up rents in proximity to green amenities (Checker, 2011; Dooling, 2009). As such, vacant land re-use and other greening projects form little more than a “sustainability fix” (While, Jonas, & Gibbs, 2004), a play on Harvey’s (1982) spatial fix, in which vacant land re-use unfolds within an urban growth strategy that subsidizes capital by sacrificing land in some parts of the city so that capital accumulation can continue elsewhere.

To the extent that they place green burdens on local residents, urban greening projects may be perceived as “locally undesirable land uses” and become contested on that basis (Anguelovski, 2015). In the context of gentrification, sustainability initiatives have become the object of racialized dispute because they appear aimed at attracting a ‘creative class’ of affluent residents, who tend to be White, while displacing low-income residents intended to benefit from vacant land re-use, who tend to be Black or Brown (Gould & Lewis, 2012; Lubitow & Miller, 2013; Quastel, 2009). However, this class-based framework is not supported by empirical

evidence, at least in Cleveland, where vacant land re-use has not bid up land values or increased gentrification pressure (Griswold et al., 2013; Mallach et al., 2016).

Moreover, the focus on economic class and distributive outcomes leaves other dimensions of urban greening proposals largely unanalyzed. Neither vacant land re-use boosters nor their green gentrification critics make an effort to explain why greenspace might constitute a locally unwanted land use for reasons related to race (Anguelovski, 2015; Byrne, 2012; McLean, 2013). It also does not explain why the vacant land re-use literature conspicuously avoids dealing with race even as green interventions tend to be enacted by primarily White practitioners amid an ongoing history of structural racism and White racial dominance. For example, *Reimagining A More Sustainable Cleveland* (2008) does not once mention race. It carefully side-steps dealing with why the bulk of vacant land in Cleveland is concentrated in *de facto* segregated Black neighborhoods, ignoring the fact that this spatial patterning is an outcome of a durable racial hierarchy that has shaped processes of land clearance for decades and continues to do so following the recent economic crisis (Chapter 3). Across policy documents, practitioner conferences, and academic papers, there is a conspicuous silence around how race shapes these power asymmetries in producing land vacancy, particularly in Rust Belt spaces of disinvestment (Mallach, 2018). Vacant land re-use is colorblind, it would seem—it ‘doesn’t see race’.

4.2.4: ‘Colorblind’ racism and White colonization of vacant land

The silence around race in vacant land re-use scholarship and practice exemplifies ‘colorblind’ racism, the core racial ideology of neoliberalism (Omi & Winant, 2014). In colorblind racism, persistent racial disparities like the uneven distribution of land vacancy are said to result incidentally from purportedly non-racial processes, for instance, market forces or

race-neutral cultural practices. Such discursive maneuvers serve as “ideological armor” that legitimizes and justifies “a covert and institutionalized” system of White racial privilege by distancing White people from overt racial hatred and normalizing and naturalizing a wide range of cultural practices that reproduce *de facto* White racial dominance (Bonilla-Silva, 2010). Colorblind racism solves a number of problems for neoliberalism as a regime of rule arising in the wake of the Civil Rights movement: it articulates a fantasy of a level playing field, derails and diffuses resistance, and provides cover for upward redistribution (Taylor, 2016). Discursive maneuvers associated with neoliberal colorblindness have authorized new forms of racism, including mass incarceration, the dismantling of the welfare state, and regressive tax policies.

Colorblind racism also props up and legitimizes neoliberal austerity strategies that concentrate disinvestment and demolition of the built environment in predominantly Black spaces. From the vantage point of colorblind racism, vacant land is concentrated in predominantly Black neighborhoods through evenhanded, racially-neutral market processes, rather than through the spatialization of structural racism, for example, the state practices of redlining, urban renewal, and, more recently, the subprime lending industry (Wyly, Moos, & Hammel, 2012). Similarly, the White-led vacant land re-use of this land is also even-handed and racially neutral, an unimpeachable benefit that resolves a number of conjoined problems.

In buttressing vacant land re-use and other sustainability projects, the colorblindness of *Reimagining A More Sustainable Cleveland* and other vacant land re-use documents does political work: it provides cover for whiteness to shape how such initiatives are conceived and implemented. By whiteness, I do not refer to a particular skin tone but rather “a historically constructed position associated with privilege and power” that is, at once, deemed ‘normal’ but also retains a sense of moral superiority through “a set of cultural practices and politics based on

ideological norms that are lived but unacknowledged” (Kobayashi & Peake, 2000, p. 394). In other words, whiteness refers to an unmarked social category characterized by privilege that functions as the unstated benchmark against which all other forms of social difference are measured. In a context of a durable racial hierarchy, ‘not seeing race’ has the effect of universalizing whiteness by allowing White priorities, values, and aesthetics to be articulated as unraced in opposition to a raced ‘other’ (Diangelo, 2011). Whiteness does not only exist intersubjectively but also produces material effects. It has been theorized as a form of status property (Harris, 1993) constituted by a capacity to exclude and, through that exclusion, it conveys a “public and psychological wage” (Du Bois, 2001, p. 35). Whiteness maintains a “cash value” (Lipsitz, 2006, p. vii) through processes including intergenerational wealth transfers, the maintenance of higher property values in *de facto* segregated White neighborhoods, and through White-dominated social networks.

To show how colorblind racism and whiteness work together to shape the ‘reclaiming’ of vacant land, I turn to evidence from Detroit. In Detroit, the whiteness of vacant land re-use comes to ground through right-sizing proposals that call for state-led depopulation of some predominantly Black neighborhoods, with the land to be repurposed for ecosystem services. Despite being framed as inevitable, racially neutral, and universally desirable (Detroit Future City, 2013), right-sizing reinscribes White racial dominance over urban space by implicitly centering White priorities and desires. Safransky argues persuasively that such proposals amount to little more than a neocolonial project of accumulation by green dispossession, a ‘green’ land grab that doubles as a program of demographic sculpting whose endgame is the White resettlement of urban space (Safransky, 2014).

Most significantly for this case study, certain discursive practices and aesthetic representations are necessary to ‘whiten’ vacant land to prepare the ground for land grabbing. To stake a land claim, the targeted (and, typically, predominantly Black) neighborhood must first be characterized as uninhabited or empty, a new post-industrial ‘wilderness’ awash in idle land, waiting to be claimed by a (preferred White) demographic so that it can be ‘re-civilized’ and brought back into ‘productive’ use. Drawing on a wilderness trope is no accident. In a U.S. context, ‘wilderness’ is constructed as a specifically *White* space, and this construction was at the core of facilitating White land claims. Such racial coding of space continues to exclude people of color from outdoor recreation (Finney, 2014). Aesthetic representations of Detroit’s ‘ruins’ mobilize this racial coding by portraying Detroit’s landscape as devoid of inhabitants, reclaimed by nature (Millington, 2010), a “wild” or “found condition” (i.e. not produced through state practice and processes of accumulation) that requires “scraping...the land of its symbolic meanings and past associations” prior to being reclaimed (Desimini, 2014, p. 23). Bringing this land into a new round of capital accumulation requires more than just demolition, in other words. Today, certain discursive micro-processes that affix racial coding to space are required in order to pivot from devaluation to revalorization in the Rust Belt; the “targeted land first be cleared of both its physical structures and, in particular, its discursive inscription, including in this case its dangerous racial inscription” followed by a process of White emplacement by “designating large areas of the city to be returned to nature, and thus ‘purified’ of their discursive blackness” (Pedroni, 2011, p. 210).

