



Forest ethnography: An approach to study the environmental history and political ecology of urban forests

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Laura A. Ogden¹ · Carissa Aoki² · J. Morgan Grove³ · Nancy Falxa Sonti³ · William Hall⁴ · Dexter Locke⁴ · Steward T. A. Pickett⁵ · Miriam Avins⁶ · Katie Lautar⁶ · John Lagrosa⁷

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Abstract

A landscape succession paradigm has shaped much of our understanding about the processes of forest emergence and transformation in the United States. Drawing heavily from theory and method in environmental history, this paradigm has focused attention on the role of landscape-scale shifts in land use and land cover in the production of forests. The geography of cities is patchy, dynamic and heterogeneous, with change and differences occurring at much smaller scales (e.g. Jacobs 1961; Clay 1973) compared to coarse scale of stand replacing successions affecting rural forests (Grove et al. Ecosyst Health and Sustain 2(9):e01239, 2016; Pickett et al. Urban Ecosyst 20(1):1–14, 2017). Therefore, trying to understand *how urban forests came to be*, as well as *what they are*, requires a research approach that is specific to the land use dynamics of cities and attentive to the social life of urban forests. In response to this methodological gap, this paper describes a research approach called “forest ethnography,” which we are piloting in Baltimore, Maryland as part of the Baltimore Ecosystem Study (BES), one of the National Science Foundation’s urban Long-term Ecological Research Programs (LTER). As we describe, we propose that an urban forest ethnography approach can contribute to our understanding of both forest environmental history and urban political ecology.

Keywords Urban forests · Dynamic heterogeneity · Political ecology · Urban ethnography · Baltimore, MD

Introduction: Urban forests as hybrid phenomena

Environmental anthropologists, historians, and geographers have long been interested in understanding the ways in which landscapes that seem like “nature” or “wilderness” are actually the result of complex social histories. The dominant paradigm for understanding the emergence and transformation of forests in the northeastern United States suggests that forests today are the product of successive colonial agricultural and industrial histories and even longer-term indigenous management regimes, as well as interacting environmental forces and natural disturbance (Foster et al. 2003; Foster 1992; Cronon 1983). This “landscape succession paradigm,” as we are calling it, allows us to see forests as the result of landscape-scale shifts in land use and land cover. This paradigm’s important intervention is to conceptualize forests not only as the *product*

✉ Laura A. Ogden
Laura.A.Ogden@Dartmouth.edu

¹ Department of Anthropology, Dartmouth College, Hanover, NH, USA
² Ecology, Evolution, Ecosystems & Society, Dartmouth College, Hanover, NH, USA
³ Baltimore Field Station, US Forest Service, Baltimore, MD, USA
⁴ National Socio-Environmental Synthesis Center (SESYNC), Annapolis, MD, USA
⁵ Cary Institute of Ecosystem Studies, Millbrook, NY, USA
⁶ Baltimore Green Space, Baltimore, MD, USA
⁷ Center for Urban Research and Education, University of Maryland, Baltimore County, Baltimore, MD, USA

of entangled human and ecological histories, but also as *hybrid phenomena* that fundamentally challenge dichotomies of nature and culture (Lachmund 2013).

The landscape succession paradigm is not limited to rural forests. Urban forests also challenge dichotomies of the city and the countryside (Williams 1973; Cronon 1992), though studying forests embedded in urban landscapes require a different research approach. The geography of cities is patchy, dynamic and heterogeneous, with change and differences occurring at much smaller scales (e.g. Jacobs 1961; Clay 1973) compared to coarse scale of stand replacing successions affecting rural forests (Grove et al. 2016; Pickett et al. 2017). The classic landscape succession paradigm, drawing methodologically from environmental history, paleoecology, and landscape ecology, is insufficient to account for the temporal and spatial dynamics of land use and land cover change in cities (Grimm et al. 2000). Therefore, trying to understand *how urban forests came to be*, as well as *what they are*, requires a research approach that is specific to the land use dynamics of cities and attentive to the human experience of urban forests. In response, this paper describes a research approach called “forest ethnography,” which we are piloting in Baltimore, Maryland as part of the Baltimore Ecosystem Study (BES), one of the National Science Foundation’s urban Long-term Ecological Research Programs (LTER). As we describe below, we propose that our urban forest ethnography approach can contribute to an understanding of both forest environmental history and urban political ecology.

What qualifies as an urban forest is, surprisingly, an open question. While many scholars use the term “urban forest” to indicate any form of tree canopy in cities, including street trees or residential landscaping, we are using the term to specifically describe land use patches, dominated by trees, that resemble their rural counterparts in terms of species composition, structural layering, and change over time (Konijnendijk et al. 2006). Though overall tree canopy is an important indicator of various ecosystem services, there are significant differences in social-ecological patch dynamics between a complex, layered forest patch and a corridor of trees along a city street (Jorgensen and Tylecote 2007). Additional differences relative to non-urban forests are the legacies of ornamental gardens and prior land use practices that shape the look, feel, and ecology of urban forests. For example, the remnants of abandoned buildings, mounds of landfill, as well as trash and stray cats can be found within urban forest patches. Certainly, the human experience of urban forests also differs significantly from forests in the countryside – such as what these forest patches “mean” to local residents, how they are used, and related stewardship practices. Later in the paper, we detail our approach to defining forest patches in Baltimore.

Broadly, forest patches are closed-canopy woodlands contained within a city, whether completely surrounded by

urban development or on the urban fringe, with varied land use histories and management regimes (Kowarik 2005). The study of urban woodlands and other “natural areas” outside of parkland has received more attention in Europe than in the United States, with scholars using the term “urban wild woodlands” to describe forest patches that exist on vacant or abandoned land (Kowarik and Körner 2005). Interest in the ecological and social benefits of urban forests motivates recent scholarship, including biophysical ecosystem services such as carbon sequestration, stormwater regulation, nutrient cycling, and temperature regulation (Livesley and McPherson 2016). Equally important socio-cultural benefits of urban forest patches, though less documented, include spiritual and religious values, inspiration, aesthetic values, social relations, sense of place, and recreation (MEA 2005).