In sum, colorblind neoliberal racism lies at the root of certain discursive maneuvers and aesthetic representations associated with vacant land re-use that affix racial codes to space as a way to prepare the way for revalorization and, with it, White land claims. However, as I argue

below, the trope of post-industrial wilderness affixed to Detroit's landscape is far from universal across other US cities of the US Rust Belt, including Cleveland, Ohio. Despite erosion of the housing stock and tax base, Cleveland has a number of neighborhoods euphemistically deemed 'stable' (meaning predominantly White), has not declared bankruptcy, and is not under Emergency Management (Walker, 2018). Moreover, Cleveland's vacant land re-use projects, including the Shale Street project, rely on vague references to environmental justice to legitimate land claims—there have never been serious plans to 'right-size' Cleveland (personal communication, May 2015). If the land is empty and uninhabited, who are the environmental justice beneficiaries?

4.2.5: The pastoral and cultural politics of vacant land re-use

The central argument made in this paper is that, rather than wilderness, tropes of the *pastoral* animate the discursive and aesthetic preparatory work required to claim land through vacant land re-use in Cleveland. The cultural politics of the pastoral proves useful for casting White land claims as beneficial such that they cohere with an environmental justice rhetoric. However, affixing pastoral tropes to Cleveland's landscape may also give rise to racialized contestation around 'aesthetic concerns' as aesthetic representations and signifying practices associated with the pastoral are universally shared and may even be perceived as insulting or offensive.

I deploy the pastoral as a White racial trope that conjoins notions of moral order and improvement with an ethos of rurality. The pastoral celebrates the countryside by imbuing it with ideas of physical health and spiritual restoration, cultivation (including cultivating certain preferences and dispositions), and ideas of cleanliness or purity (Moore, Pandian, & Kosek,

2003). By implication, it denigrates the city as corrupting, filthy, chaotic, and ‘unnatural’. As it was taken up by the American painterly tradition of the Hudson River School, the pastoral was deployed to convey ideas of nostalgia for a past golden age from which society has fallen, while also suggesting the possibility of return to a new bucolic landscape. These tropes feed directly into the *Reimagining A More Sustainable Cleveland* project documentation. The Reimagining document encourages the reader to think of Cleveland’s vacant land as a landscape-scale extension of the existing greenspace network to be ‘re-imagined’ as farms, meadows, and other rural land uses, which is then portrayed as an environmental amenity (Figure 10). The use of pastoral tropes and symbols positions ruralization as synonymous with improvement, hence its utility as a stand-in for environmental justice within a rubric of colorblind racism: a pastoral landscape is made to seem universally beneficial. However, not all vacant lots are equally suited to receive green ‘treatments’. The Reimagining document explicitly states that only land parcels with ‘weak’ development potential—devalued land, in other words—are to be ruralized.

Unlike wilderness tropes used to romanticize and fetishize Detroit, the pastoral is not constructed as empty or uninhabited. Instead of erasing human *presence*, the pastoral a-historicizes rural landscapes selectively obscures questions of land *ownership* and erases certain forms of human *labor* required to reproduce them (Feldman & Hsu, 2017). As Alkon and McCullen (2011, p. 942) explain, the pastoral (or, as they put it, the ‘White farm imaginary’) holds up “romantic notions of yeoman farmers and rural culture” but “ignores the justification of Native American displacement by White homesteaders, the enslavement of African-Americans, the masses of underpaid Asian immigrants who worked California’s first factory farms, and the mostly Mexican farm laborers who harvest the majority of food grown in the USA today.” This erasure of history and labor is evident in vacant land re-use efforts that fail



FIG 18-19 Design concepts for vacant land in headwaters areas

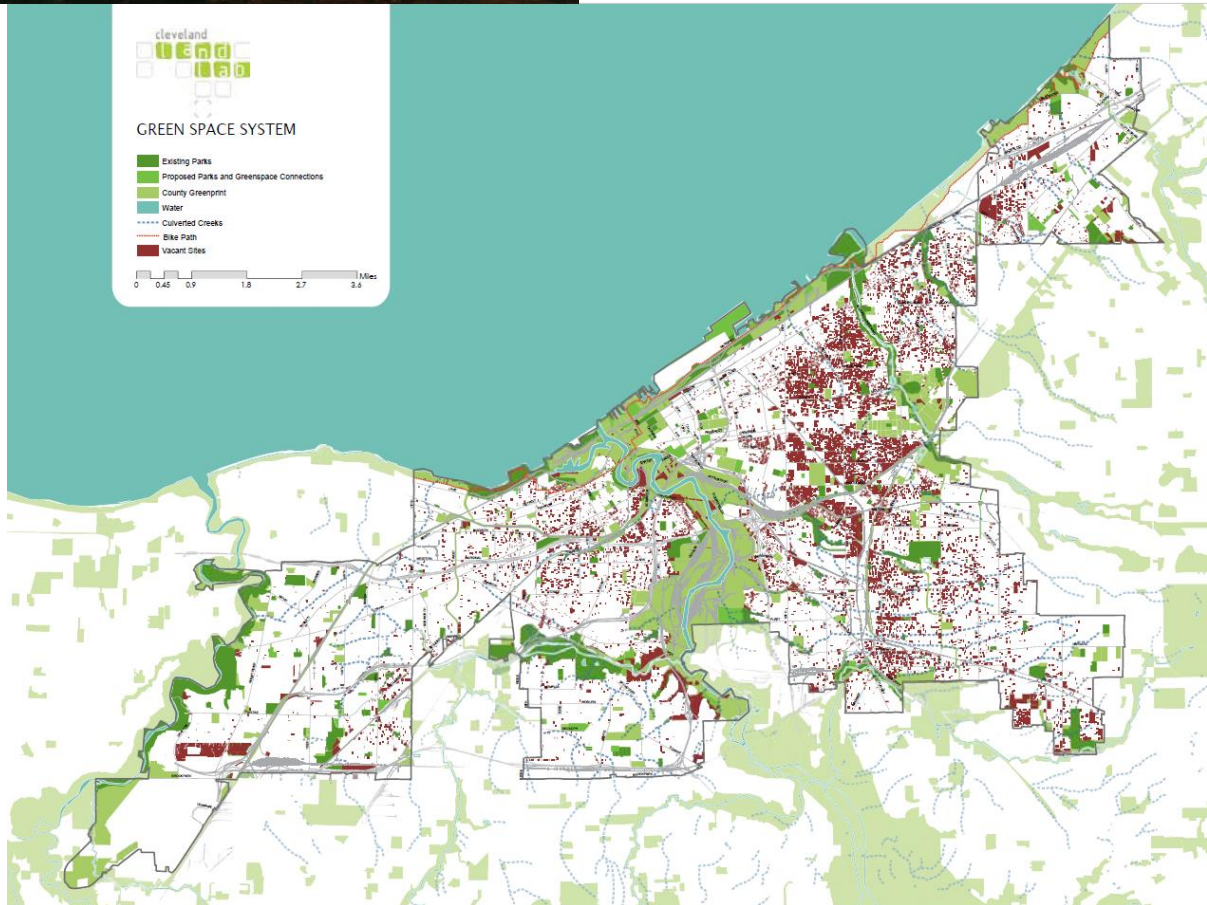


Figure 10: Representations of the pastoral in 19th century romanticism and in vacant land re-use project documentation. ‘The Arcadian or Pastoral State’ is the second in a series of paintings entitled The Course of Empire by American landscape painter Thomas Cole, portraying a pastoral landscape in the tradition of romanticism (top left). Contemporary re-working of the pastoral can be seen in vacant lot re-use site designs for post-industrial American cities, including from *Re-Imagining a More Sustainable Cleveland* (2008) (top right). The *Reimagining* document encourages readers to think of land vacancy as an extension of the existing greenspace network, waiting to be called into being (bottom).

to inquire into the historical causes of land vacancy in Rust Belt cities while relying on residents to subsidize project maintenance with unpaid labor within a rubric of ‘community building.’

Importantly, the way the pastoral links rurality and amenity is far from universal or race-neutral. To the contrary, like wilderness, the pastoral is infused with racial codes. Greenspace designed within this pastoral ideology of nature become racially coded as White and conveys “a White ideal of nature and commensurate notion of what constitutes appropriate recreational styles, that has become enshrined in park spaces, and which in turn acts as a normative register influencing how other ethno-racial groups perceive and use these spaces”, often to exclusionary effect (Byrne & Wolch, 2009, p. 597). The design and production of Central Park in New York City, for example, was explicitly intended to “impart civilizing sensibilities and enact elitist ideals of morality and refinement, creating a binary ‘moral geography’” (Gandy, 2003, p. 747) in which White emplacement required displacement of a racialized other, both materially and symbolically. Alternative food movements call on this same exclusionary cultural practice that connects power relations with signifying practices when they mobilize agrarian tropes that tacitly “hail a White subject” (Guthman, 2011, p. 264) and cast anyone unmoved by pastoral ideals as out of place or even incompetent, in need of education, leading to disagreement, misrecognition, and conflict. Furthermore, drawing on writings by Frederick Douglass, Bennett (2001, p. 195) argues for a relational, contingent, and historically mediated “link between anti-pastoralism and African-American culture” stemming from collective memory of the terror and brutality of the Southern countryside under chattel slavery and, later, Jim Crow, in which pastoral landscapes may conjure up ideas of threat, fear, or exclusion (Kinsman, 1995). Billie Holiday’s *Strange Fruit* invokes this linkage, drawing on lyrics originally written in protest of Southern lynching: “Pastoral scene of the gallant south / The bulging eyes and the twisted mouth / Scent of

magnolias, sweet and fresh / Then the sudden smell of burning flesh” (see <https://billieholiday.com/signaturesong/strange-fruit/>).

In sum, the pastoral is a racially coded trope that has long been bound up in the production of urban natures and stands at the center of efforts to bring vacant land in Cleveland into ‘productive’ use within the guise of environmental justice. To further understand how the pastoral becomes amenable to environmental justice claim-making, I draw on Paperson’s (2012) theorization of “settler environmentalism,” which provides a framework to understand how upper-middle class White environmentalists use ecological ‘improvement’ initiatives to claim land in predominantly Black space. The utility of environmental stewardship for colonization is threefold: first, as an *evasion* of culpability for previous harms, second, as a *move to innocence* through ecological stewardship, and, third, through that manufactured innocence, as *redemption* from past harms in a way that scripts a White *belonging* to the land—the settler becomes the “new native”. Colorblind racism facilitates this evasion-innocence-redemption formulation by leaving race unmarked, allowing White practitioners to maintain a sense of virtue while retaining privilege. Sullivan arrives at a similar conclusion around colorblind racism, White evasion, and redemption, arguing that colorblindness is used to articulate “a yearning desire that non-White people...absolve White people of any responsibility to learn to see race and racial injustice” (Sullivan, 2006, p. 128). Environmental justice rhetoric, particularly couched in terms of the unimpeachable benefit of pastoral imagery, is particularly well-suited as a vehicle to secure this sense of contrived White innocence because it tells a story of Black pain from a damaged land to be remediated by a “White rescue” while also emplacing whiteness in the landscape in a way that conveys a sense of “belonging” to the land. In what follows, I demonstrate how the pastoral (and the anti-pastoral identified by Bennett) helps make sense of conflict over a vacant land re-use

project in Cleveland in which aesthetics became the site upon which White land claims were contested.

4.3: Case description and main findings

4.3.1: Study area and project background

As with most Rust Belt cities, Cleveland, Ohio, has undergone extensive deindustrialization, losing more than half its population relative to the peak of over 900,000 in 1950. In residential landscapes, small vacant land parcels are scattered across otherwise inhabited landscapes, particularly in the majority Black areas east of the Cuyahoga River, where foreclosure and vacancy have destabilized what were, until recently, considered middle-class Black neighborhoods in a downward spiral of declining property values and disinvestment (Coulton et al., 2010).

Funded by Great Lakes Protection Fund, the Shale Street project was sited on land held by the Cuyahoga County Land Bank in the Woodhill neighborhood on the predominantly Black east side, just west of the inner-ring suburb Shaker Heights. The installation was managed by Cleveland Botanical Garden (CBG) and Buckeye-Shaker Square Development, a local community development organization. As with many urban greening projects spearheaded by NGOs rather than local governments, Shale Street was influenced by the priorities of the predominantly White environmental non-profit funder. The primary motivation behind the project was not social benefits to Black residents at the neighborhood scale but rather enhancing Great Lakes water quality through a novel approach to stormwater management (see Section 4.2.1). Providing greenspace was framed as a co-benefit but not the primary objective. The project also relied on unpaid resident labor for upkeep, again couched as a community building

co-benefit. Consistent with vacant land re-use as a project informed by neoliberal colorblindness, the Shale Street project documentation makes no mention of race or racism (Great Lakes Protection Fund, n.d.), although all environmental staffers and policy makers I spoke with were White and all residents with were Black.

This analysis of the Shale Street conflict drew on unstructured interviews (n=21), a review of policy documents, and participant-observation at a number of vacant land re-use practitioner events held in spring and summer 2015 and the summer and fall of 2017, including workshops in Cleveland and the Center for Community Progress Reclaiming Vacant Properties conference. I interviewed residents, environmental non-profit staff associated with the project, and policy makers who were present at the controversial ribbon-cutting ceremony, where residents intervened to express their dismay with the project. Notes and transcripts were thematically coded in a process consistent with grounded theory (Creswell, 2012).

4.3.2: Securing resident acceptance and procedural injustices

The Shale Street project casts itself as an alternative to the ‘right-sizing’ proposals critiqued by Safransky (2014) and Pedroni (2011) (see Section 4.2.4). Indeed, the project structure formed as a direct response to the critiques of right-sizing emerging from Detroit. Rather than a top-down process centered on blank-slating vast swaths of land and a ‘return to nature’ critiqued by Safransky (2014), Millington (2012), Pedroni (2011), and others, Shale Street sought to bill itself as a bottom-up, spatially distributed project that insinuates itself seamlessly into the socio-spatial fabric of the block. A hallmark of this approach was the use of community engagement process to secure resident acceptance. Neighborhood residents, mostly members of a local block club, were invited to shape the site designs, especially with regards to

the ‘recreational overlay.’ Through this process, residents voiced a strong preference for the project to include customary playground equipment, for example, swings and a slide.