The very presence of forested land in urban areas challenges conventional expectations of how cities work. For Sandberg and colleagues, the shifting spatio-temporal patterns of urban forests are a function of how green areas are valued and used by those “people who manage, speak for, and often live close to them” (Sandberg et al. 2014:1). Yet as the authors recognize, urban forests also have dynamics and structures themselves, and so are materially resistant to complete management by human actors. The heart of our inquiry focuses on how forests emerge, persist and change within urban political economies. Such economies align land use in cities with the maximum accumulation of capital (Harvey 1978, 1987; Smith 1984) within a shifting landscape of investment and disinvestment. A critical approach to these political ecology assumptions calls us to explore new frameworks and methodologies for the study of urban forests. Contrary to popular assumptions of highest and best use, is the observation of persistence of forest patches in cities like Baltimore in both neighborhoods of abandonment and those enjoying continued investment. In the first case, there are places where histories of state-sponsored neglect and decades of residential segregation have created neighborhoods seemingly abandoned by capitalist investment (Pietila 2010). In the second case, there are forest patches in Baltimore that persist in gentrifying neighborhoods or neighborhoods where urban land values remain competitive (Avins 2013). In some ways, forest patches in cities can belie some of our assumptions about urban ownership regimes, as they seem to flourish in both neighborhoods of capitalist abandonment and investment though their social histories may be very different.

Our approach builds from other interdisciplinary research projects that seek to understand social-ecological dynamics and change at multiple scales. Some of our methodological training and experience stems from participation on multi-sited urban research on residential yards that combine

spatial-temporal analyses, including use of aerial imagery, with qualitative research approaches (Groffman et al. 2014; Polsky et al. 2014; Chowdhury et al. 2011). This integration of methods and attention to multi-scalar dynamics has been applied to the political ecology of urban and exurban landscape dynamics (Knigge and Cope 2006; Hurley and Taylor 2016), including forest conservation initiatives (Hurley et al. 2017) and availability of forest non-timber resources (Hurley et al. 2008; Grabbatin et al. 2011). Building from these traditions, forest ethnography offers a conceptual and methodological approach to understanding the emergence, persistence, and transformation of urban forests over time, making significant contributions to theories of forest environmental history and the political ecology of urban property regimes. This approach, which we illustrate using fieldwork on urban forests in Baltimore, includes the spatio-temporal analysis of forest patch dynamics, property and land use histories of forest patch parcels, analyses of neighborhood change, and qualitative research with forest constituents including neighbors, city planners, real estate agents, and representatives from community stewardship organizations.

Forest ethnography in Baltimore

Located on the Chesapeake Bay, Baltimore City was once one of the leading ports of entry for immigrants and a major manufacturing center. Once, the production of goods, particularly flour and steel, tied Baltimore's ports and workers to the rest of the world. Yet, like other U.S. industrial cities, Baltimore has experienced waves of economic prosperity and growth, stagnation and disinvestment, followed by periods of reinvestment (Olson 1997). Pivotal events in the city's history include the fire of 1904, which destroyed much of downtown, followed by an era of Progressivist reconstruction, industrial growth during and after World War II, as well as rioting in response to Martin Luther King, Jr.'s assassination. In the post war years, two planning efforts transformed the City and its demographic profile—urban renewal programs led to “slum” clearance and gentrification, mainly impacting poor and African American neighborhoods, simultaneously suburbanization encouraged a middle-class exodus from the City (Power 1983; Crooks 1968; Euchner 1991). Successful economic development efforts, particularly the Inner Harbor revitalization, has transformed the City's profile yet has not stemmed depopulation trends. Baltimore City has experienced steady decreases in population, currently housing 620,000 residents according to U.S. Census population estimates, a 30% decrease since 1970 (Grove et al. 2015). In addition to depopulation, other demographic trends include stark patterns of residential segregation by neighborhood, and rates of poverty aligned with race, education and family dynamics (Yeip 2015).

We use the term “forest ethnography” to describe a research approach that specifically explores the ways ecological and social processes interact to produce our environments and shape the experience of being human in those environments over time (Ogden 2011). Since the 1990s, social science and humanities scholars have sought to understand the significance and meaning of place and landscape in constructing socio-cultural differences and identity. Much of this scholarship has focused on local or community experience, how people make meaning of their surroundings, and the history of parks and natural areas, while also examining the multi-scaled political and economic processes that contribute to access, control and conflict over these places (Peluso 1992; Braun 2002; Neumann 2002; West 2006; Escobar 2008). In doing so, this scholarship has focused attention on the social constructions and cultural contexts of spatial experiences. This rich and varied scholarship has moved us beyond treating landscape simply as a “framing convention,” or a backdrop to society and culture (Hirsch and O'Hanlon 1995), to understanding the complex and uneven ways in which society and the non-human world are co-constituted.

Within anthropology, as well as other social science disciplines, ethnography is a qualitative research approach that combines multiple research methods (Willis 2000; Wolcott 2008). Ethnography generally includes structured but open-ended interviews, long-term fieldwork within a community, and analyses of how history shapes our understanding and experience of contemporary living. Ethnographers seek to understand the complexities of everyday life in a variety of research settings, from rural to urban to virtual communities near and far. Within this range of research sites, as well as theoretical interests, ethnographers share a commitment to self-reflective awareness of the ways an individual's biases and experiences limit the possibilities of fully and objectively knowing other worlds and experience (Agar 1980).

Our work in Baltimore draws methodologically and conceptually from studies of place and landscape, urban ethnography, and political ecology. There is a rich ethnographic tradition focused on urban environments, broadly defined. For example, urban ethnographic research ranges from the Chicago School of Sociology's theories of urban ecology to contemporary research on urban environmental justice and inequalities, environmental activism, and vulnerabilities to hazards (for early example, see Du Bois and Eaton 1996). This research examines how people in cities make meaning of the complex social and ecological worlds they inhabit, from individual thought and action to the macro-level social structures that shape our experience (Ocejo 2013:3). For example, in *Noxious New York*, Julie Sze (2006) describes how environmental activism around issues of asthma, garbage, and pollutants in New York emerged in response to broader processes of privatization

and deregulation in waste management. In another example, Anne Rademacher's *Reigning in the River* (Rademacher 2011) examines how contested claims and histories of belonging politicize and transform river restoration initiatives in Kathmandu, Nepal.

As our methodological approach suggests, we also draw upon theory and practice in urban political ecology. Scholars use the term “political ecology” to signal a commitment to understanding how political and economic inequalities transform communities' access to their environments and natural resources, as well as the ways in which environmental change disproportionately affects communities already marginalized by political-economic processes operating at other scales (West 2012). The goal and often the challenge of political ecology has been to examine how political-economic inequalities manifest across space and at various scales in ways that shape how people relate to one another and their environments. In the last decade or so, this agenda has expanded to encompass an urban focus, or what has been termed urban political ecology (for overviews, see Swyngedouw and Heynen 2003; Heynen et al. 2006; Heynen 2014; Rademacher 2015; Heynen 2016, 2017), an important analytic expansion from the field's traditional rural to global focus (Angelo and Wachsmuth 2015). For example, Amita Baviskar's vivid ethnographic research in Delhi has shown how profound trajectories of social and economic difference become instantiated in the politics of environmentalism, contests over open space and natural resources, as well as the geography of the city itself (Baviskar 2003a; Baviskar 2003b).