However, residents were not informed that the project was, in fact, quasi-experimental in design. The project was structured to determine whether and how rain gardens could be combined with various types of low-budget ‘recreational overlays.’ The project comprised three installations: one with an ‘active play space’ desired by residents, another with ‘passive greenspace’ involving native vegetation and a series of bird boxes, and a third with a ‘natural play area.’ The site hosted a ‘natural play area’ built from found materials in the neighborhood: a ‘play log’ (found tree detritus) and a bench made of recycled tires found in the neighborhood along with a grassy mound and pebble mulch (Figure 9). Residents reported feeling upset and misled when much of their input was not been reflected in the outcome. The natural play structure, in particular, was widely received as an insult due to associations with ongoing dumping of waste materials in the neighborhood:

“They put tires, ugh! Who put tires and like grass, a hill, like, and that? What happened to the swings? They should make it better instead of just tires...They just did what they wanted to do, I think.”

This led to a sense of hurt among residents that White practitioners provided play equipment they thought were appropriate for Black children but would not install in their own White communities. Describing his conversation with one of the project managers, one resident indicated that he saw the natural play area through the lens of anti-Black racism:

“...would you let your kids play there? Oh no. Are you prejudiced?...Build ours up like y'all would build yours up.”

Non-profit staff, by contrast, touted the perceived benefits of “soft spaces for creative play,” often referencing their own rural upbringings in justifying the natural play area:

“I grew up in the country. I played on logs. It was wonderful, you know. And these residents were like, this is garbage. You literally brought garbage to this neighborhood, polished it up, and told my kids to play on it.”

What White practitioners interpreted as a ‘natural play area’ that includes reclaimed materials for creative play (an investment) looked like trash to Black residents (ongoing disinvestment). Practitioners deemed found materials desirable not only because of their alignment with rural lifeways and ecological stewardship through recycling but also their low cost, enabling more funding to be devoted to geo-engineer the site for stormwater management and avoiding insurance costs associated with traditional play structures—insurers, like residents, do not regard tires and logs as playground equipment.

White practitioners indicated that decision to invest most of the budget in a rain garden was based on the presumption that ecological improvements alone will stand in for environmental justice. Yet, when asked whether the site responded to environmental justice concerns, no resident responded in the affirmative. Some residents suggested the funds could have gone to more pressing issues, traffic calming infrastructure and lead abatement, for instance. Others indicated that standing water, along with the log and the tires, were introducing new environmental burdens because they provided potential mosquito habitat—an ecosystem disservice. Site grading has failed to prevent standing water from developing on portions of the site that back to a derelict shed on an adjacent parcel.

Beyond the way the natural play area was framed as a pastoral amenity but received as a racist insult, the way the project aesthetically deurbanized space also formed a point of

contention. For example, I photographed the President and Vice-President of the block club who hosted the community engagement events (and subsequently led the opposition) in the ‘natural’ play area. Thinking the image had turned out well, I showed my phone to the block club members expecting delight but instead got dismay. “It looks like we’re in the country,” the Vice-President remarked, to which the President replied, “it looks like we’re in Alabama.” The cultural politics of the pastoral and anti-pastoral, and the attendant racial coding of space, lie at the core of what appears as conflict over aesthetics.

4.3.3: Ecosystem (dis)services and environmental (in)justice

While Black residents saw the site in terms of ecosystem disservices and unwanted rurality, the majority of White practitioners explained the failure of services to translate to benefits using tropes of Black ignorance and disconnection from nature.

“Being someone who grew up in the country, you just dealt with that. That's what nature does. But in the city, when you live in an urban environment, people have been disassociated from that for so long that it's then a nuisance instead of a fact that you have to deal with for a couple weeks over the year.”

“kids - and adults - in a very urban setting, who don't have a lot of exposure to natural areas, um, don't know how to interact with a nature play site. They just don't...”

Black residents are framed as finicky and ecologically illiterate for demanding well-maintained greenspace, a “manicured” space as one practitioner later put it, in contrast to what more wholesome “unmanicured” aesthetic derived from a purportedly superior knowledge of “what nature does”—the knowledge deficit model is doing work here. When pressed, this practitioner

remained firm in the view that the site design was desirable, that the ecosystem services were worth the trouble, and that the conflict was ultimately rooted in Black perception, a problem to be remedied by education. Indeed, it was not uncommon to find White practitioners frustrated at what they say as lack of gratitude from residents for ‘investments’ that were, according to practitioners, not only self-evidently necessary and beneficial but nearly beyond reproach. Despite resident opposition, the project lead continued to present Shale Street as a success story in practitioner conferences I attended, noting its “mistakes” but ultimately affirming the validity of the approach. One practitioner absolves the design on grounds of good intentions: “the things they are doing are good. It was a bad design choice that they made and they're fixing it, so no blame on them.” Contrary to this claim, however, no site changes were made, largely because of insurance costs. The project currently sits abandoned.

Finally, practitioner accounts indicate a certain evasion of accountability at work in the enthusiasm around vacant land re-use. As a more skeptical practitioner noted:

“A whole incredible vision [emerged]...everything from side lots and pocket parks all the way to big things like urban agriculture, you know, tree farms...Vacant lot re-use became something that was attractive and in a way that what the other part, the destabilization and the blight, is not, because the one has to do with holding people accountable, whether it's banks or, you know, flippers coming in from out of state...Re-use of vacant land is moving into the sunshine of the future. It's, like, gardens and, like, wow! If you attend a meeting, who goes to those meetings, it's very different than who goes to the other meetings [on blight]...I do hold out a little part of me that is a little concerned about how, as all of these things move forward, is there some element of vacant land re-use begins

to occupy, dominate the field, so to speak? You know, it's like, the rest of the problem is behind it...we could drive out there and see the extent of the vacant property and look at the data that shows where the home sale prices are and say, "my god, we still have a pretty big problem." We don't want to lull ourselves into thinking, let's just move into the bright sunshine of vacant land re-use because everything else is solved. It's not. But I do believe that there are people and often, you know, where is their energy and resources, a lot of people are drawn to something that isn't negative and unpleasant...sometimes, the people who promote the vacant lot re-use ideas are people who are imposing their ideas on communities because they think it's the right thing and maybe it isn't...[following provocation] they're ideas of what the Black people need.”

Here, Paperson’s evasion-innocence-redemption formulation at the core settler environmentalism becomes relevant. Vacant land re-use is “attractive” specifically because it *evades* dealing with accountability for “the destabilization and the blight” associated with the 2007-2009 economic crisis by placing the crisis in the rear view. It uses environmental justice to script “black pain in need of a White rescue” (Paperson 2014) by articulating “ideas of what Black people need.” Enacting this ‘rescue’ not only enacts a move to innocence (the “sunshine of the future”) but also evades accountability for past and current harms, particularly those related to the long history of state-led disinvestment from Black urban neighborhoods that produced land vacancy (which was “not attractive”).

Moreover, a document review revealed evidence consistent with the claim that stewardship serves as a bid for future resettlement. This is borne out in project documentation for both *Re-imagining* and for Shale Street. While both documents make gestures at environmental

justice, they are also quite clear that vacant land re-use is, at its core, a holding strategy for devalued land rather than a strategy to confer environmental amenities to current residents. The *Re-imagining* document calls for “balancing current and future demands for new development,” in other words, managing land for the benefit of current residents but ultimately holding devalued land in reserve intended to meet the needs of future development to benefit imagined future residents (Cleveland Urban Design Collaborative, 2008, p.3). Figure 11 provides an artist’s rendering suggestive of how planners imagined these imagined future residents—none are Black. Thus, while Shale Street and similar greenspace initiatives find their justification not only in environmental justice for current residents, these projects are ultimately intended to hold space for ‘new residents’ – racially unmarked, implicitly White residents – to resettle the city. Within this image, a colonizing logic scripts a White return to the city and enrolls Black residents who cannot be blank-slated away to participate in their own gradual erasure.



Figure 11: Artist’s rendering of future users of the Shale Street project from project documentation.

4.4: Discussion: whiteness and urban greening

In presenting the findings above, I have argued for using a cultural politics lens to explain conflict around aesthetics in vacant land re-use, which resists explanation through two dominant frameworks of conflict around environmental amenities. Drawing on evidence from Cleveland, I argued that site aesthetics became a flashpoint of racial conflict through the way the Shale Street project solicited resident preferences regarding site design, checking the ‘participation’ box for best practices in urban greening, but then ignored those preferences and instead imposed racially coded tropes of the pastoral onto devalued urban space. For practitioners, these tropes stood beyond political contestation because they conjured up ideas of a romantic return to the countryside. For residents, however, they stood for ongoing disinvestment and signaled anti-Black racism. Imposing the pastoral, for example by positioning waste materials as play structures, privileged an upper-middle class White gaze and cast working class Black opposition as ignorance, a form of misrecognition. Environmental justice rhetoric obscured and legitimized this misrecognition by framing the pastoral as a universal benefit, leaving the whiteness of the pastoral both normative and unmarked while implying that opponents lack knowledge. The positioning of waste as play equipment, the prioritization of runoff infiltration over community benefits, and the aesthetic deurbanization of space all contribute to asserting whiteness through a language of urban nature and ecological stewardship. Whiteness need not take the form of overt hostility but instead can mean “embracing people of color and their cultures in condescending and controlling ways” as a way of “turning social pain into aesthetic pleasure” (Lipsitz, 2006, p. 118 and p. 120). In other words, affixing pastoral tropes to spaces of racialized disinvestment and calling it ‘environmental justice’ is a “performance of whiteness,” (Pedroni 2011) that advances “ide[a] about nature...articulated through hidden discourses of race” (Millington 2013, 290).

This finding signals a need for caution in how participatory planning frameworks are used. Community engagement processes that fail to give residents actual decision-making power over land use and site design may reiterate, rather than transcend, exclusionary practices in the provision of environmental amenities by failing to engage with “the underlying structures of dominance that produce environmental injustice” (Gibson-Wood & Wakefield, 2013). For example, projects informed by neoliberal colorblindness may allow White cultural practices to be taken as universal, leading to the provision of greenspace that is not received as a benefit and, as a consequence, does not ameliorate environmental justice concerns.

Moreover, this analysis found that the way that whiteness articulates with the pastoral is not an accidental misrecognition but produces its own political effects by implicitly authorizing White land claims in the future. Today, environmental stewardship proves useful to justify land claims for an unmarked, but dominant, racial group (McKee, 2014). The whiteness of vacant land re-use stands as one example of how such claims are made: through a post-industrial reworking of the pastoral, a rehash of the English garden to “establish rights of possession” (Moore et al., 2003, p. 9) to devalued urban space. Project documents, and particularly imagery in the documents (Figure 11), from Shale Street suggest that vacant land re-use performs preparatory work needed to establish White land claims, forming not just a hidden discourse around race but a covert White emplacement strategy that designates who will and will not belong on Shale Street in the future. While green gentrification may not be helpful to understanding the proximate causes of the Shale Street conflict, the process of land revalorization it describes may ultimately play a role in understanding the root causes behind the frenzy of energy around vacant land re-use. From this standpoint, Shale Street appears entirely

coherent as an effort to produce a new greenfield to not only in service of a rent gap but to also reduce the White racial threat to future investors (Hackworth, 2018).

Urban greening is not universally beneficial. As Walker (2009, p. 31) explains, “greenspace is not an entirely uncontested and unproblematic “good thing” that contributes equally to wellbeing for all; rather there can be important cultural, gender and other differences in how particular forms of greenspace are viewed and the functions and services that these perform.” As the way we understand environmental justice continues to expand from the distribution of environmental burdens to the distribution of amenities and, ultimately, the distribution power, it is critical to identify the exclusionary practices that obscure but also reproduce power asymmetries, including asymmetries around deciding whose nature is to prevail. Practitioners and scholars can benefit from attending to how aesthetic and representational practices form an ideological terrain upon which subtle exclusions are obscured, where struggle and resistance are enacted, but also where procedural and recognitional justice may be secured (Agyeman, Schlosberg, Craven, & Matthews, 2016; Walker, 2009). This may be particularly true for White-dominated environmental organizations that have a longstanding interest in ecosystem services but have only recently taken interest in environmental justice. For my own part, I did not set out to investigate the whiteness of vacant land re-use. To the contrary, my initial framework for understanding land vacancy in Cleveland focused primarily on questions surrounding the non-human and only tangentially engaged with questions of race or racism, a reflection of my own positionality as a White woman. It was through struggling to make sense of why vacant land re-use projects were so hotly contested that led me to reanalyze my field data through a cultural politics of race and nature lens.

Key findings from this paper that may be useful to practitioners include:

- **Prioritizing social benefits:** ecological restoration may be out of view of daily life, so funds should be allocated to prioritize social benefits and make them visible, even if they conflict with existing funder priorities. Asking for input and then ignoring it may do more harm than good.
- **Recognition and representational sovereignty through design:** ensuring residents perceive site design as a benefit, from the types and placement of materials to the way they integrate into existing land uses and sorts of landscapes the site invokes. Incorporating non-dominant understandings of what constitutes “the environment” and what environmental states are desirable are critical. Much in the same way as “alternative food movements” are in tension with “food justice” or “food sovereignty” (Alkon & Mccullen, 2011), urban greening is in tension with land justice. Practitioners may benefit from examining some of the ways food justice activists have attempted to destabilize the racially exclusionary practices around local food, for example, by attending to cultural appropriateness and foregrounding, rather than erasing, the labor required to produce food.
- **Decentering whiteness:** community engagement should rigorously expose site plans to resident critique to ensure the site meets residents’ needs rather. Future research on urban greening projects in spaces of disinvestment may benefit from interrogating this cultural politics and, in particular, excavating around the White observational modality that has been affixed to Rust Belt land vacancy following the 2007-2009 economic crisis.

4.5: Conclusions

The paper asked: *why do “aesthetic concerns” become sites of racialized contestation in vacant land re-use and what does this contestation imply for urban greening practices, particularly in spaces of disinvestment?* Drawing on evidence from Cleveland, this paper addressed these questions by calling attention to the cultural politics of vacant land re-use, particularly the way it deploys exclusionary aesthetic and representational practices associated with ruralization and rural lifeways, which I am calling ‘the pastoral.’ I argued that the pastoral is a White racial code that become laden with socio-spatial power when affixed to Black spaces of disinvestment such that the trope reproduces but also obscures White racial dominance by recasting White land claims as Black ‘benefits.’ On Shale Street, and in Cleveland’s vacant land re-use initiatives more broadly, colorblind racism has fused with environmental justice rhetoric in a way that enables the pastoral to be taken as a universal marker of ‘improvement’ and, in doing so, misrecognizes resident needs, leading to conflict over place-making that is then explained away as a problem of resident ignorance. Moreover, signifying practices associated with the pastoral have the implicitly authorized certain ways to claim land through ecological stewardship, ‘whitening’ land vacancy within a strategy that, according to project documentation, explicitly aims to prepare the ground for future development. Thus, whitening vacant land through the pastoral may form one of the discursive micro-processes that performs preparatory work for the pivot from land devaluation to revalorization and, with it, resident displacement, even if gentrification pressure is currently absent. However, attending to the cultural politics of vacant land re-use may also help clarify the sorts of discursive work and representational practices needed to advance struggles for Black recognition, reinvestment, and alternative land tenure arrangements.