Case study: Forest ethnography

In this section, we describe our research approach. While we exemplify the approach using preliminary fieldwork, this project builds on decades of urban socioecological research conducted by BES collaborators. This body of work includes environmental justice research on the spatial patterns of environmental inequality and the social and institutional processes responsible for creating those patterns (Pickett et al. 2001; Troy and Grove 2008; Boone et al. 2009; Boone et al. 2010; Huang et al. 2011; Troy et al. 2012; Boone et al. 2014; Grove et al. 2015). Reflecting our multidisciplinary collaboration and theoretical insights from environmental history, urban ecology, and political ecology, several key principles guide our approach to understanding *how urban forest patches came to be* and *what they are*.

1. Forest ethnography moves beyond traditional qualitative ethnographic methods to incorporate quantitative spatial analyses, such as GIS; and historical analyses using archival, genealogical, and property records. This method helps tell a richer account about Baltimore landscapes.

2. The political economic processes that shape the urban forest mosaic require a multi-scalar research approach. In our research, we examine urban forest patch dynamics at the city, neighborhood, forest patch, and parcel scales.
3. Urban social theory reminds us that real estate markets and property regimes are significant drivers of land use change in cities, so we prioritize understanding the relationship of forest patches to property ownership dynamics and legacies.
4. Most importantly, forests are joint ecological and social phenomena. Therefore, our research seeks to understand the diverse ways forest patches came to be, as well as the diverse ways they are used, cared for, valued, and understood.

The most significant requirement of this approach is to develop community partnerships for research, as strong community partnerships are fundamental to understanding the complex and heterogeneous political-ecological dynamics of forests in cities. For this project, Baltimore Green Space, a land trust for community-managed open space, has been integral to the design and implementation of this research approach. Working with its research partners, Baltimore Green Space has begun to quantify and characterize the extent, spatial heterogeneity, and soil and vegetation characteristics of forest patches in Baltimore. Equally important, Baltimore Green Space has established relationships with community members and organizations associated with several forest patches in Baltimore City, collaborating on strategies to analyze the biological diversity of forest patches and develop stewardship practices. The organization has been working with neighborhood forest stewards in Baltimore for five years, pioneering unique collaborations with residents who want to care for forested areas on lands outside of parks in their Forest Stewardship Network. Baltimore Green Space has begun research on use and stewardship of 88 forest patches in Baltimore, which are geographically distributed across the city. We will build on their research by increasing our sample size to ensure we have a sample of forest patches stratified across Baltimore's nine geographic regions and that our sample represents Baltimore's demographic variation at the neighborhood scale.

Our research approach follows an iterative process, which starts by defining what constitutes a forest patch in Baltimore (Step 1). These patches can be identified using remotely-sensed imagery, and their spatial attributes quantified. In Step Two, we use historic imagery to understand changes in the city's urban forest patches over time. In Step 3, we characterize property ownership of forest patches in Baltimore City, followed by in-depth ownership and land use histories of select forest patches. In Step 4, we analyze the relationship of neighborhood change to forest patch emergence,

persistence, and loss. Last, we conduct ethnographic research to understand the social significance of urban forests in Baltimore City.

Step 1: Defining and quantifying forest patches

Like the old saying about not seeing the forest for the trees, the first step in studying urban forests is to distinguish between the forest and non-forest trees. Many scholars use tree canopy as a proxy for urban forests, as there are important reasons to quantify the total number or extent of tree cover in a city, such as calculating the cooling benefits of urban trees (e.g. Tallis et al. 2011; Loughner et al. 2012). As a metric, however, total tree canopy cover does not quantify the shape or size of patches of trees. There are significant differences in the environment, structure, and functioning of isolated trees and forest patches of various sizes (e.g. Groffman et al. 2006; Girão et al. 2007; Zhou et al. 2011; Kang et al. 2015; Pinho et al. 2016). Since our interest is to understand the social and environmental histories of actually forested land, we need a working definition that allows us to characterize urban forest patches, rather than the more-inclusive category of tree canopy. In this section, we describe how we define and quantify forest patches in Baltimore. Developing a consistent definition is important, though different research questions and urban contexts will shape how other investigators develop definitions and quantifications of a “forest patch.”

Defining forest patches is an iterative process, which is one of our project’s most significant recommendations. Choosing a size threshold is the first stage in the process of identifying the spatial extent and patterns of forest patches within the broader urban mosaic. As examples, a size threshold can help determine the relative importance of parks or other protected lands to a city’s forest patch mosaic or can be used to analyze relative change in the extent of forest patches over time. Next, ground-truthing should be used to determine if the chosen size threshold captures the ecological and social properties of forests relevant to a project’s questions, goals, and urban context. Following Baltimore Green Space, our preliminary definition of urban forest patches uses a 10,000-square foot (929m²) threshold (Avins 2013), which aligns with the City of Baltimore’s definition (Baltimore City 1992). The exclusion of patches smaller than 10,000 square feet provides a simple way to eliminate individual street trees and other types of tree canopy outside our primary research interest, while retaining larger patches including a variety of shapes ranging from park-like forested areas to large but slender patches along rail transit lines; since residential development close to rail lines is no longer permitted, these latter patches can often provide significant “emerald corridors” within the city (Avins 2013). As a first step in testing the validity of the 10,000-square foot threshold, we have developed a stratified, random sampling protocol for ground-truthing forest patches that is attentive to

both forest patch ecology and variations in ownership regimes and neighborhood lot size (as discussed below).

In its Baltimore’s Forest Patches report (Avins 2013), Baltimore Green Space found 4822 acres of forest patches, which constituted 34% of the city’s total urban canopy cover.¹ Their analysis revealed several trends about the distribution of forest patches across the city. Significantly, 20% of Baltimore’s tree canopy is in forest patches outside of public parks (2668 acres), with lands abutting public parks also important sites for forest patches in Baltimore. On the other hand, there is little tree canopy, much less patches of forest, within the city’s urban core or harbor area. Forest patches outside of parks tend to span multiple lots and owners, making them vulnerable to development (Avins 2013).

In addition to patch size, we also use mowed grass as a metric of exclusion. Because mowed grass and natural understories are not usually visible from the leaf-on satellite data used to identify tree canopies, this component of our definition requires ground-truthing (Fig. 1 and 2). While managed grass may be an important stage in the successional histories of urban forests, patches with managed lawn underneath have very different ecological and social characteristics than a forest patch with a less intensively managed understory. Still, as Greg Bankoff describes, “More than trees, [forest] is also about plants, animals, and the other agents that live in, use, and consume the forest” (Bankoff 2013:523). Mowing forest understory produces different plant and animal assemblages, which shapes the ways in which residents and others use, care for, and value these sites. In other words, mowing understory transforms both the ecological and social characteristics of forest patches.

Property lot size may also impact the working forest patch definition we use in Baltimore. Forest patches occur on one or more property lots in any given neighborhood, and lot size varies considerably by neighborhood. Because of this variability, we are interested in whether or not we need to align our forest patch size threshold relative to median lot size. In many cities, including Baltimore, lot sizes are much smaller in the central or urban core neighborhoods. Forest patches that grow up in abandoned or razed lots, even on multiple adjacent lots, can be quite small in neighborhoods where the standard property lot size is small. For example, in some neighborhoods five abandoned lots would result in just 5000 square feet of space, but this smaller “patch” size would not necessarily preclude the growth of trees or the eventual production of a forest. As an example, Fig. 1 compares two Baltimore neighborhoods with different median lot sizes, with an overlay of tree canopy data from the City of Baltimore. Excluding

¹ Matthew Baker, University of Maryland, Baltimore County, led the forest patch analyses for (Avins 2013), which was supported by the City of Baltimore’s Office of Sustainability.

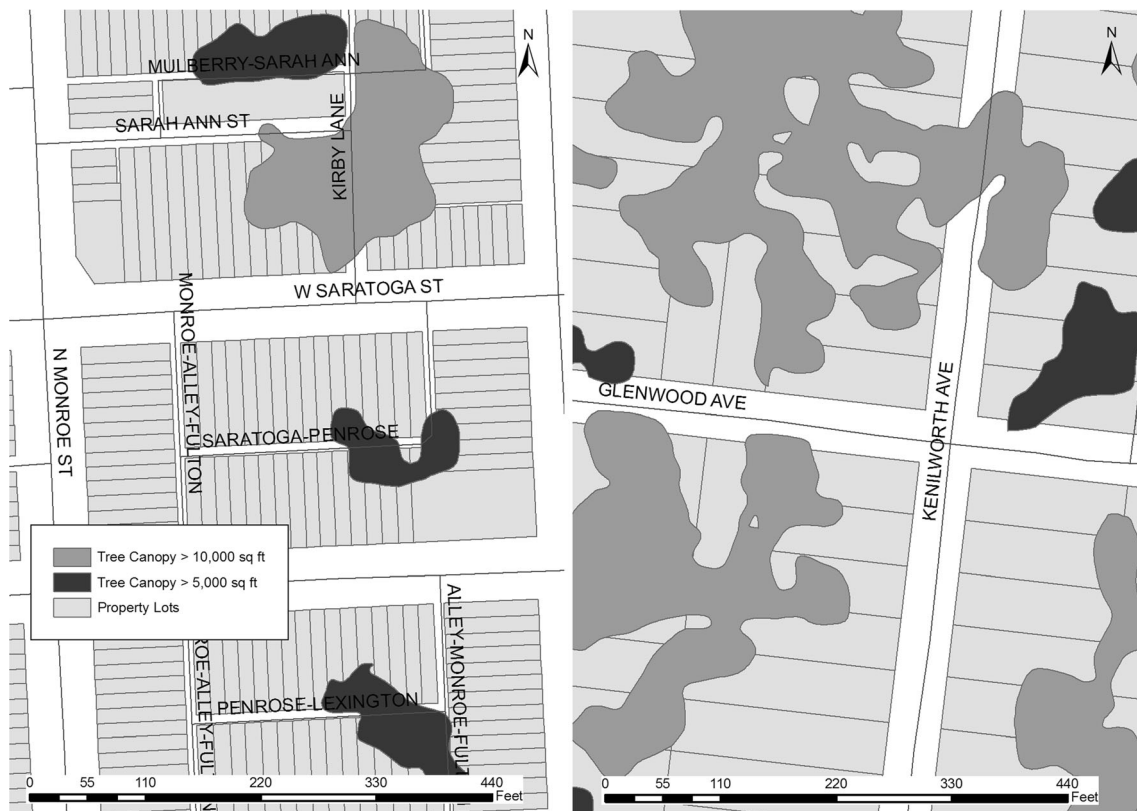


Fig. 1 Comparison of small and large lot areas within Baltimore. Tree canopy data source: Baltimore City Open GIS Data: Tree Canopy 2015. Property lot data source: Baltimore City Open GIS Data: Real Property 2017

patches smaller than 10,000 square feet would mean that few patches in these small-lot neighborhoods would be included, while the large-lot neighborhoods contain plentiful patches in both size groups. Extensive fieldwork conducted by Baltimore Green Space suggests that smaller-sized patches do not retain “forest” qualities in Baltimore, though this may not be the case in other cities. Even so, an important area of future research, is to understand the significance of lot size, and related histories of development, including histories of tree planting, to the production and presence of urban forests.

Fig. 2 Springfield Woods, an example of a forest patch showing a developed understory. Image source: Google 2011



Step 2: Temporal dynamics of urban forests

While Step 1 identifies and quantifies the contemporary extent of forest patches in Baltimore, we are using several sources of landscape-scale historical data to characterize change in the city’s forest cover over time. This analysis of forest patch change allows us to determine which forest patches are relatively stable, persisting through time, and which are much more dynamic. Like Step 1, this analysis enables us to analyze shifting patterns of forest patches at the city scale, though it

does not tell us much about process or the reasons for these patterns. As we learn more and develop hypotheses about potential processes that have led to these patterns, we can then analyze these temporal forest cover data in conjunction with other spatial and process data pertaining to social and economic variables, using both traditional statistical methods as well as methods designed specifically for spatial data (Fig. 3).

We plan to utilize a range of city-wide datasets to capture changes in forest patches through time. Historical illustrations (e.g., Fig. 4) provide the earliest documentation of what the city looked like during the 18th and 19th centuries. While not quantitative in nature, these images give important historical context for the period prior to aerial photography. From the 1920s through the 1970s, we are fortunate to have several sets of digitized aerial photographs. For example, the earliest set of images, of the period 1926–27, are currently housed at the Maryland State Archives. An area covering 210 mi² (544 km²) within and surrounding Baltimore City was photographed in a grid-like fashion from October 19th, 1926 to February 24th, 1927. This set comprises 93 individual images, or “tiles” taken from a biplane, over the 129-day period and capture a moment of dynamic expansion in the city, just prior to the Great Depression. Scans of each image were georectified to spatially align and project them to coordinate maps. This process converts the images from a disparate set of photographs into a GIS dataset that can be used to observe changes in land patches over time—and ultimately to be integrated with other social, economic, and ecological data (e.g. Grove et al. 2015).