CHAPTER 5: PREDATORY INCLUSION: FROM SUBPRIME LOANS TO UNWANTED GREENSPACE

5.1: Introduction

In this chapter, I draw the three preceding chapters into a broader conversation around the ecology of economic crisis and the politics that emerge from using ecology to resolve crisis. I begin by discussing findings from Chapters 3 and 4 to extend the critique of the ecology of shrinking cities literature I advanced in Chapter 2. I argue that the causal force the literature tacitly ascribes to population is not borne out in the data and that the main policy implication stemming from it, vacant land re-use, stands in tension with environmental justice (Section 5.2). After a discussion of mixed-methods research, in which I point towards non-positivist ways to think about knowing land change through remote sensing (Chapter 5.3), I present my synthesis point, organized around the concept of ‘predatory inclusion.’ I argue that, just as subprime mortgage lending transformed racial exclusion from credit into predatory inclusion, vacant land re-use transforms historic disparities in environmental amenities into a sort of predatory inclusion in urban greenspace (Chapter 5.4). Indeed, the latter follows from the former within a broader process that prepares the way for anticipated future land revalorization, which is being conducted today under the guise of sustainability and environmental justice in declining Rust Belt cities.

5.2: Critiquing the ecology of shrinking cities approach to Rust Belt decline

In Chapter 3, I used remote sensing data, real estate transactions records, and US Census demographics to develop a set of statistical models that explained variation in monthly census tract-scale residential vegetation abundance as a function of weather variation, population change, demographics characteristics, and property market characteristics. If these data

supported the claim that population loss ‘drives’ vegetation increase, as neo-Malthusians would have it, I would have expected to see the coefficient for population to take on a negative sign and be statistically significant within the City of Cleveland. In other words, census tracts that lost more population would be expected to ‘green’ more over time. I did not obtain this result. In fact, population loss was found to have no statistically significant relationship to vegetation increase within the city (Table 2, Model 4).

Instead, the most significant variables associated with heightened revegetation abundance were race (% Black) and an interaction terms involving foreclosures in the historically redlined area. Presence in the redlined area on its own was negatively related to vegetation, likely because higher housing densities closer to the city center tend to result in smaller land parcels with a relatively higher fraction of impervious surfaces. However, the higher rates of foreclosure in this area had a countervailing effect, heightening vegetation presence, for several reasons. First, foreclosures were more prevalent in the redlined area. On Cleveland’s east side, roughly two out of every three residential tax parcels in the redlined area were subject to at least one foreclosure (Table 1). Second, those foreclosures were more likely to subsequently become building demolitions and ‘green’ as a result. Indeed, areas with the highest rates of foreclosure during the Great Recession—the Slavic Village neighborhood on the east side of Cleveland—have the largest increases in vegetation abundance today.

These findings provide quantitative evidence *against* the neo-Malthusian perspective that animates the ecology of shrinking cities literature, which I laid out in Chapter 2. It is not a gradual process of depopulation that is ‘driving’ the expansion of vegetated surfaces. Rather, processes of revegetation are linked to rather sudden land tenure changes, many of which are associated with foreclosures linked to subprime mortgage lending and tax default, which arose

from and, in many ways, have reproduced historical racial disparities in housing, credit access, and wealth. The neo-Malthusian perspective on urban decline is largely silent on the ways race and property come together to produce urban environmental change.

These same silences around questions of race and property were echoed in the qualitative case study I developed in Chapter 4, which examined one of the main policy recommendations coming from the ecology of shrinking cities literature: the re-use vacant land for ecosystem services in service of urban sustainability and environmental justice. I looked at a vacant land re-use project that incorporated current best practices, including community engagement and polyfunctionality (a mixture of stormwater management and recreation value), but nonetheless became a flashpoint of place-making conflict around procedural injustices and objections to site design and aesthetics. I showed that dominant frameworks to make sense of conflict around urban greenspace, the knowledge deficit and green gentrification models, fell short of explaining why aesthetics and community engagement procedures made this project so contentious, nor could they account for the stark racial divide that emerged between Black residents and White environmental non-profit staff.

I argued that a cultural politics lens can fill this knowledge gap. Drawing on a document content analysis, interviews, and participant-observation, I identified a process I termed the ‘whitening’ of vacant land, in which upper-middle class White desires and cultural practices, summarized in what I called ‘the pastoral,’ dominated the way vacant land was enrolled into ecological stewardship, taking priority over resident preferences in a way that sparked conflict. Further, through a document analysis, I argued that the whiteness of vacant land re-use is not primarily intended to advance the interests of environmental justice but rather serves as a land holding strategy that anticipates future land revalorization. The practice not only holds land for

future development but offers a way to stake a claim to land while representing that land claim as a benefit to current residents. Although this strategy uses rhetoric associated with environmental justice for legitimation, evidence from my case study suggests that, ultimately, the intended beneficiaries are future, not current, residents. In sum, vacant land re-use has become entangled with a contemporary reworking of racially coded pastoral tropes, forming a cultural politics that has traveled from the ecology of shrinking cities literature and across the practices of urban planning, ecology, and landscape architecture to inform concrete site designs.

Given the silences around race and property, and around political economy more broadly, it should come as no surprise that the ecology of shrinking cities literature misrecognizes material effects of subprime mortgage lending as a ‘benefit’ and recommends policies that tacitly prop up processes of accumulation while reinscribing racial hierarchies onto urban space. By framing land vacancy as an outcome of population loss, the literature has not only misrecognized the root causes of post-crisis land vacancy but also provides cover for perpetuating them by justifying certain types of land tenure and land management arrangements that prepare the ground for future land revalorization.

5.3: Critical remote sensing

Taken together, these findings indicate that one of the most visible material effects of the dispossessions of subprime mortgage lending—the greening of the redlined area—is being misrecognized as ecological improvement, leading to a second misrecognition—the whitening of vacant land under the guise of sustainability and environmental justice. In this section, I want to draw these misrecognitions into conversation with my previous discussion of using triangulation for divergence in mixed-methods research (see Sections 2.2.4 and 2.4.1) to propose a more critical approach to urban remote sensing.

What would it mean to take up provocations by Nightingale (2003) to triangulate for *divergences* between these findings (see Section 2.4.1), in other words, to *situate* remotely sensed imagery, to regard it as no less partial than, for example, analysis of interviews and participant-observation, and to look for inconsistencies between the two sets of accounts? For both Nightingale (2003) and Burhham et al. (2015), who employ this approach, the key analytical move arose from juxtaposing the ‘view from nowhere’ against an on-the-ground view infused with local meaning, which revealed that some parts of a forest (in the case of Nightingale), or some parts of the climate record (in the case of Burhham et al.), matter more to smallholders and resource-dependent communities than others. There is an indeterminacy in remotely sensed data that arises from the way it is “devoid of local meaning” (Nightingale 2003, p. 85).