Picking up where these earlier datasets leave off, the LANDSAT missions began providing satellite imagery for civilian purposes beginning in 1972. We can use these data

to fill in the most recent 45 years of change over time. While LANDSAT imagery tends to underestimate tree canopy in urban areas when patches are small (less than 30 m², Grove et al. 2014), and when canopy cover is low or high (Smith et al. 2010), the consistency and higher temporal resolution of the LANDSAT imagery will help complete our city-wide record through the present. These data, together with even earlier historical illustrations (Fig. 4), will help us determine patterns of change from which we can develop hypotheses about forest patch dynamics and ownership regimes.

Our preliminary work has shown that patterns in forest patch change can be inextricably linked with changes in ownership regime. For example, Jonah House, a forest patch included in Baltimore Green Space’s Forest Stewardship Network, is an emergent forest within an historic cemetery. Monsignor Edward McColgan, founder of St. Peter’s Parish in Baltimore, purchased the original acreage for the cemetery in 1851 (St. Peters 1942). Irish Catholic parishioners supported and maintained the cemetery through the mid-twentieth century. In 1996, after the property became overgrown and neglected, the Archdiocese of Baltimore leased the property to Jonah House, a social justice religious community, for \$1 a year. Jonah House continues to manage the 22-acre forest patch, because, as one of the caretakers mentioned, they believe in fostering a place of retreat for all forms of life. As Fig. 3 shows, by 1927 cemetery lands are largely without tree canopy, while significant patches along the cemetery’s western boundaries are forested. Over time, the ownership and land use of properties outside the cemetery changes, as does the forest cover on these properties, while the cemetery, whose ownership remains constant for well over a century, becomes reforested.

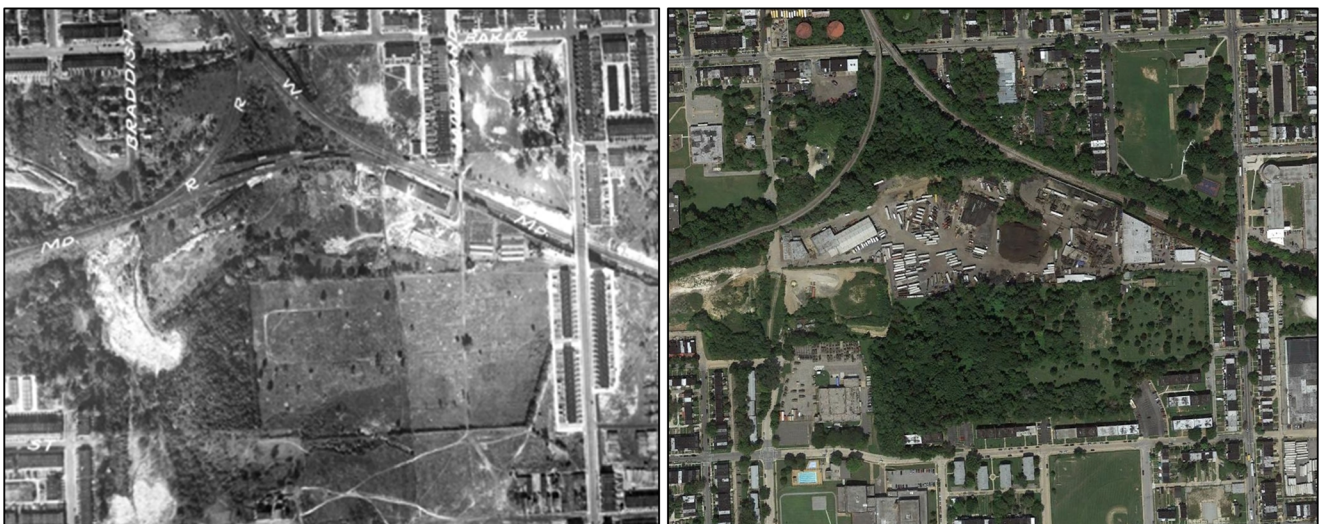


Fig. 3 St. Peter’s Cemetery, 1927 (left) and 2010 (right). In 1927, land on the western border of the cemetery was forested. Today, caretakers of the cemetery have allowed the property to become reforested, while lands outside the cemetery’s boundaries have been cleared for industrial

purposes. 1927 image source: Aerial Photographic Map of Baltimore and Metropolitan District of Baltimore County, available at <http://jhir.library.jhu.edu/handle/1774.2/375932017>. 2010 image source: Google Earth

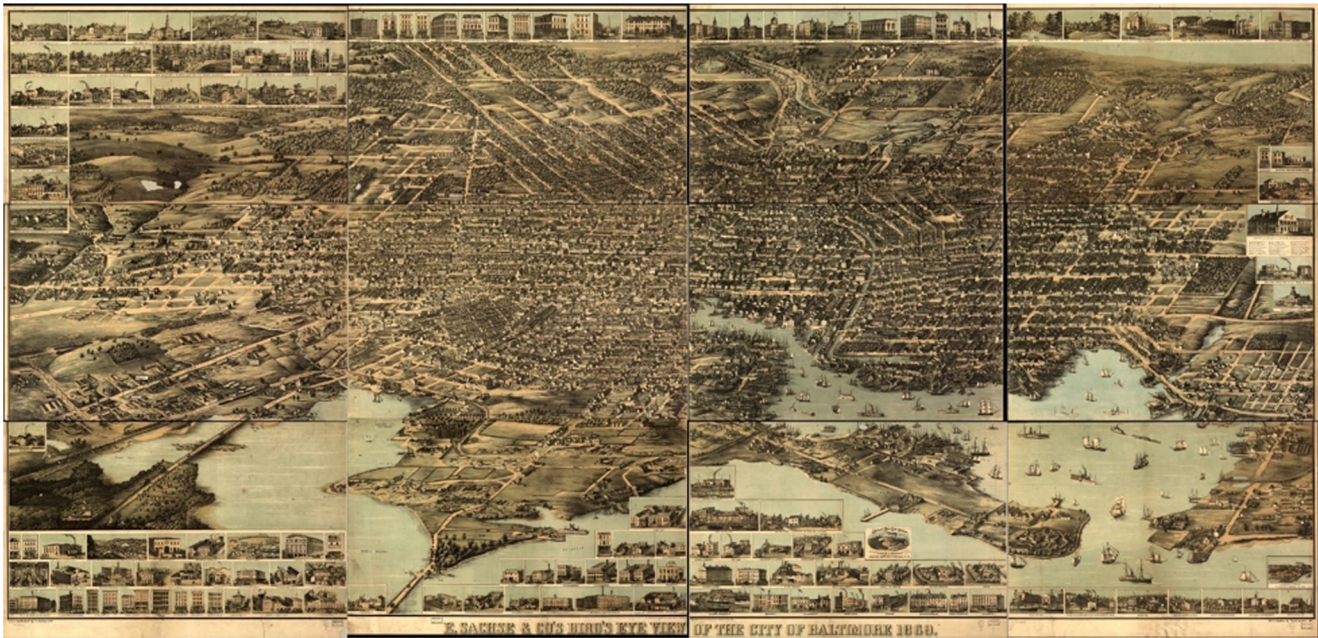


Fig. 4 Bird's Eye View of the City of Baltimore, 1869. Historic reproduction available at the Johns Hopkins University Libraries, high resolution digital version available at the Library of Congress

Finally, classifying land use, such as forest patches, on historic photographs cannot be automated. Thus, we have developed preliminary methods for landuse/landcover classification of historic imagery and are preparing to initiate the “Old Baltimore Forest Project,” which will be a community-based collaborative research platform. Using a “crowd sourcing” approach, the Old Baltimore Forest Project will allow members of the community to classify the historic images through a web-based research platform. We will host this platform on Zooniverse, a popular site for “people-powered research,” that hosts similar projects that use archival material. For this project, we worked with Baltimore high school and college interns to develop the necessary methods for landuse and landcover classification, digitization, and quality assurance and quality control protocols of this imagery. Our team, including Baltimore Green Space, will work with local community members, schools, and organizations to classify the images through digitization in an online GIS, allowing them to engage the scientific process while contributing their personal, in-depth knowledge of the “patches” they call home.

Step 3: Characterizing ownership regimes over time

Ownership regimes fundamentally govern land management and use trajectories in U.S. cities. Building from scholarship of the commons and natural resource management, we use the term “ownership regime” to indicate an authority system that authorizes rights over access and exclusion, as well as rules, responsibilities and social expectations related to a particular parcel of land and its attributes, such as soil, buildings, trees, bodies of water, etc. (Schlager and Ostrom 1992; Bromley

1992). Importantly, different ownership regimes are invested with distinct abilities and rights to transfer property (through sale or gift) to another owner. In the heterogeneous urban mosaic, ownership regime categories are critical to how forests emerge, persist, or are lost. Image analyses (from Step 2) provide the basis for examining the importance of ownership regimes to the stability of urban forest patches in Baltimore, particularly lands transferred to public oversight and ownership such as parks and schools.

Scholars on the commons and natural resources have categorized property regimes into four basic types: open access, private property, communal property, and state property (see Feeny et al. 1990 for discussion). Except for open access, all of these property regimes exist in Baltimore, with varying levels of *de facto* open access on specific state-owned properties, such as public parks, and on privately owned abandoned lots. Within these property regimes, there are different types and configurations of owners and stewards, which are sometimes public administrative units. Depending upon the category of owner, there are different rules for land use and management, social expectations, and the relative ease of transfer to another owner and or land use. Neighbors may use foreclosed lots to plant a community garden, for example, or these lots may be mowed and cared for by the financial institution who has acquired the deed. For these reasons, we prefer the narrower category of “ownership regime” over “property regime” in our approach, to indicate the possibility of multiple configurations of management within a category of ownership.

For example, both public parks and public schools are forms of state property regimes in which a government unit

authorizes particularly agencies, such as the Department of Recreation & Parks or the School Board, to manage parcels of land under its jurisdiction. There are some similarities in governance of lands “owned” by the Department of Recreation & Parks with School Board properties, such as expectations about transparency in decision making. Yet there are also significant differences in the management of these properties related to each administrative unit’s distinct mission, zoning rules associated with the properties, as well as social expectations about use and access. For example, States may authorize local school boards to sell land parcels, forested or not, to raise revenue for school construction or programmatic needs, while Recreation & Parks Department lands managed for conservation may have different regulations about sales.

Characterizing contemporary forest patches by ownership regime allows us to analyze the relationship of forest patches to governance structures. In Baltimore, forest patches are found on lands owned and managed by the City’s Department of Housing and Community Development, the City’s Department of Recreation & Parks, Housing Authority of Baltimore City, the School Board, non-governmental organizations, as well as private owners (Fig. 5 and 6).

To understand the legacies of ownership regime change, we have begun to analyze property and land use histories at the parcel scale. To do so, we are stratifying forest patches based on the following ownership regimes: public parks, schools, privately-owned parcels, government-owned vacant lots, and parcels owned by non-governmental organizations. In piloting this approach, we examined archival records of deed transfers, which provided information about changes in ownership and land use. Deeds also contain the names of owners associated with parcels at different points in time. Examining archival newspaper stories and genealogical data bases provided additional information about these owners.

Examining the histories of parcels provides insight into how and why forest patches remain, such as Springfield Woods, a 2.5-acre forest patch in the middle of a busy north Baltimore neighborhood. Springfield Woods lies south of the historic Wilson Park community, and is now a focus of neighborhood forest stewardship efforts (Avins 2013). Land records show that Henry O’Neill Wilson filed a development plan in 1918 (Plat Book SCL 6, p. 148), which ultimately became Wilson Park, one of the first suburban enclaves for African Americans in Baltimore. A few years later, Wilson expanded his holdings, purchasing additional acreage from the estate of Andrew Carruthers to build a family estate near Wilson Park. The 23 lots that make up Springfield Woods remained part of Wilson family-owned development corporations until 1986, when the parcels were sold to the Alameda Development Limited Partnership. Alameda continues to own almost all the lots within Springfield Woods, though the lot sizes are small and have assessed values at about \$8000 each. In

the case of Springfield Woods, a combination of long-term ownership within one family, limited development potential, and now residential support for conservation are part of the narrative of how and why Springfield Woods persists today (Avins 2013).

Step 4: Neighborhood forest patch dynamics

Of course, parcels and forest patches have a neighborhood context and these neighborhoods have their own socio-economic, cultural, political, and environmental histories and dynamics. The legacies of these histories continue to shape neighborhood social and environmental characteristics (Grove et al. 2018), including the emergence, persistence, and loss of forest patches within neighborhoods. We describe three strategies to investigate the relationship of neighborhood change to forest patch dynamics.