This same indeterminacy is evident in patterns of urban vegetation observed through remote sensing. What urban vegetation means and what effects it produces cannot be known from the ‘view from nowhere’. This indeterminacy is present in Heynen’s (2006) observation around the ‘fenceline forest’ (Section 2.3.3), although he does not develop this point; one cannot reliably use remotely sensed imagery to distinguish amenity trees from the fenceline forest resulting from structural disinvestment. In my own land change analysis, I reproduced this same indeterminacy through the way I represented greening quantitatively in the Normalized Difference Vegetation Index (NDVI) (see Section 3.3.1). Representing greening as a number homogenized across a wide range of urban vegetation qualities, constructing a generic ‘urban green’ (Section 3.2.2) that, as Heynen showed, can obscure as much as it reveals. Although I would argue this reduction was a necessary tactic to draw out the landscape-scale pattern emerging from the data, it is hardly a politically neutral move. Particularly in spaces of

disinvestment, collapsing together environmental amenities with unmanaged urban vegetation is precisely how material effects of subprime mortgage lending are misrecognized as ‘benefits.’ In other words, not only is the political content of urban vegetation impossible to determine via satellite but eliding that indeterminacy itself enacts a politics that leads to misrecognition of the landscape.

Yet, qualitative field work cannot remedy this indeterminacy around vegetation qualities and their political effects without attending to questions of positionality, as main findings from Chapter 4 demonstrated. The story of Shale Street is, at its core, a story of an unmarked White gaze becoming affixed to spaces of disinvestment, leading to conflict over whose preferred vegetation qualities are to prevail—the pastoral signifiers preferred by White environmentalists or the “manicured” lawns with traditional play equipment preferred by Black residents. Thus, there is a double-indeterminacy around vegetation quality in this case study that arises from the collision of two different sorts of unmarked gazes: the techno-scientific gaze of the satellite that homogenizes vegetation and another that emerges from the unmarked White gaze that is linked to a set of aesthetic and representational practices. One might argue that I am myself implicated in this indeterminacy, to the extent that I had not anticipated that vacant land re-use would become the object of racialized contestation, largely as a result of my own positionality (see Section 4.4).

To develop a more critical approach to urban remote sensing, I want to draw this double-indeterminacy into conversation with a particular point Haraway (2003) makes in articulating her concept of situated knowledge and the gaze. Seeking to rehabilitate vision by situating it, Haraway “insist[s] on the embodied nature of all vision and so reclaim[s] the sensory system that has been used to signify a leap out of the marked body and into a conquering gaze from nowhere.

This is the gaze that mythically inscribed all the marked bodies, that makes the unmarked category claim the power to see and not be seen, to represent while escaping representation” (Haraway 2003, p. 581). Here, Haraway argues that no gaze *actually* originates from nowhere. All vision is embodied vision and cannot be separated from a particular standpoint. A *critical urban remote sensing* might begin by embodying the satellite and its outputs, refusing to allow them to “escape representation,” so that remote sensing can be brought into conversation with human geography on equal terms, while also insisting that there is no one way to interpret qualities through field work. McCormack offers a means to bring remote sensing down to earth, by reconceptualizing it as “a set of mobile and modest techniques through which affective materials are sensed without direct contact or touch” (McCormack, 2010, p. 641). From this perspective, remote sensing is unseated from the view from nowhere and instead that offers a means to bring “the persistence and circulation of spectral geographies...[or] a noncoincident spatio-temporality in which past and future participate simultaneously and in unpredictable ways” (McCormack, 2010, p. 642). Consider the satellite a “seeing machine” (Brannon & Brannon, 2013, p. 271) but one whose vision is partial, imperfect and incomplete, and whose outputs, for example, the Landsat archive I used in Chapter 3, forms a prosthetic spectral memory of landscape that can show where vegetation is but not what it *does*. Below, I show how this might be applied to draw out main findings into conversation from a non-positivist standpoint.

5.4: Extending predatory inclusion from subprime lending to vacant land re-use

In this section, I want to draw on that silence around vegetation quality to synthesize these two processes using the concept of *predatory inclusion*. The argument I want to advance is

that, through these series of misrecognitions, predatory inclusion in credit through subprime lending is being transformed into predatory inclusion in greenspace through vacant land re-use, both materially and discursively, and this transformation is reshaping the way urban decline is understood and managed today.

Although typically discussed in relation to lenders and financial actors, predatory inclusion can refer to any “process whereby members of a marginalized group are provided with access to a good, service, or opportunity from which they have historically been excluded, but under conditions that jeopardize the benefits of access. Indeed, processes of predatory inclusion are often presented as providing marginalized individuals with opportunities for social and economic progress. In the long term, however, predatory inclusion reproduces inequality and insecurity for some while allowing already-dominant social actors to derive significant profits” (Seamster, 2017, pp. 199–200). Predatory inclusion puts a name on the process by which systematic denial of credit to Black households associated with redlining pivoted to the provision of subprime or otherwise high-cost home loans (Taylor, 2019). This pivot provided the conceptual scaffolding for setting up and interpreting the ‘interaction’ of redlining and foreclosure rates (see Section 3.2.4). In a sense, the interaction term resulting from land change analysis provided quantitative evidence for how predatory inclusion came to ground as an increased likelihood that subprime loans would be located in or near the redlined area, that those loans would become foreclosures, and that those foreclosures would be ‘greened’ through demolition.

Not stated in the Chapter 3 analysis, however, is that neoliberal colorblind racism is precisely the mechanism enacting the pivot from racial exclusion to predatory inclusion. Part of the reason why subprime lending disproportionately targeted Black households was that it took

factors like zip codes or credit scores, both directly shaped by antecedent racial segregation and credit exclusion, but treated them as though they were neutral borrower characteristics for the purposes of ‘pricing’ the risk of a home loan, thereby disproportionately saddling Black borrowers with toxic credit with high risk of default (Langley, 2008). It is striking to compare predatory inclusion of subprime lending with the way residents were enrolled into the Shale Street project: the same neoliberal colorblindness at the root of greening the redlined area is also the mechanism at the heart of the cultural politics that sparked the conflict around the whitening of greenspace. Indeed, the process of land clearance quantified in Chapter 3 quite literally prepares the ground for White land claims to be portrayed as a ‘benefit’, as I argued in Chapter 4. In this way, the transformation from racial exclusion into predatory inclusion in credit set the stage for projects like Shale Street to transform historical exclusion from greenspace into a parallel process of predatory inclusion in vacant land re-use.

By using predatory exclusion to connect subprime lending to vacant land re-use through the concept of neoliberal colorblindness, findings from this dissertation suggest that casting the material effects of racial dispossession associated with subprime mortgage lending in ecological terms is *de facto* enrolling the racialized poor into providing free labor for unmarked political projects that aim to prepare devalued land for future revalorization. It should come as no surprise that the transformation of racial exclusion into predatory inclusion through neoliberal colorblindness is considered to be one of the mechanisms behind persistent racial inequality, particularly racial wealth gaps, in contemporary markets (Houle & Addo, 2018). Drawing a connection between subprime lending to urban greening also relates directly to the provocative claim that “Wall Street is a way of organizing nature” (Moore, 2011)—risk-based pricing, and the conceptual apparatus that it rests on, shaped the material and discursive elements involved in

production of nature through demolition and re-use following the 2007-2009 crisis. Further, by erasing political economy, omitting race and property, and misrecognizing dispossession as a 'benefit,' the resurgence of cultural ecology in bodies of literature such as the ecology of shrinking cities is de facto participating in this process.