First, time-series Census data with Ward (1900–1950), Tract (1950–1970), and Block Group (1970–Present) geographies were used to understand both social and economic change at the neighborhood scale, including processes of social and economic decline, stability, and gentrification (Grove 1996; Lord and Norquist 2010; Chuang et al. 2018). Second, we examine planning, zoning, and other practices of social and economic segregation, which can shape the trajectory of neighborhoods, patterns of environmental amenities, and environmental inequalities. These neighborhood scale practices, such as deed restrictions or municipal ordinances, can have complex effects on neighborhood decline or gentrification (Grove et al. 2018). For example, we are only now beginning to understand the long-term impacts of “redlining” in U.S. cities. Redlining was applied in Baltimore in 1937 when the Federal Home Owners’ Loan Corporation (HOLC) assigned the highest foreclosure risk to predominantly immigrant and African American neighborhoods, which resulted in long-term patterns of segregation, disinvestment, and property value stagnation. Almost all African American neighborhoods in Baltimore were redlined, except Morgan Park and Wilson Park, just north of the Springfield Woods forest patch (Pietila 2010). Wilson Park’s “B,” or still “desirable rating,” may have offered the neighborhood stability in the residential real estate market and prevented the encroachment of industrial uses. Thus, urban forests may be related to the legacies of institutionalized forms of spatial segregation.

Third, at the parcel scale within neighborhoods, we assessed whether land use or ownership of parcels adjacent to a forest patch affected the emergence, persistence, or loss of the forest patch. For example, the properties adjacent to the Springfield Woods forest patch have been relatively stable, in terms of ownership and condition. One house, to illustrate, has sold only three times since it was built in 1900, maintaining a slow increase in value between when it was last purchased in 1978 for \$16,800 to today’s valuation of about \$84,000.



Fig. 5 Ownership regime mapping of Springfield Woods in the Pen Lucy Neighborhood of Baltimore City. The land beneath the forest patch is divided into individual residential lots, most of which are owned by a

single development corporation (indicated in dark grey at right). Image source (left): Google Earth. Data source (right): Baltimore City Open GIS Data: Real Property [2017](#) and Avins [2013](#)

Step 5: Urban forest ethnography

Earlier steps of our approach help us understand patterns of forest patch dynamics, over space and time, and some insights into the processes that account for these patterns. Qualitative, ethnographic research is critical to extending our findings in two ways. First, qualitative research provides additional and sometimes more nuanced accounts of processes or mechanisms of change, including the social, political, and economic factors that contribute to forest patch emergence, persistence and loss. For example, deed records of forest patch and adjacent properties can reveal how often forested lots changed hands over time, who owned those lots, and the value of properties and adjacent lots at the time of each exchange. We can then develop hypotheses about the underlying causes for stability or instability of forest patches within a particular neighborhood, such as long-term property ownership or stagnation in property values. Interviews with owners, descendants of owners, neighbors, and others, may confirm one of these hypotheses or provide alternative explanations, such as community support for forest patch conservation.

Second, ethnographic research may offer insight into the contemporary and diverse meanings, values, and uses of urban forest patches. Fieldwork discussed in prior steps largely enables a characterization of a forest patch's biophysical characteristics, such as species diversity or understory structure. Yet, if we understand forests as social-ecological entities in contrast to the product of entangled social-ecological histories, then we need to examine the ways in which urban forests exist as social categories, perhaps categorically distinct from rural forests. The social significance of forests varies widely, depending upon forest use including play, solitude, or communion; different attitudes about "nature," including cultural and gendered differences; concerns about safety; and the broader ways in which sense of place shapes how forests are valued (Peluso [1992](#); Tsing [2005](#); Kosek [2006](#); Kohn [2013](#); Li [2014](#); Emery and Hurley [2016](#)). Ethnographic research on communities and forests has demonstrated the ways "who you are," as positioned subjects, shapes the meaning and experience of forests.

Several key questions guide our qualitative research, which builds on Baltimore Green Space's ongoing work and

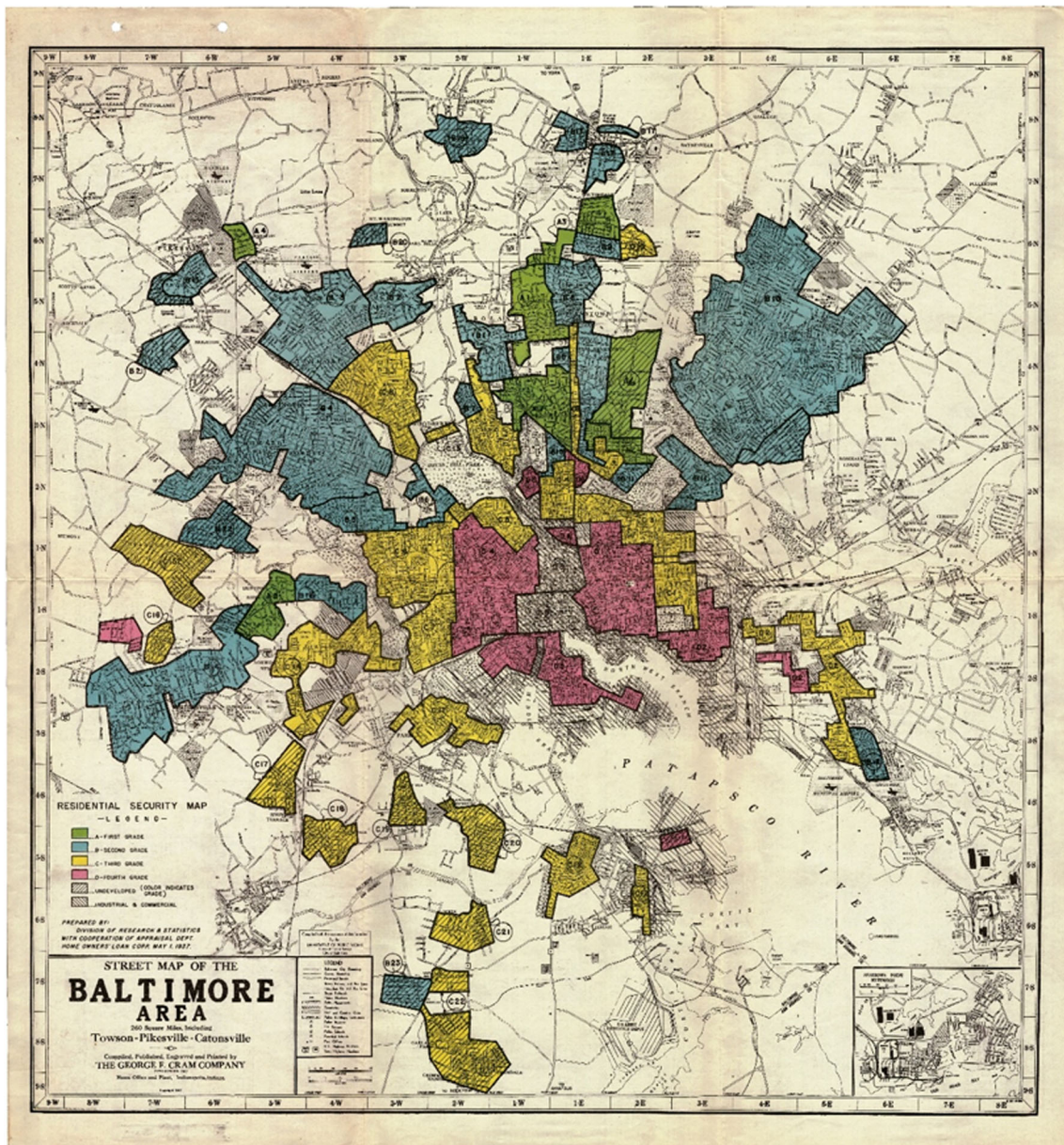


Fig. 6 Baltimore HOLC map 1937. Available at: <http://jhir.library.jhu.edu/handle/1774.2/32621>

relationships with forest patch stewards. Questions guiding this research include:

- 1) *What constitutes a “forest” experience in a city?* For some residents, this may be a sensory experience, such as standing in a forest patch and feeling surrounded by trees. For others, an urban forest experience might include particular activities, such as bird watching, collecting berries or mushrooms, unstructured play, or dumping trash. Like the contradictory ways wilderness and nature is valued, urban forests may evoke distinct emotions, ranging from contentment, a sense of the sacred, to fear about wildlife or crime. To explore this question, we conduct observational studies in forest patches to document the ways people
- 2) *How do attitudes about forest patches vary within neighborhoods and among neighborhoods?* Like many U.S. cities, Baltimore neighborhoods are highly segregated by race, social class, and other metrics of difference (Yeip 2015). We complement the interviews we do with forest users with interviews with forest patch “non-users,” or neighbors who live adjacent to forest patches

spend time in urban forests. We also conduct interviews with forest patch users about their personal histories and experiences, perceptions, and motivations. In addition, we draw upon Baltimore Green Space’s research on forest stewardship practices in Baltimore to understand what motivates stewardship and how stewardship activities shape forest experience.

but do not actually spend time in their neighborhood forest. This research provides a broader sense of neighborhood forest patch perceptions, while also enabling comparative analyses of neighborhood demographic profiles and perceptions.

- 3) *What important events have shaped the trajectory of neighborhoods?* Oral histories with long-term residents and community leaders help us understand the relationship of neighborhood stability, decline, or gentrification to forest patch dynamics. We focus these interviews on neighborhood history, paying particular attention to how interviewees narrate the role of pivotal events in discussing neighborhood history or change. These events might be ongoing and complex, such as processes of gentrification or segregation, or specific, like the restoration of a neighborhood park. In addition to interviewing long-term residents and community leaders, we also conduct interviews with real estate agents who have worked in those neighborhoods, as they often have enormous expertise about neighborhood change.
- 4) *What is the role of governance in the persistence and protection of forest patches?* Decision making that governs land stewardship occurs in multiple, sometimes overlapping, organizations—from neighborhood homeowner associations to municipal and state resource management agencies. This governance is enabled by formal and informal rules and regulations, policy, and laws. As is the case in many U.S. cities, Baltimore City’s professional planning and zoning staff, including staff at the Office of Sustainability, develop and implement land management policy and plans, as well as acting as knowledge brokers among these other relevant land stewardship organizations. For these reasons, our ethnographic research focuses on city planning and zoning activities. Research activities include interviews with key staff, participant observation research during meetings of the Commission on Sustainability, of the Baltimore City Office of Sustainability, and discourse analysis of planning and zoning documents.

Conclusion

Urban and rural forests share similarities, offer contrasts, and are connected through social and ecological flows, though in ways we still need to discover. Like forests in the countryside, the configuration of forested land across a city is contingent upon changing land use and land cover practices. Yet we have less knowledge of the specific social-ecological drivers that enable urban forest patch emergence, persistence, and loss in space and time. We also have less knowledge about the

relationship of forest patch dynamics to urban political economy and related patterns of social and environmental inequality. More broadly, we know little about the role of urban forest in the structure and functioning of cities, beyond characterizing the ecosystem services of urban tree canopy and forest patches.

Our initial research on forest patch ownership regimes and property histories has motivated some initial steps toward hypothesis development. Real estate and land markets are foundational to the political ecology of cities (Pincetl 2012; Heynen et al. 2006), though the presence of urban forests challenges assumptions about highest and best use. Our preliminary research suggests that forested land in Baltimore persists because it lies outside of viable real estate markets. By viable, we mean land which can be commodified and where profit can be maximized through market exchange. There are multiple reasons that forest patches are shielded from the market, including depressed housing and land markets, conservation status, geographic barriers to development, or the presence of the forest itself, particularly when residents are committed to forest protection. It may be that urban forests flourish in the “ruins of capitalism,” as Anna Tsing has eloquently described the disturbed forest landscapes where matsutake mushrooms thrive (Tsing 2015).

Urban forests are embedded within highly dynamic, heterogeneous landscape mosaics. Understanding the dynamics of urban forests requires conceptual and methodological attention to social and ecological processes that occur at scales distinct from rural forest landscapes. Urban and rural landscapes are shaped by different constellations of agents or drivers of change, as well as potentially novel drivers specific to the urban context. These differences compel us to rethink the types of disturbances and change events that are key urban forest change. The ecological literature addresses natural disturbance from a number of viewpoints: as an instigator of successional processes in communities (Connell and Slatyer 1977; Connell 1978), as a shaper of landscape mosaics (Pickett and White 1985), and as an evolutionary process generating specific adaptations (e.g., Bond and Keeley 2005), among others. These natural disturbances can include, but are not limited to fire, windstorms, and pest and pathogen outbreaks. Recent work in northeastern forests of the United States and elsewhere has expanded the nature of “disturbance” to include anthropogenic processes—industrialization, agriculture—as drivers of change in resulting communities and landscapes (Foster et al. 2004). We hope to understand how other social and economic perturbations, such as collapses in the real estate market or urban renewal projects, may influence forest patch dynamics in urban landscapes and the scales at which they operate.

Forest ethnography builds upon insights from environmental history, ethnographic research on place and landscape, as well as urban political ecology. In *Nature’s Metropolis*,

William Cronon challenged his readers' "habits of thought" that make nature and humans distinct (Cronon 1992:8). Today, we view forests not as wilderness devoid of human history, but as landscapes produced by complex and interacting social and ecological processes. We bring this conceptual framing to our study of urban forests, while seeking to understand what makes urban forests unique as social-ecological phenomena. Forest ethnography offers a conceptual and methodological approach to characterize the emergence, persistence, and transformation of urban forests over time.

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