CHAPTER 6: CONCLUSIONS

Moments of economic crisis disclose the contradictions at the heart of capitalist development. This dissertation investigated a contradiction around land vacancy, foregrounding emerging frameworks that have attempted to hold the ecology and political economy of land vacancy separate, which have become prominent in the aftermath of the 2007-2009 economic crisis. In particular, I honed in on new ways of thinking about land vacancy as *ecology* and an environmental amenity, and explored the tension between this perspective and the *political economy* of land vacancy, which, in my study area of Cleveland, Ohio, cannot be separated from broader issues of race and property in US cities. At the broadest level, this dissertation asks: what does it mean to cast the material effects of racial dispossession associated with subprime mortgage lending in ecological terms, and how does that move reshape the way urban decline is understood and managed today? I made three moves to examine new ways of thinking about the ecology of urban decline: a synthetic review and critique of the ecology of shrinking cities literature, a land change analysis of post-crisis revegetation patterns, and a qualitative case study of a vacant land re-use project that leveraged this new way of thinking about land vacancy as ecology. Taken together, these moves were intended to draw out an urban political ecology of economic crisis and its aftermath while also bridging the growing divide between systems science and critical theory.

In sum, my first overarching contributions in this dissertation has been to demonstrate that casting the fallout of economic crisis in ecological, but not political economic, terms has produced a series of misrecognitions, failing to see how race and property ‘drive’ environmental change (the greening of the redlined area) and, as a consequence, encouraging certain forms of ecological stewardship that shore up these ‘drivers’ while also obscuring them (the whitening of

this newly greened space through vacant land re-use). I reviewed and critiqued the ‘ecology of shrinking cities’ literature (Chapter 2). Locating this literature within the cultural ecology tradition, I demonstrated that its dominant tendency is to understand decline in the Rust Belt as a product of population loss, and to link population loss to heightened ecological function through demolition of the built environment. I argued that this framing reproduces a set of neo-Malthusian fallacies, erasing the political economy of urban decline in a way that bears certain resemblances to critiques of cultural ecology and risk-hazards research leveled by early political ecologists. I suggested that, in the context of growing divergence between political ecology and other sub-fields with roots in cultural ecology and risk-hazards research, integrating land change science with urban political ecology offers a theoretically rigorous and empirically robust means intervene in this misrecognition. I made the case for engaging the ecology in urban political ecology within a ‘triangulation for divergence’ approach to mixed-methods research.

Taking Cleveland, Ohio, as a case study, I developed two chapters to support this proposed engagement. First, in a land change analysis, I used remote sensing to quantify changes in vegetation abundance after the Great Recession (Chapter 3). This analysis challenged the neo-Malthusian logics of the shrinking cities literature by demonstrating that property markets, not population loss, best explain shifts in post-crisis vegetation abundance. I identified an interaction effect between foreclosure rates and the legacy of redlining, in which the relationship between foreclosure rates and post-crisis greening was magnified in the historically redlined area. Slavic Village, the Cleveland neighborhood intersecting the historically redlined area that was deemed to be the epicenter of the foreclosure crisis, is now the epicenter of post-crisis greening, for example. I demonstrated quantitatively that the premise that urban population loss ‘drives’ environmental change fails on its own terms and argued that excessive focus on patterns of

population decline and vegetation increase obscures the underlying political economic processes that give rise to both. To show this in a way that is legible and meaningful to systems science researchers, however, it is necessary to map, quantify, and analyze vegetation change. Along the way, I proposed a methodology to leverage the specifically urban features that historically have limited urban land change analysis (small management units, mixed pixels that change at different rates) as an asset for observing urban vegetation change across decades at a relatively fine spatial and temporal resolution.

Through a qualitative case study of a contested vacant land re-use project, I uncovered a process of ‘whitening’ vacant land, in which cultural practices aligned with upper-middle class whiteness dominate the way vacant land is drawn into urban ecological stewardship projects (Chapter 4). I argued that, through vacant land re-use, newly ‘greened’ land is being enrolled into a broader political project that uses the rhetoric of sustainability and environmental justice as cover to legitimate certain claims regarding the use, management, and ultimately ownership of land. I argued that racialized conflict over aesthetics and representational practices proxy for broader struggles for whose nature, and ultimately, whose claim to land, is to prevail in these newly ‘greened’ spaces. The elements I identified that hold the cultural politics of vacant land re-use together—colorblind racism, whiteness, and the erasure of labor associated with ‘the pastoral’—are key to making sense of the discursive microprocesses that conduct land revalorization and push it forward in declining US cities in the contemporary moment.

My second contribution has been development of an approach for bringing land change science and political ecology into closer conversation. By situating remotely sensed images and bringing the ‘greening of the redlined area’ in a political economy framework, I argue that housing foreclosures associated with the Great Recession not only arose from and reproduced

antecedent racial discrimination in access to credit and housing, but also prepared the way to pivot from devaluation, serving the broader needs of capital to reduce ground rent and, ultimately, revalorization. In a sense, the remote sensing analysis tracked the unfolding of the spatial fix as it is inscribed on the urban landscape, combining legacies of New Deal racism with contemporary neoliberal colorblindness to guide how this fix comes to ground. The ‘interaction’ of foreclosure and redlining discloses not only which individual houses are subject to foreclosure and are subsequently demolished, but which parts of the city are to be devalued and prepared for a new round of accumulation. These results would seem to unsettle the purportedly neutral process of gradual population loss and land abandonment, leading to demolition and benevolent vacant land re-use, that is depicted in the ecology of shrinking cities literature. I argue that this literature (1) rests on a set of faulty premises that inappropriately foreground certain preferred patterns of population loss and revegetation while obscuring underlying political economic processes, particularly around race and property, at the root of both, and (2) generates a set of policy implications that purport to align with social justice but may actually undermine it. By misrecognizing the root causes of land vacancy and prescribing White desires as the remedy, the transformation from racial exclusion to predatory inclusion in credit is extending into greenspace provision (Chapter 5). By failing to engage with questions of race or property, the ecology of shrinking cities literature not only misrecognizes why population loss and vegetation increase proceed in tandem in Cleveland and its peer cities, but also leads to a set of policy implications that run the risk of reproducing the same political economic processes it obscures. In this way, the misrepresentation of Rust Belt decline as ‘urban shrinkage’ cannot help but be haunted by past and future: the socio-spatial legacy of redlining and the anticipated future pivot from devaluation to revalorization. The urbanization of system science erases this political economy

and is silent on its racial dimensions but, with the right lens, this process can be detected via satellite.

This analysis is, of course, subject to certain limitations. Because my research question focused on the ways that new forms of knowledge around urban land vacancy have emerged, I have centered my analysis on the relation between urban ecology and political economy, but have not fully engaged with the way the ecological framing of land vacancy has been enlisted within state practice to further the needs of capital. Future research may investigate how the ecological framing of vacancy has been leveraged by actors within the local governance apparatus. Moreover, the analysis has used racialization as something of a catch-all for a complex entanglement of both race and class, largely because these axes of domination are inseparable, particularly within hyper-segregated U.S. cities like Cleveland. Future research may extend these preliminary findings in a way that more fully engages with the way the social construction of vacancy—and the cultural politics of race and nature more broadly—participate in racial capitalism.

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